

**CLASTIC INJECTITES OF THE DRY CIMARRON
VALLEY OF UNION COUNTY, NEW MEXICO:
IMPLICATIONS FOR CAPROCK INTEGRITY**

by

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COUNTY, NEW MEXICO: IMPLICATIONS FOR CAPROCK INTEGRITY**

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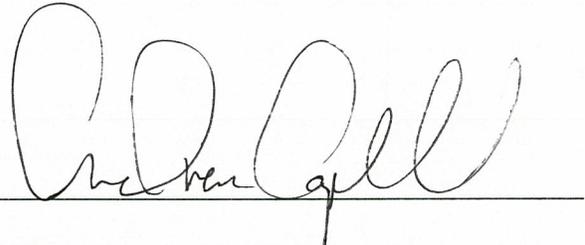
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TABLE OF CONTENTS

	Page
TITLE PAGE	
TABLE OF CONTENTS	i
LIST OF FIGURES	iii
LIST OF TABLES	xii
ABSTRACT	xiii
ACKNOWLEDGEMENTS	xiv
CHAPTER 1: INTRODUCTION	1
Background and Significance	1
Previous Studies	2
Morphologies	2
Stratigraphy	3
Origin	5
CHAPTER 2: GEOLOGIV SETTING.....	8
Depositional Environment	8
Regional Geology	8
CHAPTER 3: METHODOLOGY	11
Field work	11
Petrography	11
Permeametry (Field)	11
Electron microprobe	12
CHAPTER 4: RESULTS	14
Field description	14
Localities of outcrops and sampling	14
Geometries	16
Dikes	19
Plugs	22
Fractures	27
Petrographic data	29
Composition	29
Similarities and differences in petrography	35
Porosity and permeability	49
Diagenesis	52
Paragenetic sequences	52

CHAPTER 5: DISCUSSION	75
Origin of plugs	75
Fluidization	75
Source of injectite material	75
Texture	76
Models for origin of injectites	78
Fluidization by tectonic activities	78
Alternative hypotheses: Solution-collapsed pipes and spring conduit pipes	83
Seal bypass	84
Porosity evolution	84
General determination on permeability	85
CHAPTER 6: CONCLUSIONS	86
REFERENCES	88
APPENDIX	
1. Result of 300 point counts	
2. Microprobe result	

LIST OF FIGURES

Figure 1. Localities of outcrops and samples (marked in circles): The Dry Cimarron Valley of Northeastern Union County, New Mexico from 30X60 MINUTE SERIES (CAPULIN MOUNTAIN TOPOGRAPHIC MAP).

Figure 2. Stratigraphy of the Dry Cimarron Valley area related to the clastic injectites (modified from Mulvany, 2011).

Figure 3. Geologic map of the vicinity of Wedding Cake Butte with a cross-section of northwest-southeast trend (from Baldwin and Muehlberger, 1959).

Figure 4. A: Summary of the upper Triassic stratigraphic units and depositional environments. B: Section of Entrada Sandstone on the western face of Shiprock (Both from Lucas et al., 1987).

Figure 5. Angular unconformity between the Jurassic Entrada Sandstone and the Travesser Formation in Steamboat Butte in the Dry Cimarron Valley area of Union County, NM.

Figure 6. Localities of outcrops and sampling: The Dry Cimarron Valley of northeastern Union County, NM.

Figure 7A. Type 1: This plug (Isolated knob) contains inclusions of mud on the surface and probably formed in a reducing environment. This type also has numerous polygonal fractures similar to deformation bands. It apparently looks similar to Entrada Sandstone or Triassic Sheep Pen Sandstone.

Figure 7B. Type 2: Mineralized plug with hollow interior. This type of plug has many horizontal and vertical fractures and vertical flutes. Horizontal fractures (pseudostratification: Parker, 1933) may be equivalent to “pseudo-bedding” (Baer and Steed, 2010).

Figure 7C. Type 3: Complex plug (pipe+breccia+pods+dikes). This complex type of plug is 300 feet in diameter and roughly circular in outline, and dominantly composed of chaotically-oriented fragments of brecciated Jurassic Exeter Sandstone and upper Sloan Canyon Formation (Mulvany, 2011). A nearly continuous ring dike separates the

breccia body from the surrounding country rock (Mulvany, 2011).

Figure 7D. Type 4: Groups of plugs. This butte has dozens of white to tan plugs present. Many plugs contain fluidized features such as vertically oriented flutes or grooves on their surfaces. Some of the plugs are posed on the probable Sheep Pen Sandstone.

Figure 7E. Type 5: Large plug (with dikes). Cross-section of the plug exposed in the middle of continuous Sloan Canyon Formation by road cut shows its cylindrical form. This plug is mainly composed of a chaotically complex mixture of sandstone and mudstone, breccias, continuous blocky sandstones, and dikes with slickensides. Noticeably, unconformity is posed between plug and overlying depositional unit (probably Jurassic Entrada Sandstone).

Figure 7F. Type 6: Dikes (branched). Many dikes in this area are branched. Some dikes contain carbonate veins. It is noticed that some dikes have deformed and/or fractured uppermost part due to apparently overlying units and also exhibit slickensides due to probable vertical movement. This picture also indicates that an unconformity is between the overlying Jurassic Entrada Sandstone and underlying Triassic Sloan Canyon Formation from Wedding Cake Butte.

Figure 8. Clastic dikes with deformation and slickensides. The upper one (A) in Wedding Cake Butte shows that the uppermost part of the dike with the slickensides have been deformed by differential pressure due to overlying layers. The lower one (B) in the roadcut on Highway 456 (old 325) is exposed within the Triassic Sloan Canyon Formation, showing slickensides as evidence of its vertical movement.

Figure 9. Many thin dikes (A) less than 2cm in thickness with a number of small fractures exist adjacent to the left edge of the plug in road cut. The scale is marked in dotted circle. Another branched dike (B) is exposed in the Triassic Sloan Canyon Fm (?).

Figure 10. Two kinds of knob-shaped plugs. The upper one (A) shows flutes and tubular-shaped holes (fluidization marks), and the lower one (B) has cross cutting fractures and clay-inclusions.

Figure 11. Plug RC. The plug is located on Highway 456 of Union County, NM (UTM: 13S 0673699 and 4086194, WGS 84 (datum), Sec. 24, T31N, R36E). This plug is well

exposed in cross-section. This plug (RC, Fig. 11 and 12: approx. 22.3m in diameter) is surrounded by Triassic Sloan Canyon Formation and its uppermost layer just above an unconformity is probably the Jurassic Entrada Sandstone.

Figure 12. This diagram is based on the field observation (refer to the previous picture: Fig. 11) and shows that Plug RC with four different lithofacies is surrounded by the host rock, the Triassic Sloan Canyon Formation. Facies 1 indicates the rim of the plug composed mainly of sandstone with or without less clay matrix. Facies 2-4 contain more or less intact materials from host rocks as forms of pods or breccia. The host rock predominantly consists of calcareous mudstone and calcitic dolomite with a number of small fractures partially coupled with thin dikes less than 2cm thick.

Figure 13A. Type 1: Fractures with bleaching (with overlying Entrada Sandstone). This type has numerous vertical to subvertical and horizontal to subhorizontal fractures with bleaching mainly occurring in calcareous siltstone layers. The angular unconformity between overlying relatively more resistant Jurassic Entrada Sandstone and less resistant Triassic Sloan Canyon Formation is easily recognized. Another branched dike in the Triassic Sloan Canyon Formation terminates at the unconformity. This picture is from Wedding Cake Butte (UTM: 13S 0660543 and 4093590, WGS 84 (datum)). The scale for this picture is marked in dotted circle.

Figure 13B. Type 2: Plug-adjacent fractures with bleaching. This type of fracture is apparently related to clastic injectites. Most fractures with bleaching tilt away from the plug and some of them coexist with subvertical thin dikes (<2cm in thickness). Left-hand side of the roadcut; UTM. 13S 0673699 and 4086194, WGS 84(datum), Sec. 24, T31N, R36E. The scale for this picture is marked in dotted circle (small tag in orange for marker).

Figure 13C. Type 3: Fractures in the Sloan Canyon Formation. Some vertical fractures with bleaching are obvious but they mainly show a chaotic feature without specific orientation. Location: UTM 13S 0662428 and 4093067, WGS 84(datum).

Figure 14. Sandstone classification (Folk, 1974) from all of the stratigraphic units and clastic injectites. All samples of Entrada Sandstone have greater than 75% quartz whereas those from other stratigraphic units classify as subarkose and arkose (classification of Folk, 1974). Clastic injectites have a more variable composition,

including feldspathic litharenite and litharenite for samples in Facies 2-4 of Plug RC and a thin dike in the Triassic Sloan Canyon Formation in the roadcut. These classifications may imply significant amounts of entrained materials from host rocks as lithic fragments.

Figure 15. (A) Compositional distribution of the samples from all the plugs. (B) Compositional differences indicate that the samples from Facies 2-4 and two of the other plugs are argillaceous or calcareous silty sandstone, and have much less porosity than the ones without clay matrix. When compared with Plugs A and B, Plug M seems to have a similar composition, but Plug M has a totally different cement and matrix content, in that it dominantly has Fe-oxides (probably hematite) in its pore spaces without matrix, in contrast to carbonate cement and matrix in the other plugs.

Figure 16. Proportions of grains, cement, and matrix in samples from the plug in the roadcut. Facies 2 to 4 contain very fine grains, with significant amounts of clay matrix, whereas Facies 1 has coarser grains and much less matrix.

Figure 17. Plug M (910-12) is highly mineralized with Fe oxide cement. (A) X-ray map showing Fe distribution. The white material surrounding grains in this BSE image (B) is Fe oxide cement. In optical examination hematite cement appears to be dark brownish to blackish color.

Figure 18. Fe-Ca-Mg compositions of carbonate minerals. The samples selected for the analysis are 911-2 (Sloan Canyon Formation), 911-4 (Facies 1 of Plug RC), 911-13 (Facies 3 of Plug RC), and 911-16 (Facies 1 of Plug RC).

Figure 19. This Sandstone classification (Folk, 1974) shows compositional differences among all the samples from the plugs including the plugs from Reynolds (1979).

Figure 20. The sandstone samples from Facies 1 of Plug RC show similar textures to the one from Entrada Sandstone (grain size (fU), sorting (poor), and roundness (subrounded to rounded)). The sample from Triassic Sheep Pen Sandstone (Trsp) is somewhat different from the samples of Plug RC in textures. It has smaller grain size (fL), is moderately sorted, and has rounded grains. Moreover, Sheep Pen Sandstone is not present around Plug RC.

Figure 21. These pictures are from the samples of the other plugs (Plug A, Plug B, and Plug M) and the dike next to Plug RC. The upper two samples, Plug A and B, seem to have similar textures to Sheep Pen Sandstone (Fig. 20). Both plugs and stratigraphic unit are from the same locality (unnamed butte; plugs in group). Unlike Plug A and B, Plug M has coarser grains (fU), poor sorting, and subangular to angular roundness. Whereas Plug M is characterized by its pore-filling hematite cement without much carbonate cement or muddy matrix, Plug A and B are rich in carbonate cement and calcareous muddy matrix. The sample from the dike shows similar features in texture to Facies 1, indicating that it probably originated from the same source as Facies 1.

Figure 22. The sample (A) with a gravel-sized sandstone rock fragment (?) from Facies 2 may have originated from Triassic Travesser Formation which partially contains conglomerate carbonate rocks (B) in the Steamboat Butte.

Figure 23. Plug RC is composed of significant amount of very fine to fine grains throughout Facies 2 to 4. The samples of Travesser Formation from both localities (Steamboat and Shiprock Butte) exhibit equivalent grain sizes.

Figure 24. The sample from Plug RC also contains abundant silt to mud-sized components. Similarly, Triassic Travesser Formation shows that it is also composed of silty mudstone.

Figure 25. The probable CRFs (Carbonate Rock Fragments) in Facies 4 are similar to those from Triassic Sloan Canyon Formation, which is mainly composed of calcareous mud and probable intraclast or void-filling carbonates filling moldic porosity.

Figure 26. CRF from Facies 1 of Plug RC. The dolomite crystals are from Triassic Sloan Canyon Formation.

Figure 27. CRF from Facies 3 of Plug RC is pure carbonate and may be correlated to Triassic Sloan Canyon Formation, which also shows almost pure carbonate.

Figure 28-1. Probable fossil fragment in Plug RC may be correlated to those (Fig. 28-2) from Triassic Travesser Formation. The photo (bottom) is magnified from the one (top) in circle.

Figure 28-2. Probable fossil fragments from Triassic Travesser Formation are similar to the ones (Fig. 28-1) from Plug RC. The photo (bottom) is magnified from the one (top) in circle.

Figure 29-1. Probable fossil fragment in Plug RC may be correlated to those (Fig. 29-2) from Triassic Sloan Canyon Formation.

Figure 29-2. Probable fossil fragment from Triassic Sloan Canyon Formation is similar to the one (Fig. 29-1) from Plug RC.

Figure 30. Identical fossil fragments are present in both Plug RC and dike next to it, indicating those probably originated from the same depositional unit.

Figure 31. Porosity and permeability for 42 samples from all the stratigraphic units and clastic injectites. The Jurassic Entrada Sandstone shows the highest and widest values of both porosity and permeability (A and B). The other samples display much lower porosity and permeability except for the ones (A; marked in dotted circle) from Facies 1 of the Plug RC.

Figure 32. (A) Exhibits compositional variation (grains-matrix-cement) in the plug in road cut. (B) Shows that porosity and permeability in Plug RC and the adjacent units (Triassic Sloan Canyon Formation) are not particularly variable, except for facies 1 on the east rim. The dotted line is for carbonate rocks or mudstone, which is below detection limit for permeability with Tinyperm 2.

Figure 33. This picture shows the evidence for compaction with long and concavo-convex contacts. Quartz overgrowths delineated by euhedral forms and dust rings are present (911-17, x40 in PL).

Figure 34. Quartz overgrowths with euhedral to subeuhedral forms partly contact with kaolinite and hematite (911-17, x40 in PL).

Figure 35. Quartz overgrowths were followed by both authigenic minerals of kaolinite and hematite on account of their precipitating the outlines of quartz overgrowths (911-17, x40 in PL).

Figure 36. Grain (feldspar?) dissolution preceded hematite cement because hematite filled in the partially dissolved part, which was subsequently followed by complete dissolution, forming a ghost texture (911-17, x40 in PL).

Figure 37. Partial dissolved feldspar grain exhibits skeletal texture with some precipitation of calcite and hematite. The kaolinite acted as primary pore-filling cement. The kaolinite, which is less densely precipitated in the upper part, presumably preceded iron oxides (hematite) which probably filled the remaining pore spaces. Coatings in calcite are common in this sample (911-17, x40 in PL).

Figure 38. Hematite precipitated on primary pore-filling kaolinite cement (911-17, x40 in PL).

Figure 39. Compaction occurred after dolomite precipitation. Kaolinite precipitated prior to quartz overgrowths and calcite. Quartz overgrowths also postdated dolomite precipitation (A and B from 911-3 Dike in RC, x40PL and XP, respectively).

Figure 40. Dolomite predated quartz overgrowth and calcite cement (A and B from 911-3 Dike in RC, X40PL and XP, respectively).

Figure 41. Calcite cement postdated both kaolinite and quartz overgrowths (A and B from 911-3 Dike in RC, X40PL and XP, respectively).

Figure 42. Kaolinite predated grain dissolution (probably feldspar) and possibly hematite precipitation (A and B from 911-3 Dike in RC, X40PL and XP, respectively).

Figure 43. Grain compaction probably went on even after dolomite precipitation and partial dissolution (A-D from 911-5 Facies 1 of Plug RC, A and C: x40 PL, B and D: XP).

Figure 44. Dolomite precipitated earlier than kaolinite because kaolinite occupied all the pore space except for dolomite precipitation (911-15 Facies 2 of Plug RC, X40PL and XP, respectively).

Figure 45. Kaolinite precipitated earlier than quartz overgrowth and grain dissolution. Kaolinite probably predated hematite as well (911-4 Facies 1 of Plug RC, Both X40 PL).

Figure 46. Hematite precipitated at two different times: One predated grain dissolution of probable feldspar; the other postdated dolomite dissolution. Quartz overgrowth postdated dolomite (911-4 Facies 1 of Plug RC, X40PL and XP, respectively).

Figure 47. Grain dissolution contributes considerable porosity to Facies 1. Dolomite probably postdates grain dissolution (probably feldspar), but it is not clear due to possible 3D effects (911-4 Facies 1 of Plug RC, X40PL and XP, respectively).

Figure 48. Dolomite predated poikilotopic calcite and probably underwent dedolomitization after calcite precipitation because calcitized dolomite still maintains its original outline (911-16 Facies 1 of Plug RC, X40PL and XP, respectively).

Figure 49. This sample (Facies 4; 911-6) displays partial dedolomitization. BSE image above indicates that the whitish bright color is Ca and gray one is Mg; the heavier chemical element is the brighter.

Figure 50. Grain compaction probably took place after fluidization of both sandstone grains and carbonate mud (910-8 Plug A, X10 PL).

Figure 51. Dolomite presumably crystallized from calcareous mud or in pore spaces during early diagenesis. Kaolinite postdated both grain dissolution and hematite precipitation (910-8 Plug A, X40PL and XP, respectively).

Figure 52. Grain dissolution predated calcite (?) cementation (910-8 Plug A, X40PL and XP, respectively).

Figure 53. Early dolomite, probably crystallized from calcareous mud, and presumably may have undergone calcitization (dedolomitization) during late diagenesis (910-8 Plug A, X40PL and XP, respectively).

Figure 54. Paragenetic sequences in Jurassic Entrada Sandstone and clastic injectites.

Figure 55. The sample on the left shows a possible upward fluidization even though it does have a mark for stratigraphic-up. The sample, however, with a mark for stratigraphic-up indicates that the orientation of grains are not straight upward but

heading for top-left corner.

Figure 56. These photos show similarities and differences in texture between plugs RC, A, B, and M, and compare these plugs to the samples from Reynolds (1979). Samples from the plugs show a small difference in mean grain size (fU-fL), and sandstone grains (Plug A and B) are most similar to the sample (Reynolds, 1979) from the Baldy Hill Formation.

Figure 57. These two pictures indicate that fluidized materials may have followed preferential flow paths, creating band-like grain alignments (A: Facies 2, 911-15; B: Facies 4, 911-11).

Figure 58. Diagram illustrating a possible mechanism for clastic plugs formation. (A) Undeformed depositional strata of the Upper Triassic units are present; (B) fractures were generated by tectonic events associated with folding and/or earthquakes; (C) fractures were further developed and liquefaction of sand layers took place; (D) liquefied sand grains (sediments) moved upward, scouring and entraining host-rock fragments; (E) sediments released on the surface experienced weathering and partially eroded away; (F) Entrada Sandstone was deposited on the eroded surface, giving rise to the unconformity. The stratigraphic column used here is modified from Lucas et al. (1987).

Figure 59. A set of small faults coexist with a number of fractures and thin dikes in the roadcut. Fault A is a reverse fault, which probably took place by compressional forces and fault B is a normal fault, probably due to subsequent relaxation. It indicates that some collapse- or sagging-like features right next to the plug may have occurred in relation to hardening and settling after fluidization.

Figure 60. Diagram A shows porosity change before and after cementation and B displays compositional differences among sandstone from all the plugs.

LIST OF TABLES

Table 1 A. Settings and conditions for X-ray maps

Table 1 B. Settings and conditions for quantitative analysis (Appendix 2)

Table 2. Sandstone textures for plug samples

ABSTRACT

Although numerous clastic plugs are well exposed in the Dry Cimarron Valley of northeastern Union County, New Mexico, no one has so far studied the effects of these clastic injectites on caprock integrity. Indeed, although previous workers in other regions have considered the effect of such features on reservoir storage volume, only a handful of studies have examined their potential as seal bypass systems. Previous workers have mainly focused on ore deposits, stratigraphic classification, and/or their origins, which have remained unclear. Detailed work on an exceptionally well exposed outcrop found in a road cut provides more detailed information on their internal geometry and any previous study to date.

The injectites consist mainly of sandstone, mudstone, and carbonate rocks whereas the host units (Trsc and Trt) are dominantly composed of mudstone and carbonate rocks. The lithology of the plug exposed in the road cut (Plug RC) varies from sandstone on the outer rim to a brecciated mixture of mudstone and sandstone in the interior of the plug.

The porosity and permeability of Plug RC varies considerably as a function of lithology. All of the plugs and dikes, including Plug RC (except for Facies 1 in the east), are characterized by low porosity ($\leq 4.3\%$) and permeability ($< 8.1\text{mD}$) due to abundant matrix and carbonate cement. Both the host units and the injectites have low porosity and permeability; therefore, the injectites do not currently affect caprock integrity. Facies 1 on the east of Plug RC has higher porosity (8.7%) and permeability ($< 98\text{mD}$) due to late-stage grain dissolution. Prior to cementation, however, Facies 1 in Plug RC had the potential to become a seal bypass system, thus caprock integrity in this case was time-dependent.

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CHAPTER 1: INTRODUCTION

Background and significance

Clastic injectites are structures formed by sediment injection (Oilfield Review, 2008) and can be classified into dikes, sills, pipes, and plugs by their geometries. In the oil and gas industry, clastic intrusions have been well studied from the standpoint of their contribution to reservoir volume (Hurst, 2005). Clastic intrusions can also act as secondary migration pathways (seal bypass) through caprock units (Cartwright et al., 2007). After formation, the impact of sandstone intrusions on sealing sequences can be altered by cementation or deformation, blocking highly permeable conduits (Cartwright et al., 2007). Nevertheless, issues including origins of injectites and triggering mechanisms for intrusions remain under debate.

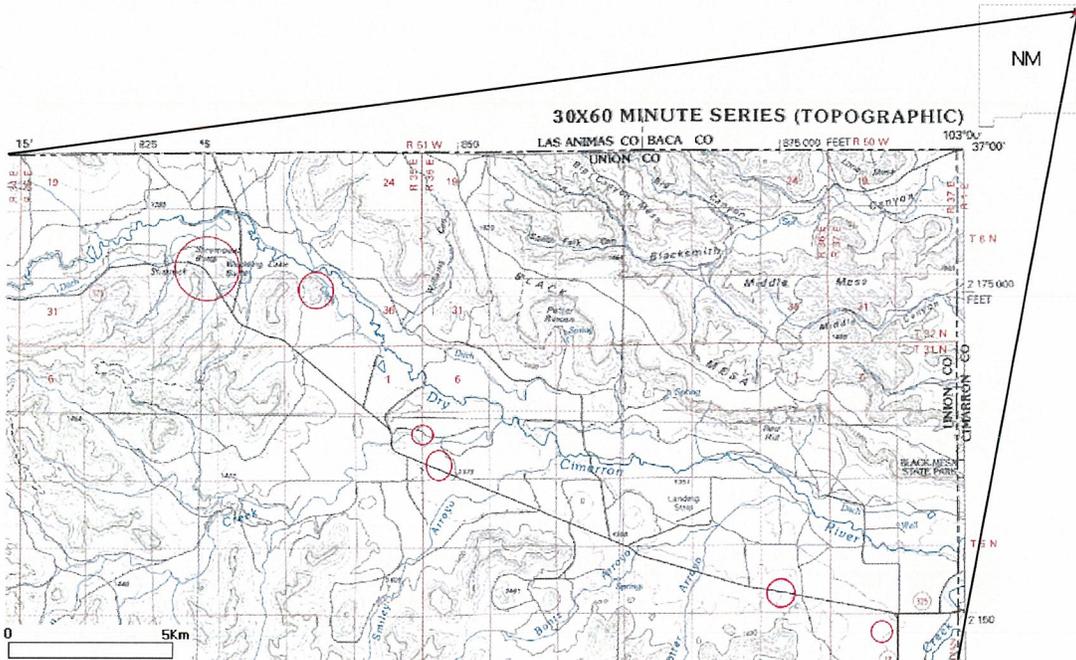


Figure 1. Localities of outcrops and samples (marked in circles): The Dry Cimarron Valley of northeastern Union County, New Mexico from 30X60 MINUTE SERIES (CAPULIN MOUNTAIN TOPOGRAPHIC MAP).

This report details my study of injectites of the Dry Cimarron Valley of northeastern Union County, New Mexico. Although the injectites have been described by previous workers, my investigation differs from the previous work by focusing on their significance for petroleum geology and carbon sequestration.

Previous studies

Morphology

Parker (1933) classified the clastic injectites of the Cimarron Valley into two types based on the morphology: plugs are “clastic stock-like masses” of cylindrical form; dikes are irregular sheet-like bodies. Unlike the dikes, the plugs are greatly exposed compared to the surrounding stratigraphic units due to their greater resistance to weathering (Parker, 1933). The plugs vary in diameter from 10 to 300 feet, 125 feet on average, and vary in exposed surface length from a few feet to a maximum of 70 feet (Parker, 1933).

Unlike clastic pipes, dikes, and sills, the term “clastic plugs” is not commonly in use in geology. This term was presumably first used by Parker (1930) to denote unique geologic outcrops, “clastic stock-like masses” with distinctive features such as cylinders with highly deformed shapes and more complex structures, often with highly branched clastic dikes (Parker, 1933).

Parker (1933) believes that all the dike systems are connected to clastic plugs although some dikes do not seem to be near to clastic plugs. Such dikes may be connected to adjacent plugs at depth. The dikes radiating from plugs are composed of the same material as the plugs (Parker, 1933). They vary greatly in size and width ranging from an inch to a maximum of two feet (Parker, 1933). Many of the clastic

dikes are highly branched into two to five dikes (Parker, 1933). Occasionally, the clastic sills with thin, sheet- like offshoots from dikes occur along the bedding planes in the Sloan Canyon Shales (Parker, 1933).

Plugs exhibit vertical banding or sheeting that develops concentric cylinders parallel to and within the walls of the plugs and horizontal jointing (Baldwin and Muehlberger, 1959) or pseudostratification along subparallel planes nearly perpendicular to the axes of the plugs (Parker, 1933).

Baldwin and Muehlberger (1959) indicated that many of the plugs form isolated knobs at a level below the base of the Exeter Sandstone. They noticed that the sandstone forming many of the knobs is cross-bedded and in some cases has fairly steep to vertical bedding planes. Baldwin and Muehlberger (1959) pointed out that brecciated materials of the plugs appear to come from the Sheep Pen Sandstone and the Sloan Canyon Formation.

Mulvany (2011) concluded that plugs and pipes are very similar, but that plugs are more complex, incorporating pipes, dikes, and surrounding brecciated country rocks. He indicated that a nearly continuous ring dike of quartzose sandstone adjacent to the plug separates the breccia body from the surrounding country rock of the Sloan Canyon Formation.

Stratigraphy

The research area is mainly composed of Mesozoic stratigraphic units (Parker, 1933; Baldwin and Muehlberger, 1959; Lucas et al., 1987). Upper Triassic units, which are closely related to the occurrences of the clastic injectites, are locally exposed in the Dry Cimarron Valley area. To begin with, Parker's (1933) nomenclature for the Sheep

Pen Sandstone and Sloan Canyon Formation forming the stratigraphic units for the upper Triassic, has been adopted by subsequent researchers (Baldwin and Muehlberger, 1959; Lucas, 1987). Nevertheless, some questions about the type sections and the interpretations of the stratigraphic units along with the nomenclature have recently been raised by Mulvany (2011). These questions related to the Sheep Pen Sandstone, which is poorly exposed in comparison to the unconformably overlying Entrada Sandstone. Ultimately, Mulvany concludes that the Sheep Pen Sandstone does not exist as a separate Triassic unit, and is instead part of the Middle Jurassic. He also concluded that the clastic plugs formed during, after, or both during and after deposition of the middle member (Middle Jurassic).

References	Parker (1933)	Baldwin & Muehlberger (1959)	Lucas et al. (1987)	Mulvany (2011)	
Upper Jurassic	To dilto Fm.	Morrison Fm.	Morrison Fm.	Morrison Fm. Bell Ranch Fm.	
Middle Jurassic	Exeter Ss.	Exeter Ss.	Unconformity Bell Ranch Fm.	Exeter Ss. Upper Mbr. Middle Mbr. Lower Mbr.	
			Entrada Ss.		Exeter Ss. Mbr.
			Entrada Ss.		Exeter Ss. main Body
Angular Unconformity				Angular Unconformity	
Upper Triassic	Sheep Pen Ss.	Sheep Pen Ss.	Sheep Pen Ss.	Sloan Canyon Fm. Travesser Fm. Baldy Hill Fm.	
	Sloan Canyon Fm.	Sloan Canyon Fm.	Sloan Canyon Fm.		
	Dockum Group	Travesser Fm.	Travesser Fm.		Travesser Fm.
		Baldy Hill Fm.	Corbert Can. Ss. Baldy Hill Fm.		Baldy Hill Fm.

Figure 2. Stratigraphy of the Dry Cimarron Valley area related to the clastic injectites (modified from Mulvany, 2011).

Origin

The origin of the injectites has been discussed by a number of previous workers. The injectites are confined to the Upper Triassic stratigraphic units: the Baldy Hill Formation, the Travesser Formation, the Sloan Canyon Formation, and the Sheep Pen Sandstone (Parker, 1933; Baldwin and Muehlberger, 1959; Lucas, 1987). Parker (1933) concluded that clastic masses of water-saturated, uncemented sand intruded into these Triassic units forming the injectites. He suggested that intrusion took place due to overburden pressure aided by stresses related to local folding. Compressional forces gave rise to sufficient faulting and fracturing for intrusion to occur from the underlying fluidized source beds.

Parker (1933) pointed out that the sand may have originated from the four layers of white sandstone in the Dockum group, which are now considered to be part of the Baldy Hill Formation (Baldwin and Muehlberger, 1959; Lucas, 1987). Subsequently, the mobilized sand moved upward by meandering injection along bedding planes and minor intersecting fractures (Parker, 1933). He concluded that this phenomenon produced such a highly branched dike system that entire blocks of the country rock were completely surrounded by the mobile sand. He also noted that such features as drag or up-bending of the strata and inclusion of shale from the lower layers may be the most convincing evidence for the upward movement of the sediments.

Baldwin and Muehlberger (1959) suggested that the cylindrical tubes may have been formed by fluids moving upward through unconsolidated sand. Unlike Parker (1933), they were not certain of the origin of the clastic plugs although they cited evidence for upward movement including instances of upward drag of the country rock and the absence of downward drag. Furthermore, they thought that the plugs are

composed of the Exeter Sandstone in their cores and the Sheep Pen Sandstone in the surrounding breccia, even though they believed the plugs occurred in pre-Exeter ages. This is probably because the plugs exist within the Triassic units and many plugs have a central core of light-colored sandstone, which is similar in appearance to the Exeter Sandstone (Baldwin and Muehlberger, 1959). Furthermore, they were uncertain about whether the plugs were intruded from below, collapsed into depressions from above, or formed somehow during deposition of the Sheep Pen sandstone (Baldwin and Muehlberger, 1959).

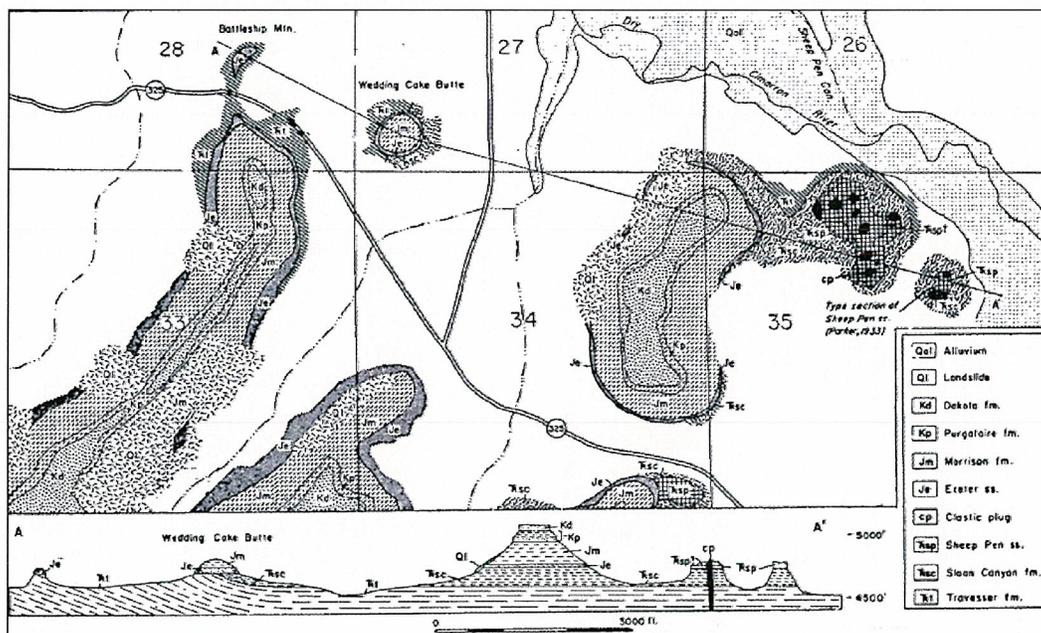


Figure 3. Geologic map of the vicinity of Wedding Cake Butte with a cross-section of northwest-southeast trend (from Baldwin and Muehlberger, 1959).

Smith (1975) mentioned that east-west compressional stresses caused fractures on a north-south trending anticline in the Travesser Formation and allowed upward movement of lower Travesser sediments to form the plugs. Reynolds (1979), who

conducted a petrologic study, expressed the same idea as Parker (1933), but he suggested that the only origin could be pre-Triassic or Triassic. Lucas (1987) had a similar idea to Parker (1933) that tectonic activity caused upward fluidization in this study area. Lucas (1987) hypothesized that earthquake activity associated with Early Jurassic tectonism in the Sierra Grande arch triggered the mobilization of sand. Thus, the folded Triassic strata had been subsequently eroded before the deposition of the Jurassic Entrada Sandstone.

Unlike other previous workers, McLemore and North (1987) and Mulvany (2011) had different ideas about the origin and formation of the plugs. McLemore and North (1987) discussed the origin and triggering mechanism of the clastic plugs by comparing them to collapse-brecciated pipes in northwestern Arizona. They believe that these pipes occurred through solution collapse of the underlying Paleozoic limestone. Mulvany (2011) had a somewhat different concept about upward clastic injections that he believed were probably induced by upward flow along a spring conduit.

anticlinal folding, first mentioned by Parker (1933). Steamboat Butte (previously named Battleship Mountain, Fig. 3 and 5) exhibits a well exposed angular unconformity, between Triassic and Jurassic units. This feature likely expresses the regional geology in relation to clastic injectites. Smith (1975) claimed that the fold was produced by east-west compressional stresses causing fractures in the Travesser Formation on the north-south trending anticlinal crests. He believed this subsequently induced the clastic plugs to form through upward migration of lower Travesser sediments. Lucas (1987) also indicated that the angular unconformity was produced by the Early Jurassic tectonism in the Sierra Grande arch; which in turn contributed to the mobilization of sand through accompanying earthquake activities. Accordingly, there is general agreement for the following sequence: Triassic strata was folded and eroded before deposition of the Jurassic Entrada Sandstone (Parker, 1933; Baldwin and Muehlberger, 1959; Smith, 1975; and Lucas et al., 1987). Lucas et al. (1987) also made observations about the western side of the anticlinal folding located as far west as T31N, R32E, in the Travesser Park-Baldy Hill area. The angular unconformity plays a key role in determining the geologic events and origin of the clastic injectites in that most of them are concentrated between Triassic units and the Jurassic Entrada Sandstone.



Figure 5. Angular unconformity between the Jurassic Entrada Sandstone and the Travesser Formation in Steamboat Butte in the Dry Cimarron Valley area of Union County, NM.

CHAPTER 3: METHODS

Field work

Several places in the Dry Cimarron Valley area were visited for outcrop observations and sampling for further petrographic and geochemical examination. Outcrop observations of representative clastic injectites included a clastic plug (Plug RC) with cross-sectional exposure in a roadcut and two clastic dikes. These outcrops were studied to determine their geometric, structural, and lithologic characteristics. The other sites (Fig. 1 and 6: Steamboat Butte; Shiprock Butte; a highly mineralized plug (Plug M); a butte (no name) with a group of plugs (Plug A and B) and a nearby valley) were also examined for sampling and field descriptions.

Petrography

There are two purposes for the petrographic analysis: one is to constrain the origin of the clastic injectites by comparing their petrologic properties to units surrounding the injectites; the other is to measure variables that control the sealing properties of the injectites. Forty-two thin sections of samples from several distinctive clastic injectites and stratigraphic units were prepared to determine lithologic classification, porosity, component materials, textures, and diagenesis. For lithologic classification, especially for sandstone classification and porosity, a mechanical stage (Carl Zeiss Point Count Microscope Mechanical Pol Stage) was utilized for 300-point counts of modal abundance of each component. Sandstone classification follows that of Folk (1974).

Permeametry (Field)

For sealing integrity of the injectites, permeability was examined using a

portable minipermeameter (TINYPERM 2, New England Research, Inc.). For accurate values, measurements were taken three times at each for 42 points throughout the study area. The lowest of the three permeability values was assumed to be the value of the sample, because the principal source of measurement error is loss of tip-seal integrity. TINYPERM 2 functions best when using sandstone within the range from moderate to high permeability (0.1 to 10^5 mD). The measuring time for samples of low permeability (less than ~ 1 mD) takes too long. For these reasons, when a value measured for a point is over the value (T) of 12.60 (equivalent to approx. 0.3mD), it is considered lower than the detection limit of this tool. It is important to measure the same points as the samples obtained for the thin sections in order to correlate porosity and permeability. According to the instructions from the manufacturer, the values obtained from the TINYPERM 2 were converted into permeability (K) in milli Darcy (mD) by the equation (EQ. 1) below. Measurement is possible within the range from 0.1 to 10^5 mD.

$$T = -0.8206 \times \log_{10}(K) + 12.8737 \quad (\text{EQ. 1})$$

Electron microprobe

In addition to standard optical petrographic analysis, samples were examined on an electron microprobe (CAMECA SX 100) using X-ray mapping, BSE (Backscattered Electron), and quantitative compositional analysis for Fe-Ca-Mg compositions of carbonate minerals. The samples selected for microprobe analysis are 911-2 (Sloan Canyon Formation), 911-4 (Facies 1 of Plug RC), 911-13 (Facies 3 of Plug RC), and 911-16 (Facies 1 of Plug RC).

For microprobe analysis, the samples were first coated with carbon to prevent electrical discharge and electron-beam deviation. These samples were first run through

BSE and then points of interest were examined using X-ray maps. These points were selected for quantitative analysis. Table 1 A and B shows the settings used for X-ray mapping (A) and quantitative analysis (B). The standard elements (oxides) used for the quantitative analysis for carbonate compositions were CO₂, SiO₂, CaO, MgO, MnO, and FeO. Analysis of these oxides results in wt % and number of ions. The number of ions from each point (less than $\pm 3\%$ deviation from 100%) was recalculated into mol % using Fe-Mg-Ca elements for ternary diagrams.

Table 1 A. Settings and conditions for X-ray maps

Condition 1			Condition 2			Column Condition	Dwell time	Resolution
Sp1 PET	Sp2 TAP	Sp3 LLIF	Sp1 PET	Sp2 TAP	Sp3 LLIF			
Ca Ka	Si Ka	Fe Ka	K ka	Al Ka	Ti Ka	HV(kV) : 15 I (nA) : 20	5 μ s	512X512 pts

Table 1 B. Settings and conditions for quantitative analysis (Appendix 2)

Crystal parameters					Column Condition	Beam Size
Sp1 PET	Sp2 TAP	Sp2 TAP	Sp3 LLIF	Sp3 LLIF		
Ca Ka 1 (20)	Mg Ka 1 (20)	Si Ka 1 (20)	Mn Ka 1 (40)	Fe Ka 1 (10)	HV(kV) : 15 I (nA) : 10	10 μ m

* (): Peak time (s)

CHAPTER 4: RESULTS

Field description

Localities of outcrops and sampling

Many plugs and dikes are present throughout the northeast corner of Union County, New Mexico. Figure 6 shows the localities for field observation and sampling for petrographic analysis. Samples for plugs were collected from Plug RC (roadcut on highway 456), Plug M (on north side of highway 456), and Plug A and B in a group of plugs on the unnamed butte. Samples for dikes were collected from RC (roadcut on highway 456), a small local stream (marked as Branched dike), and Wedding Cake Butte. Samples for fractures are from RC (roadcut on highway 456), a small valley next to the unnamed butte, and Wedding Cake Butte. A sample for Sheep Pen Sandstone is from the unnamed butte. Samples for Entrada Sandstones were collected from RC (roadcut on highway 456), Shiprock Butte, and Wedding Cake Butte. Samples for Sloan Canyon Formation are from RC (roadcut on highway 456) and Wedding Cake Butte. Samples for Travesser Formation were collected from Shiprock Butte and Wedding Cake Butte. The plug observed by Mulvany (2011) is located on the corner of highway 406 and 456.

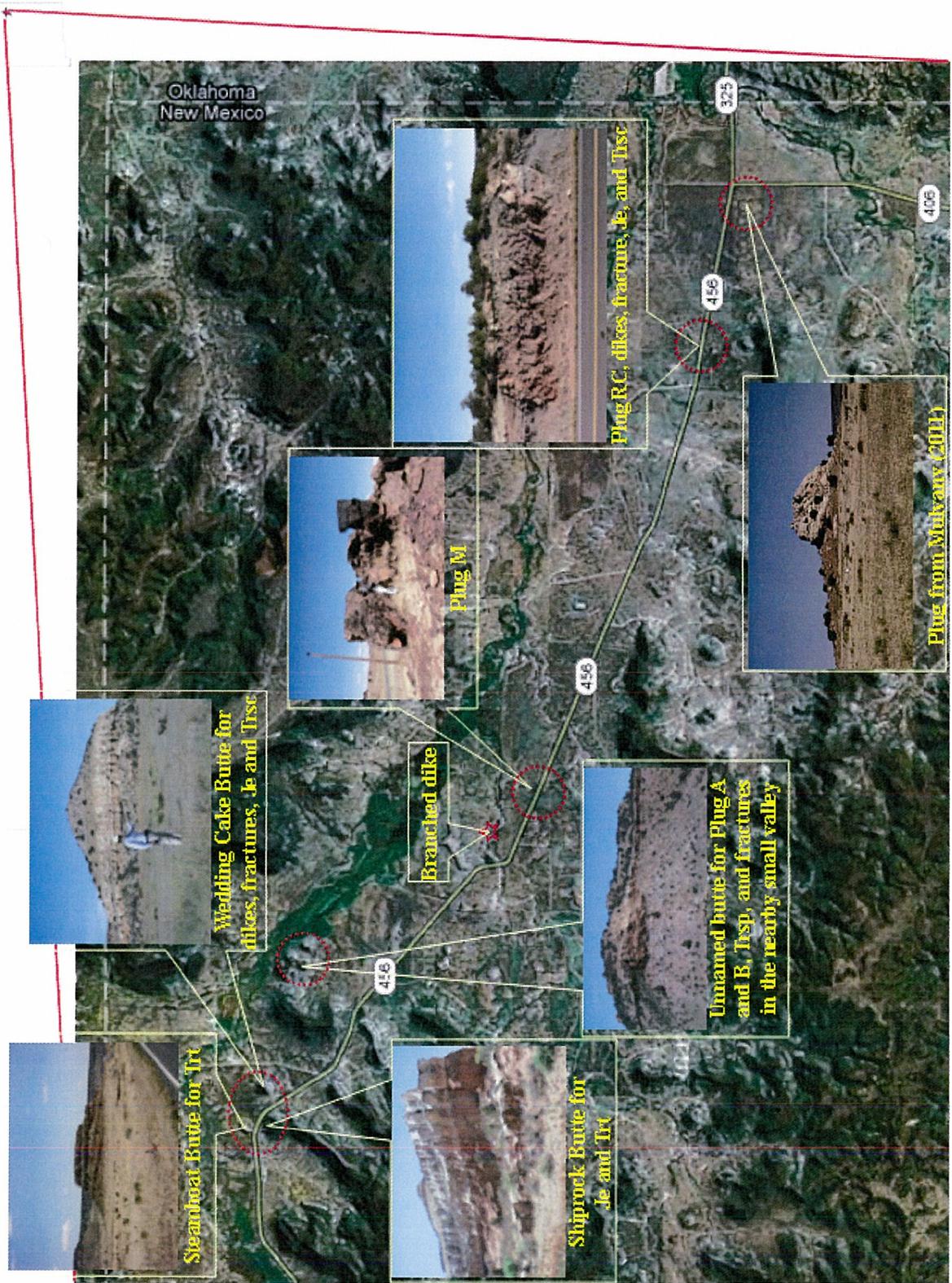


Figure 6. Localities of outcrops and sampling: The Dry Cimarron Valley of northeastern Union County, NM.

Geometries

Clastic plugs (Fig. 7A-E) differ from dikes (Fig. F) in geometry in that plugs are vertical and cylindrical and are generally circular in top-down view, whereas dikes tend to have slab- or sheet-like shapes. In some outcrops dikes and plugs coexist in a complex form (Fig. 7C and E). Based on observations, clastic plugs and dikes can be thought of as several distinctive types as shown in Fig. 7A-F below.

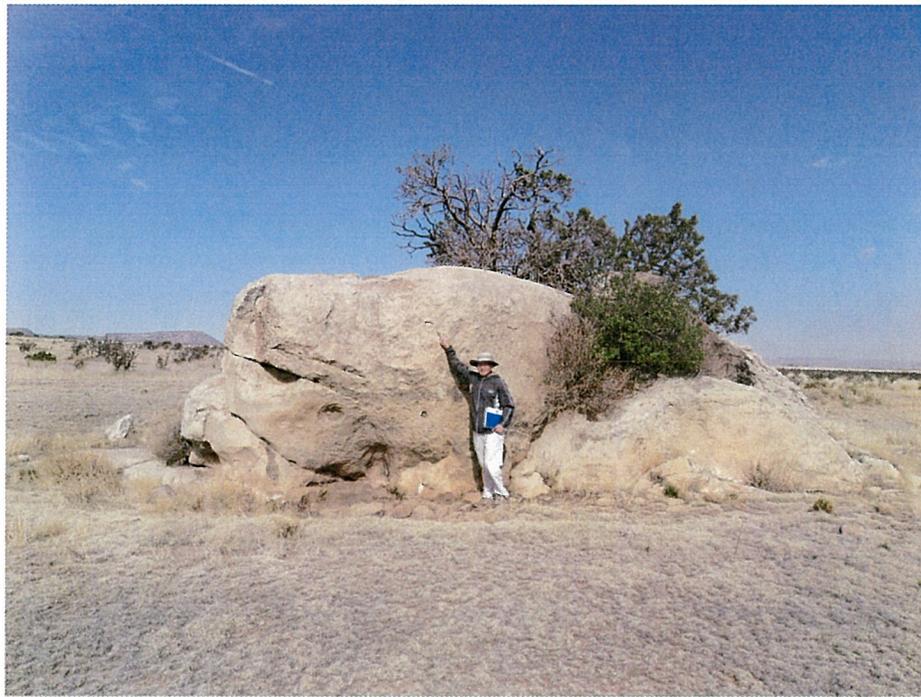


Figure 7A. Type 1: This plug (Isolated knob) contains inclusions of mud on the surface and probably formed in a reducing environment. This type also has numerous polygonal fractures similar to deformation bands. It apparently looks similar to Entrada Sandstone or Triassic Sheep Pen Sandstone.



Figure 7B. Type 2: Mineralized plug with hollow interior. This type of plug has many horizontal and vertical fractures and vertical flutes. Horizontal fractures (pseudostratification: Parker, 1933) may be equivalent to “pseudo-bedding” (Baer and Steed, 2010).

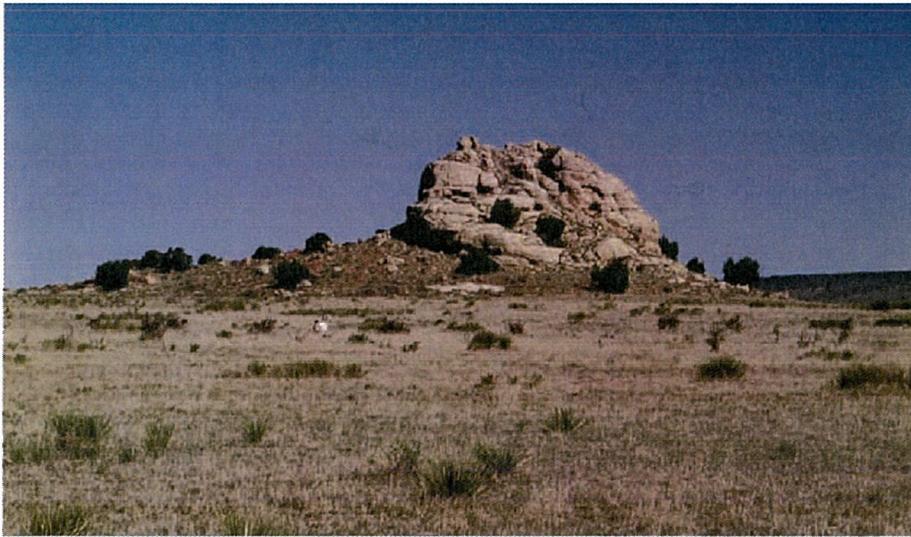


Figure 7C. Type 3: Complex plug (pipe+breccia+pods+dikes). This complex type of plug is 300 feet in diameter and roughly circular in outline, and dominantly composed of chaotically-oriented fragments of brecciated Jurassic Exeter Sandstone and upper Sloan Canyon Formation (Mulvany, 2011). A nearly continuous ring dike separates the breccia body from the surrounding country rock (Mulvany, 2011).

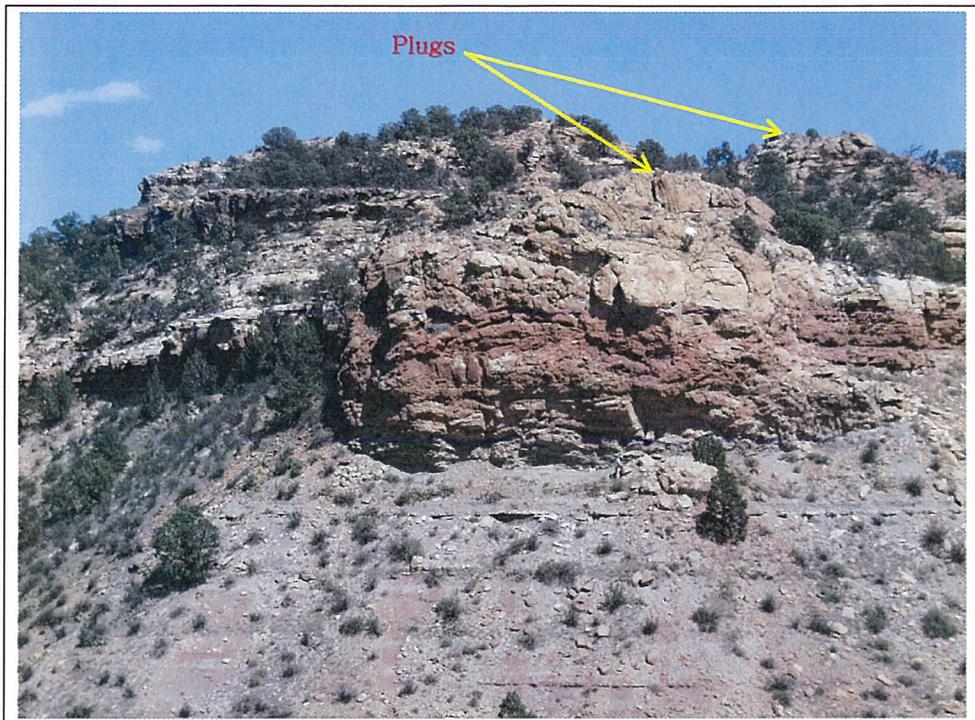


Figure 7D. Type 4: Groups of plugs. This butte has dozens of white to tan plugs present. Many plugs contain fluidized features such as vertically oriented flutes or grooves on their surfaces. Some of the plugs are posed on the probable Sheep Pen Sandstone.

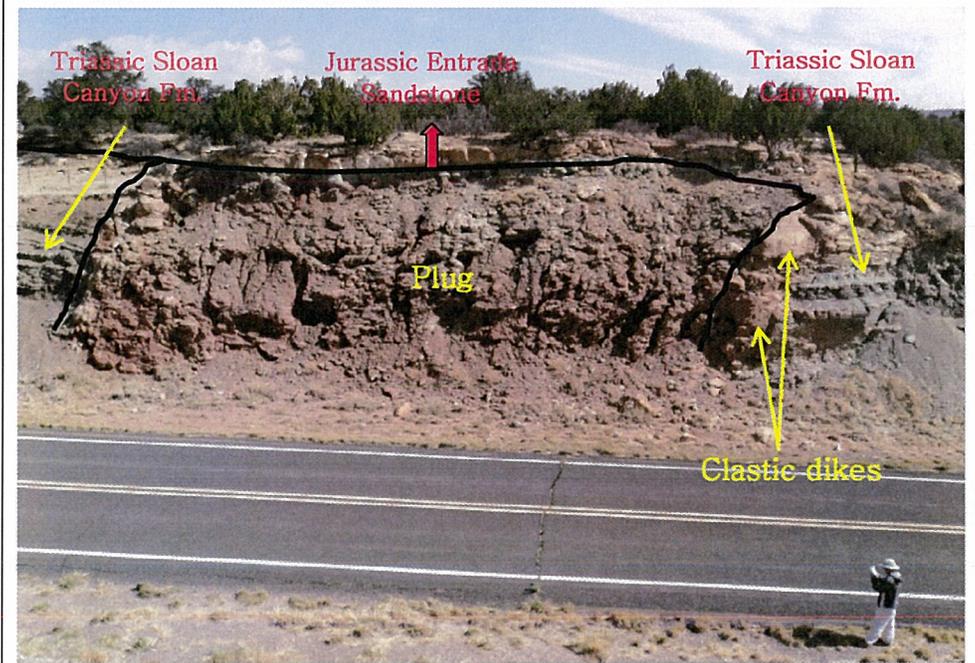


Figure 7E. Type 5: Large plug (with dikes). Cross-section of the plug exposed in the middle of continuous Sloan Canyon Formation by road cut shows its cylindrical form. This plug is mainly composed of a chaotically complex mixture of sandstone and mudstone, breccias, continuous blocky sandstones, and dikes with slickensides. Noticeably, unconformity is posed between plug and overlying depositional unit (probably Jurassic Entrada Sandstone).

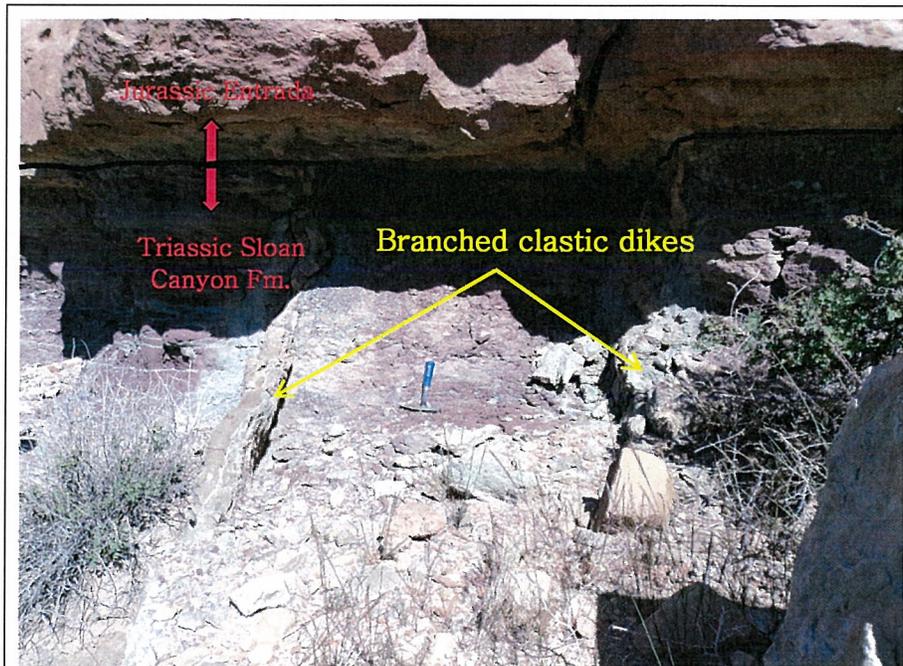


Figure 7F. Type 6: Dikes (branched). Many dikes in this area are branched. Some dikes contain carbonate veins. It is noticed that some dikes have deformed and/or fractured uppermost part due to apparently overlying units and also exhibit slickensides due to probable vertical movement. This picture also indicates that an unconformity is between the overlying Jurassic Entrada Sandstone and underlying Triassic Sloan Canyon Formation from Wedding Cake Butte.

Dikes

The majority of the dikes in the Dry Cimarron Valley are yellowish gray, pinkish, tan, and light brownish very fine to fine grained sandstone (Fig. 7F, 8 and 9). Some dikes have localized calcite veins (Fig. 8A). The dikes range in thickness from very thin (<2mm in width) sheet-like structures (Fig. 9A) to bodies a few decimeters across (Fig. 8B). These dikes commonly are branched into two or more dikes at a certain point within the dike system (Fig. 7F and 9B). The clastic dikes vary in shape: circular around plugs (Fig. 7C; Mulvany, 2011), linear associated with bleached fracture systems (Fig. 9A), and sinuous apparently unrelated to plugs (Fig. 7F and 9B). Some dikes have slickensides (Fig. 8A and B) on their vertical surfaces and exhibit deformed features (Fig. 8A).

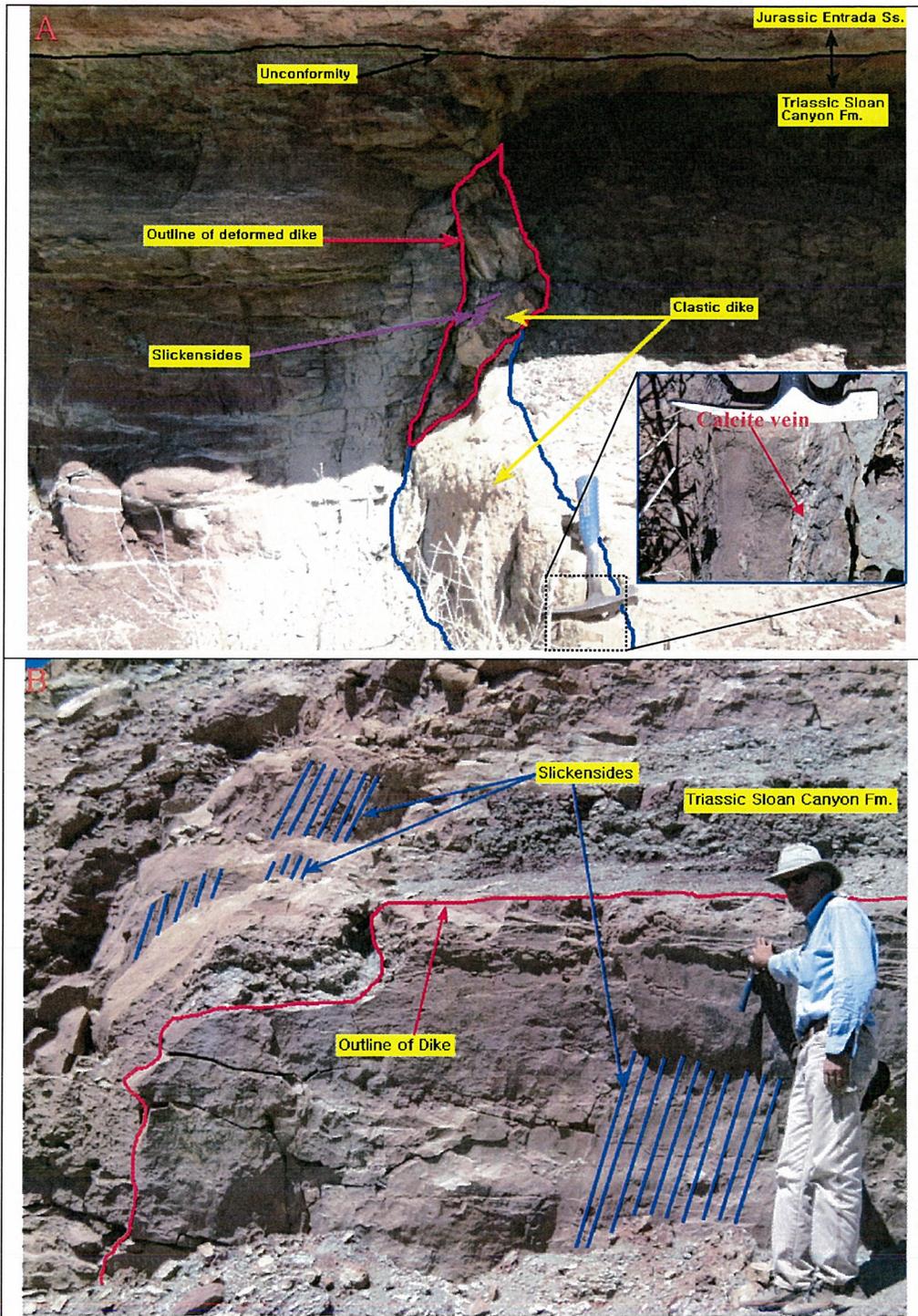


Figure 8. Clastic dikes with deformation and slickensides. The upper one (A) in Wedding Cake Butte shows that the uppermost part of the dike with the slickensides have been deformed by differential pressure due to overlying layers. The lower one (B) in the roadcut on Highway 456 (old 325) is exposed within the Triassic Sloan Canyon Formation, showing slickensides as evidence of its vertical movement.

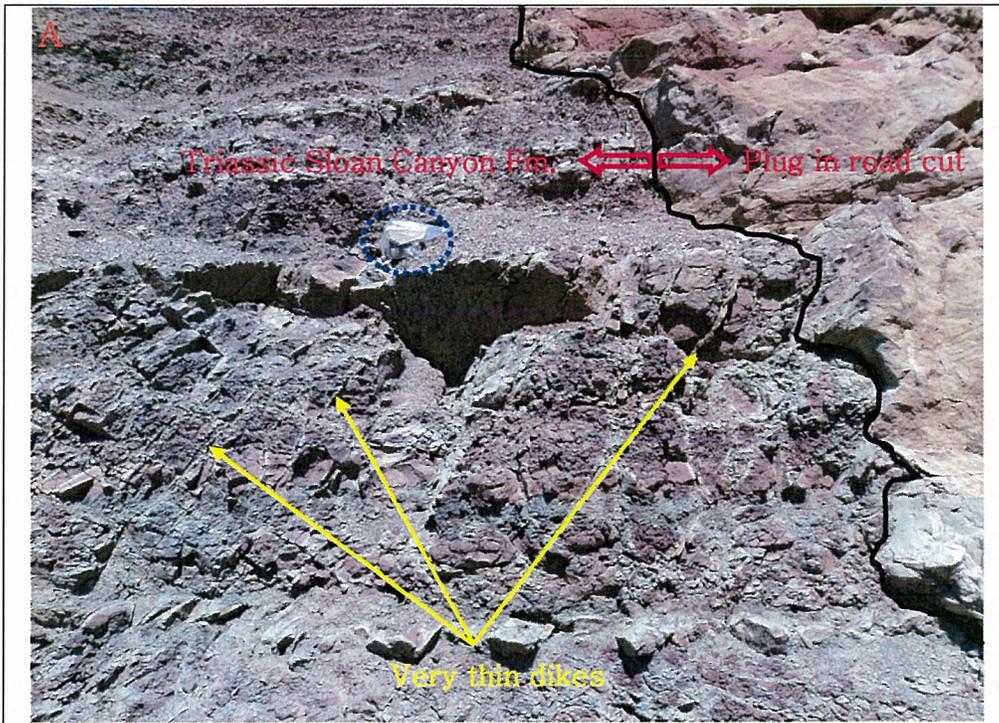


Figure 9. Many thin dikes (A) less than 2cm in thickness with a number of small fractures exist adjacent to the left edge of the plug in road cut. The scale is marked in dotted circle. Another branched dike (B) is exposed in the Triassic Sloan Canyon Fm (?).

Plugs

The plugs are fine to medium-grained, cylindrical, vertical, highly mineralized in some cases, brecciated, complex features. On the basis of the site observations, the plugs may be subdivided into two types: one is a knob-like (Baldwin and Muehlberger, 1959) plug (Fig. 7A and C) with collapse features accompanied by many breccias; the other is a cylindrical or pipe-like plug with a circular depression inside the exposed top surface of the plug (Fig. 7B).

Knob-like plugs (Fig. A and B) are mainly composed of either a simple large sandstone mass or a more complex plug composed of jumbled breccias. The latter type of plug is a massive, whitish gray sandstone with many irregular vertical and horizontal fractures. Some dome-shaped plugs have numerous cross cutting fractures (Fig. 10 B), some of which appear to be deformation bands, and greenish gray mud-inclusions.

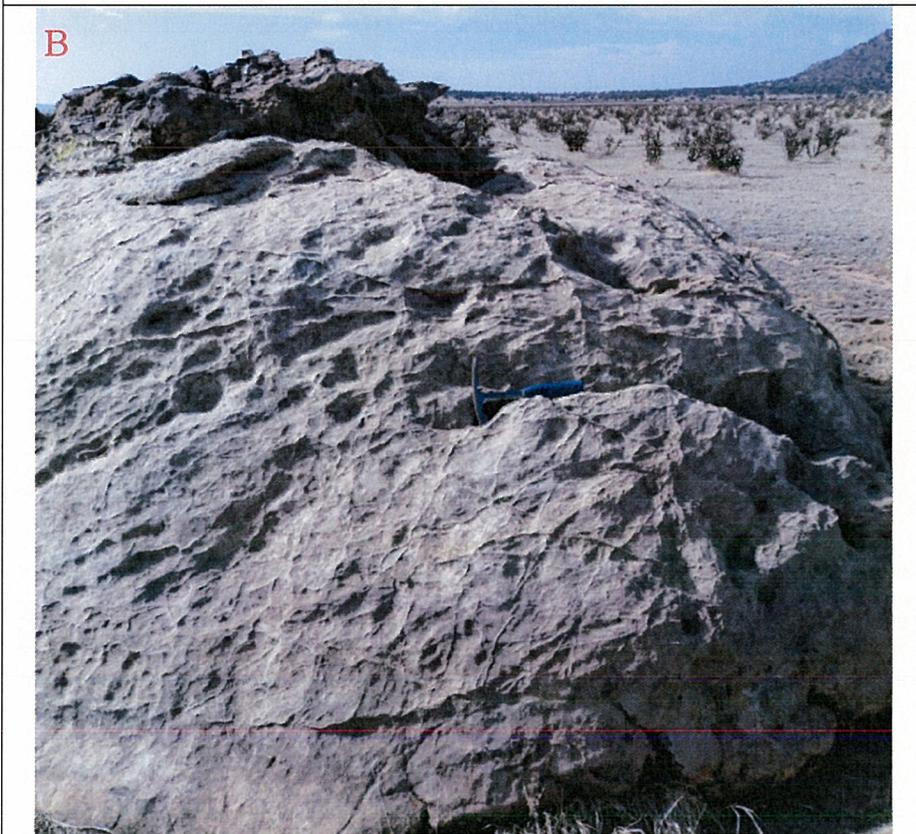
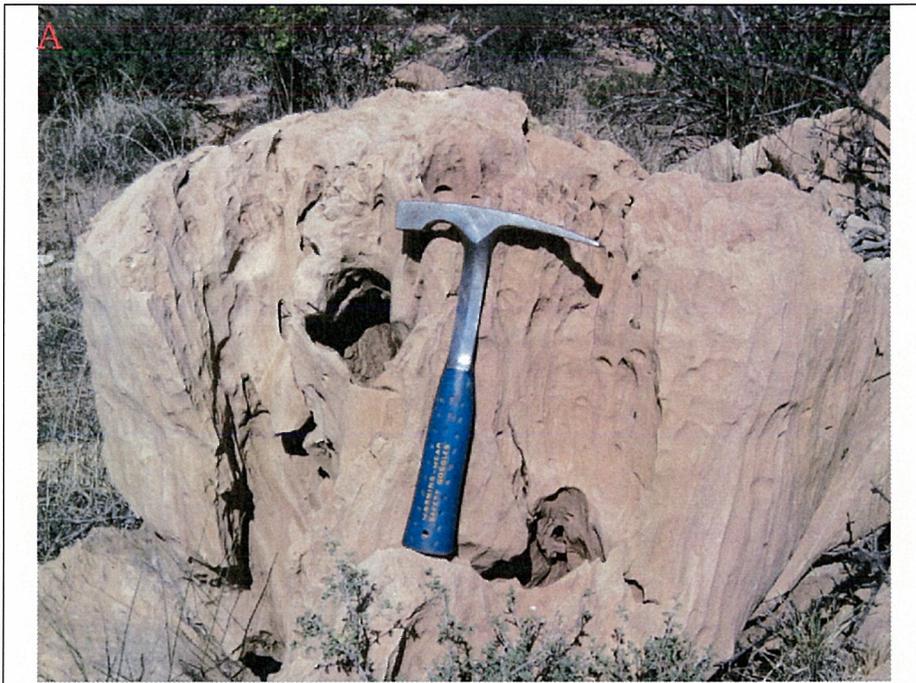


Figure 10. Two kinds of knob-shaped plugs. The upper one (A) shows flutes and tubular-shaped holes (fluidization marks), and the lower one (B) has cross cutting fractures and clay-inclusions.

The other type of plug, a cylindrical or pipe-like plug, is mainly composed of outer fine to medium-grained sandstone rims and inner very fine to fine-grained silty mudstone. Unlike the well lithified outer rims, the inner parts are filled with relatively loose particles that were subject to erosion. It is estimated that these outer rims survived weathering, keeping their innate shape due to mineralization (oxidized). This type of plug is readily recognized by its dark reddish or blackish brown color, with many vertical and horizontal fractures (Fig. 7B). Furthermore, these plugs show abundant evidence for fluidization such as vertical flutes and irregular convolute shapes.

The plug in the Highway 456 roadcut is exceptionally well exposed in cross-section. This plug, Plug RC (Fig. 11 and 12: approx. 22.3m in diameter), is surrounded by Triassic Sloan Canyon Formation, and is capped by an unconformity that is overlain by the Jurassic Entrada Sandstone. This plug is mainly composed of four characteristic lithofacies (Fig. 12): Facies 1 consists of ring-shaped edges of continuous blocky, more consolidated sandstone with partial bleaching, surrounding inner parts of the plug; Facies 2 is predominantly chaotically brecciated, reddish brown, less consolidated sandstone with minor friable mudstone; Facies 3 is largely composed of sand- and mud-pods, and seemingly intact blocks of sandstone. Facies 4 is a similar lithofacies to Facies 2, but exhibits a more chaotically brecciated complex mixture of sandstone (~60%) and mudstone (~40%). In addition to the varied lithofacies, this plug has an associated suite of well indurated dikes adjacent to the plug.

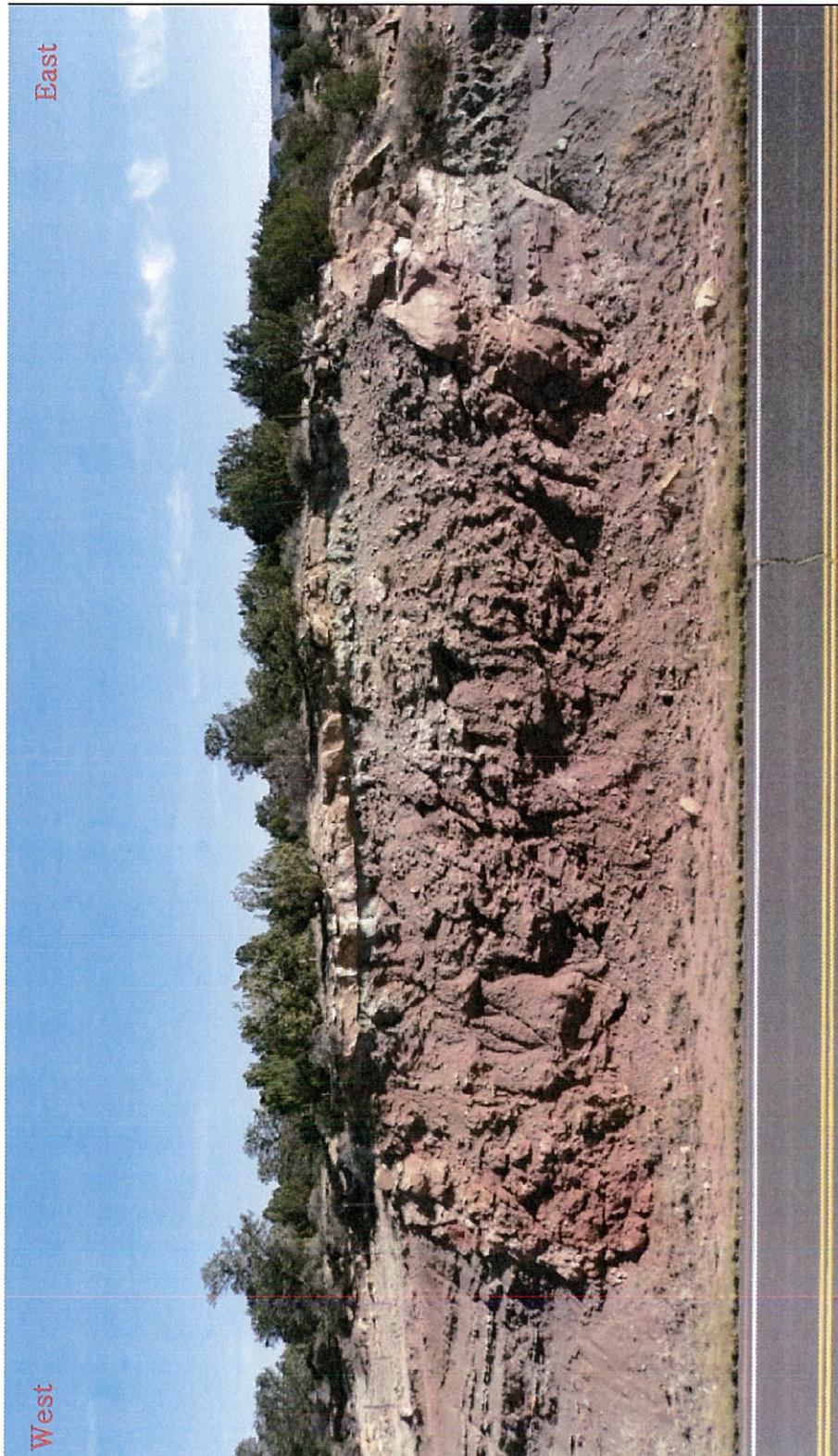


Figure 11. Plug RC. The plug is located on Highway 456 of Union County, NM (UTM: 13S 0673699 and 4086194, WGS 84 (datum), Sec. 24, T31N, R36E). This plug is well exposed in cross-section. This plug (RC, Fig. 11 and 12: approx. 22.3m in diameter) is surrounded by Triassic Sloan Canyon Formation and its uppermost layer just above an unconformity is probably the Jurassic Entrada Sandstone.

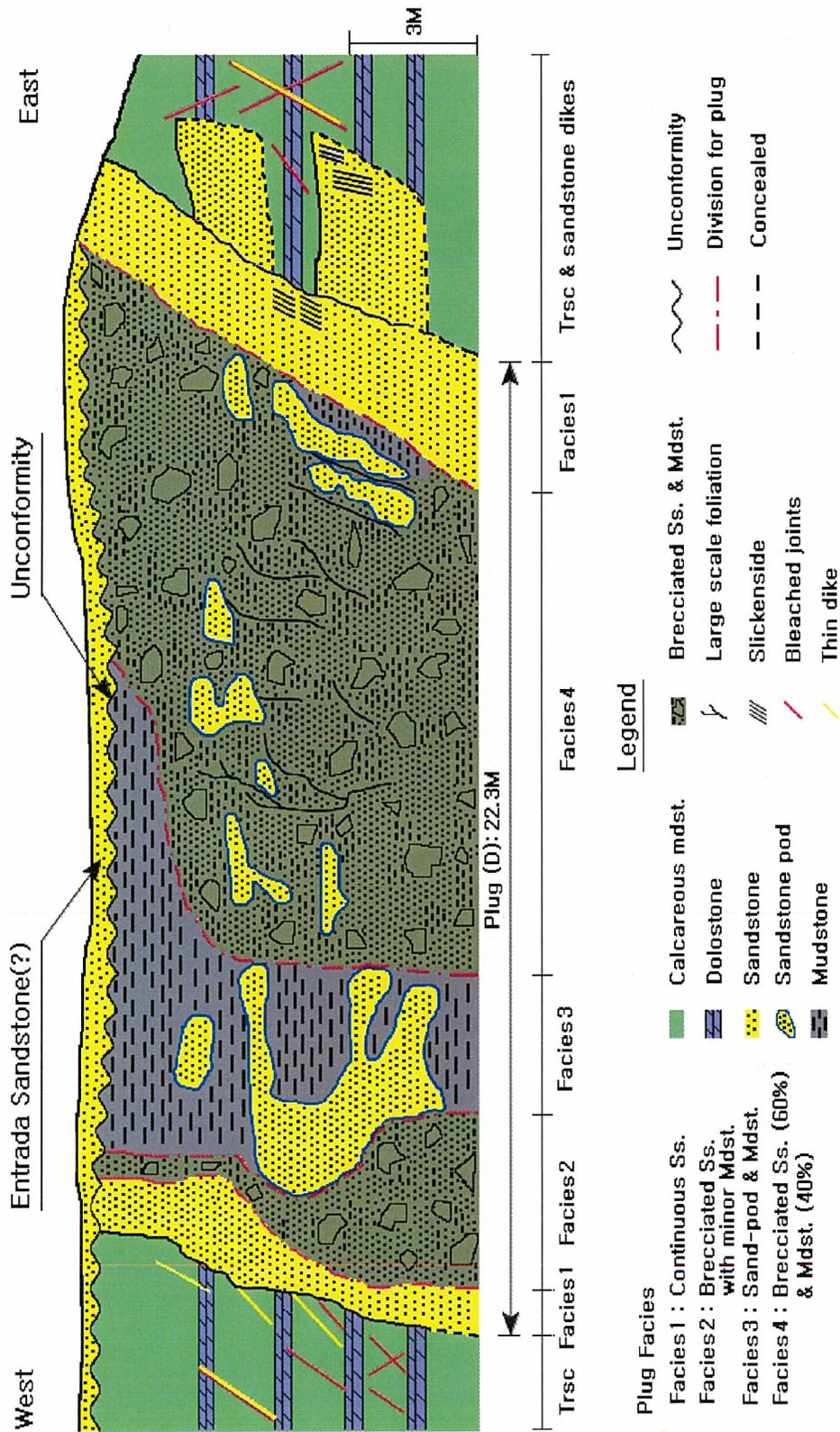


Figure 12. This diagram is based on the field observation (refer to the previous picture; Fig. 11) and shows that Plug RC with four different lithofacies is surrounded by the host rock, the Triassic Sloan Canyon Formation. Facies 1 indicates the rim of the plug composed mainly of sandstone with or without less clay matrix. Facies 2-4 contain more or less intact materials from host rocks as forms of pods or breccia. The host rock predominantly consists of calcareous mudstone and calcitic dolomite with a number of small fractures partially coupled with thin dikes less than 2cm thick.

Fractures

There are many localities related to numerous thin, bleached, vertical to subvertical and/or horizontal to subhorizontal fractures, which tend to occur together with thin dikes (Fig. 9A) in the Sloan Canyon Formation. These fractures can be divided into 3 types (Fig 13 A-C).

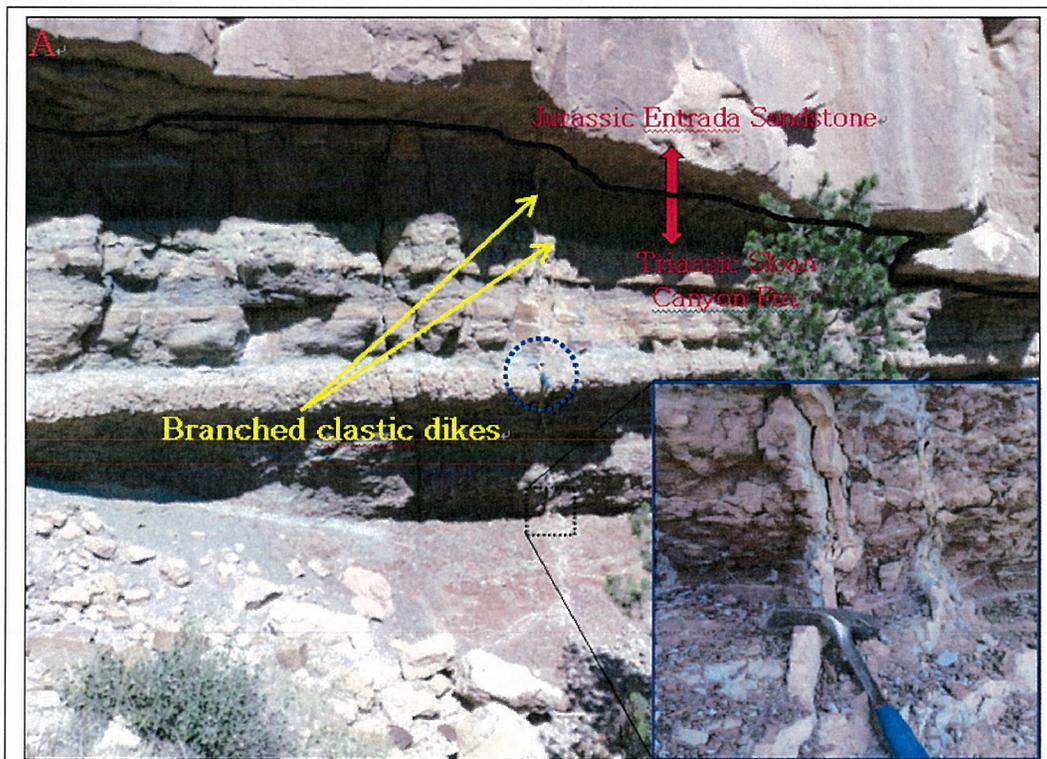


Figure 13A. Type 1: Fractures with bleaching (with overlying Entrada Sandstone). This type has numerous vertical to subvertical and horizontal to subhorizontal fractures with bleaching mainly occurring in calcareous siltstone layers. The angular unconformity between overlying relatively more resistant Jurassic Entrada Sandstone and less resistant Triassic Sloan Canyon Formation is easily recognized. Another branched dike in the Triassic Sloan Canyon Formation terminates at the unconformity. This picture is from Wedding Cake Butte (UTM: 13S 0660543 and 4093590, WGS 84 datum). The scale for this picture is marked in dotted circle.

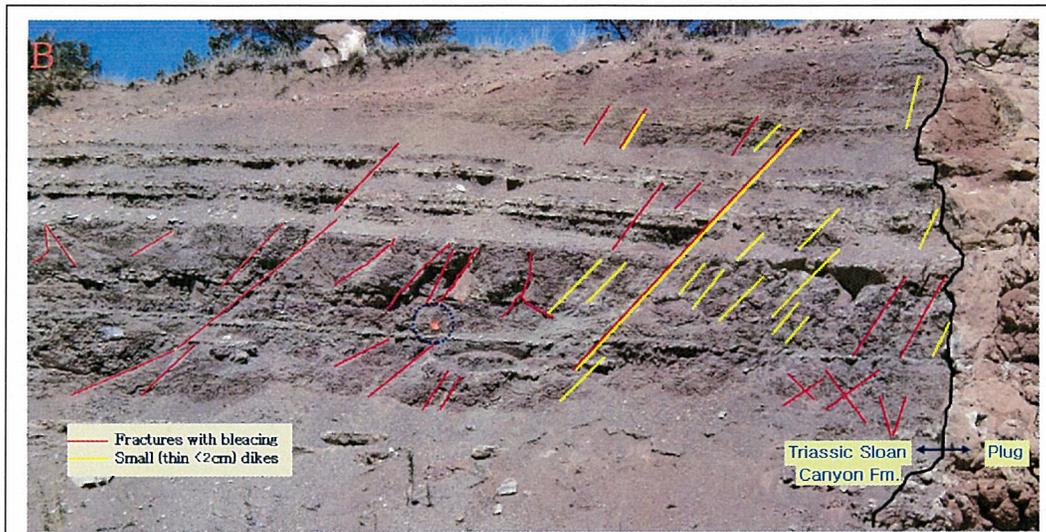


Figure 13B. Type 2: Plug-adjacent fractures with bleaching. This type of fracture is apparently related to clastic injectites. Most fractures with bleaching tilt away from the plug and some of them coexist with subvertical thin dikes (<2cm in thickness). Left-hand side of the roadcut; UTM. 13S 0673699 and 4086194, WGS 84(datum), Sec. 24, T31N, R36E. The scale for this picture is marked in dotted circle (small tag in orange for marker).

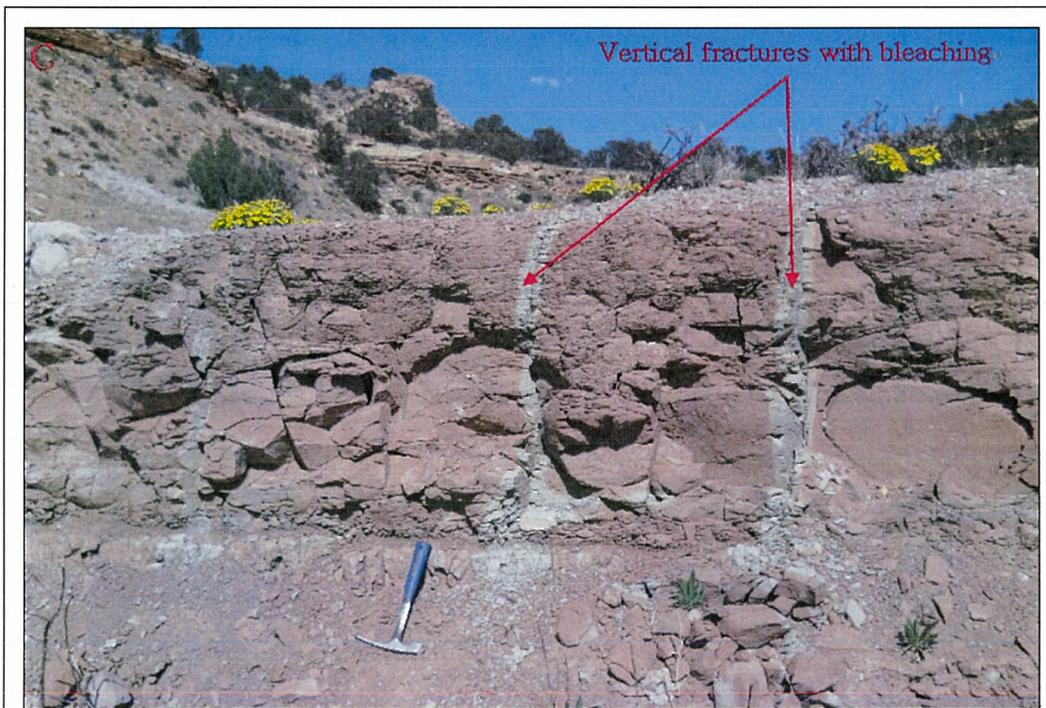


Figure 13C. Type 3: Fractures in the Sloan Canyon Formation. Some vertical fractures with bleaching are obvious but they mainly show a chaotic feature without specific orientation. Location: UTM 13S 0662428 and 4093067, WGS 84(datum).

Petrographic data

Composition

All samples of Entrada Sandstone have greater than 75% quartz with some samples classified as quartzarenite, whereas those from other stratigraphic units classify as subarkose and arkose (classification of Folk, 1974). Clastic injectites have a more variable composition (Fig. 14), including feldspathic litharenite and litharenite for samples in Facies 2-4 of Plug RC and a thin dike in the Triassic Sloan Canyon Formation in the roadcut.

In general, the samples from inner parts (Facies 2-4) of Plug RC have relatively fewer grains and more clay matrix and the samples from both outer rims (Facies 1) show more grains and much less matrix (Figs. 15 A and B). Samples from the other plugs exhibit different compositions from Plug RC, in that they are composed of less grains with more cement and much less matrix. Although the other plugs are located in nearly the same area, they have completely different cement compositions: carbonates as cement are dominant in Plugs A and B, and hematite (Fig. 17) is the major cement in Plug M.

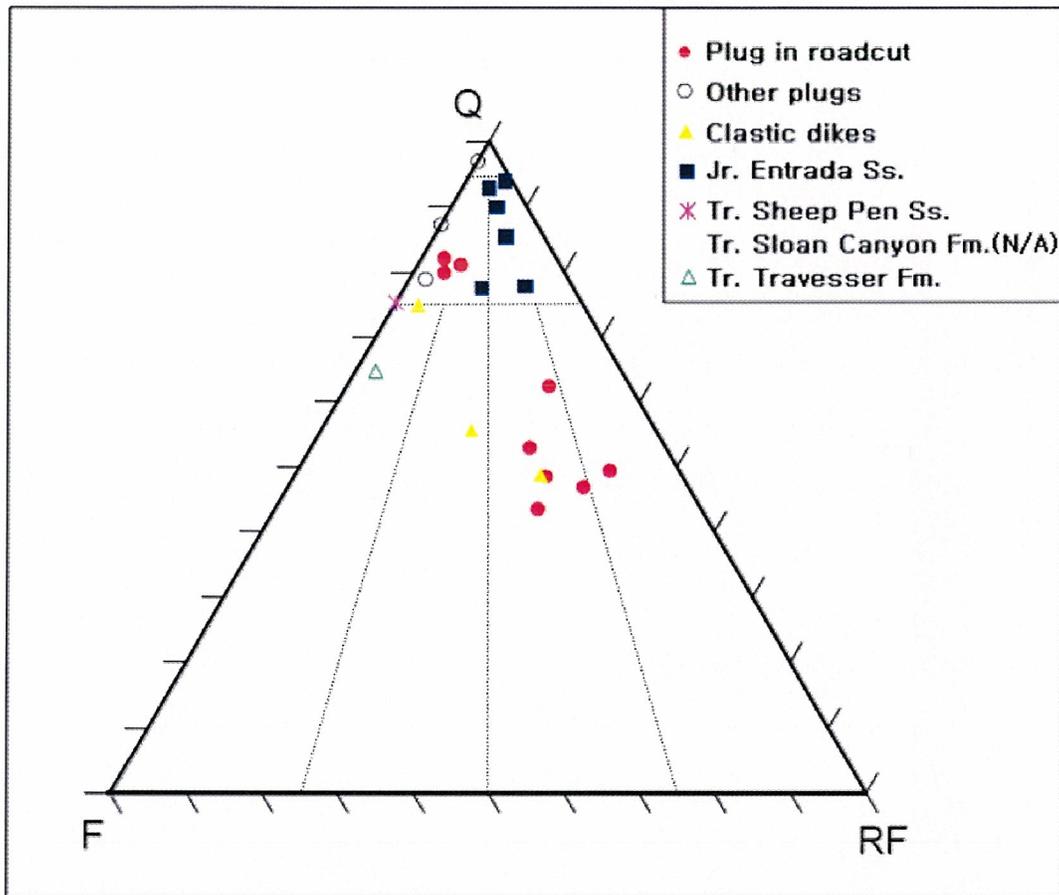


Figure 14. Sandstone classification (Folk, 1974) from all of the stratigraphic units and clastic injectites. All samples of Entrada Sandstone have greater than 75% quartz whereas those from other stratigraphic units classify as subarkose and arkose (classification of Folk, 1974). Clastic injectites have a more variable composition, including feldspathic litharenite and litharenite for samples in Facies 2-4 of Plug RC and a thin dike in the Triassic Sloan Canyon Formation in the roadcut. These classifications may imply significant amounts of entrained materials from host rocks as lithic fragments.

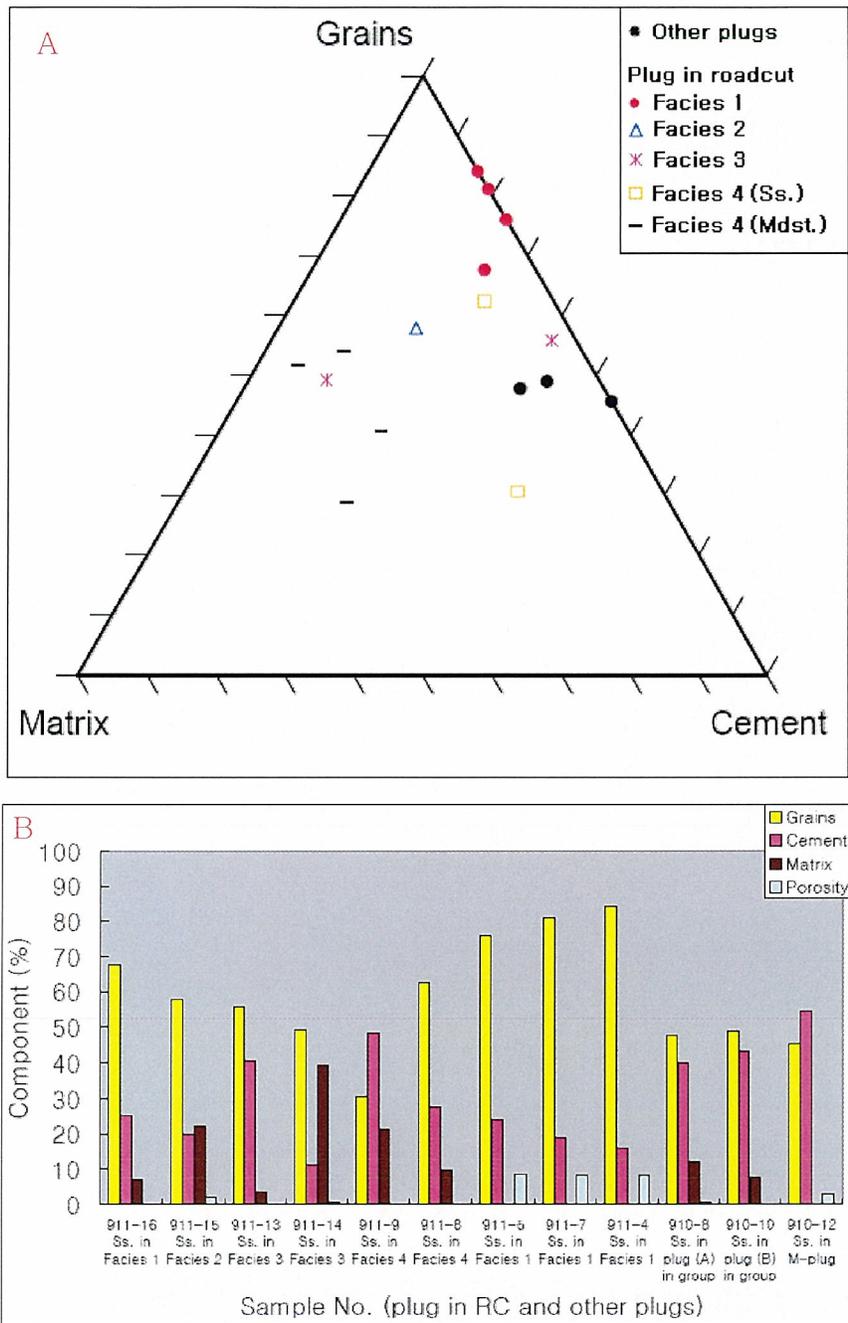


Figure 15. (A) Compositional distribution of the samples from all the plugs. (B) Compositional differences indicate that the samples from Facies 2-4 and two of the other plugs are argillaceous or calcareous silty sandstone, and have much less porosity than the ones without clay matrix. When compared with Plugs A and B, Plug M seems to have a similar composition, but Plug M has a totally different cement and matrix content, in that it dominantly has Fe-oxides (probably hematite) in its pore spaces without matrix, in contrast to carbonate cement and matrix in the other plugs.

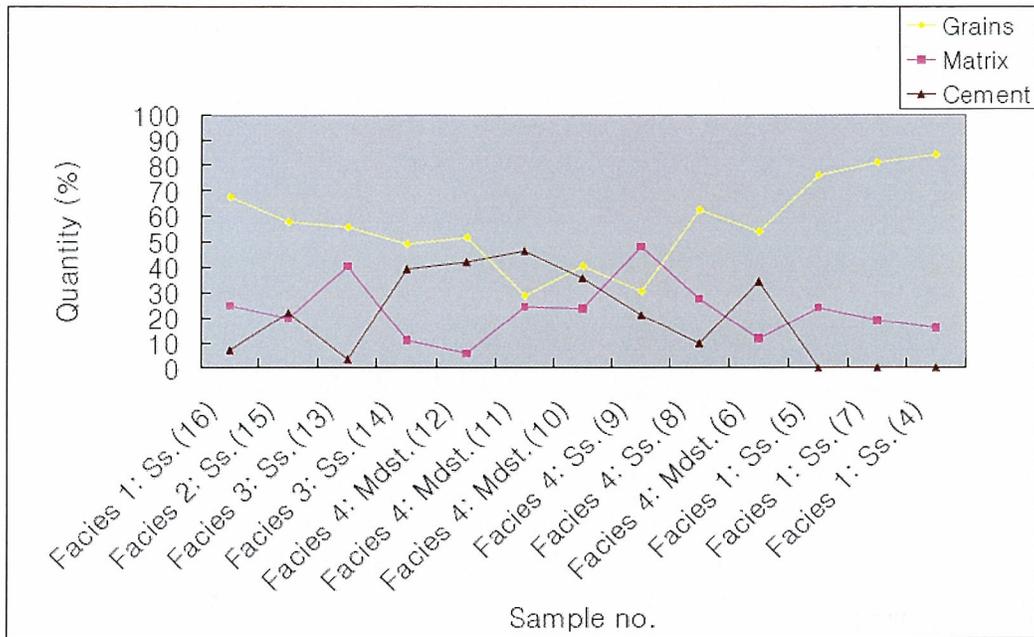


Figure 16. Proportions of grains, cement, and matrix in samples from the plug in the roadcut. Facies 2 to 4 contain very fine grains, with significant amounts of clay matrix, whereas Facies 1 has coarser grains and much less matrix.

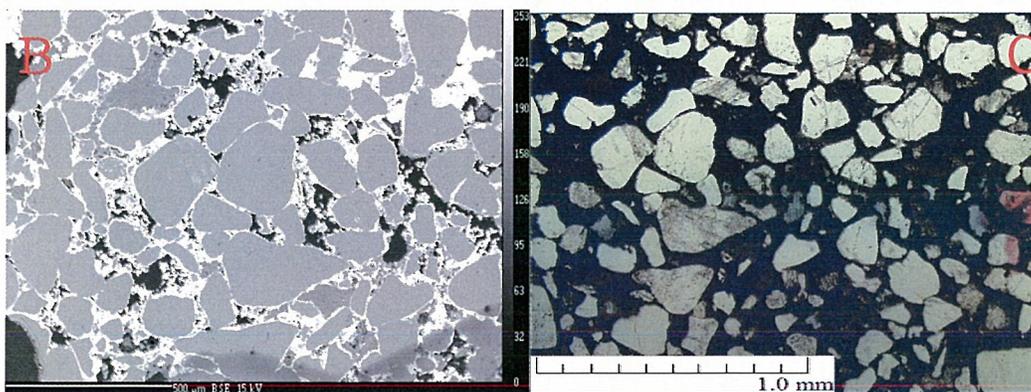
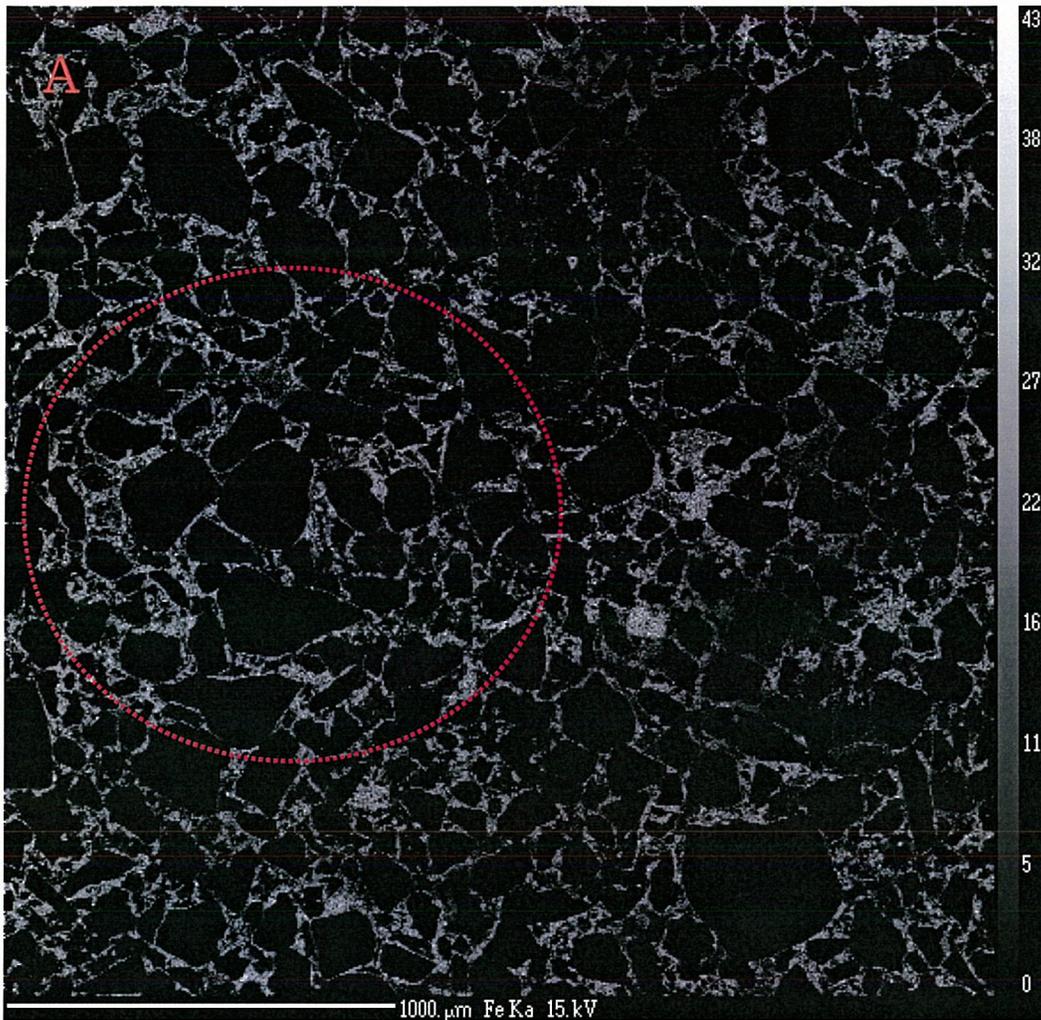


Figure 17. Plug M (910-12) is highly mineralized with Fe oxide cement. (A) X-ray map showing Fe distribution. The white material surrounding grains in this BSE image (B) is Fe oxide cement. In optical examination hematite cement appears to be dark brownish to blackish color.

Microprobe analysis shows that all the samples, with the exception of 911-4 (Facies 1 of Plug RC), have a mixed composition of carbonates (Fig. 16; Appendix 2). Sample 911-4 contains only dolomite, whereas the other samples (911-2, 13, and 16) contain both calcite and dolomite. The calcite cement is mainly low-Mg, with Mg ranging from 0.2 to 8.5%, but several samples contain carbonate with 26.9-38.4% of MgCO_3 . These cements containing MgCO_3 are either high-Mg calcite or Ca-rich dolomite. X-ray diffraction is needed to determine different cement compositions, but X-ray diffraction was not possible due to the low abundance of the carbonate phase. These high-Mg samples are from both the Triassic Sloan Canyon Formation (911-2) and Facies 1 (911-13) of Plug RC. Dolomite, which does not show stoichiometric balance between Ca^{2+} and Mg^{2+} (Appendix 2) is Ca-rich, and also contains FeCO_3 of up to 4.5%, which was mostly found in samples (911-4) of Plug RC.

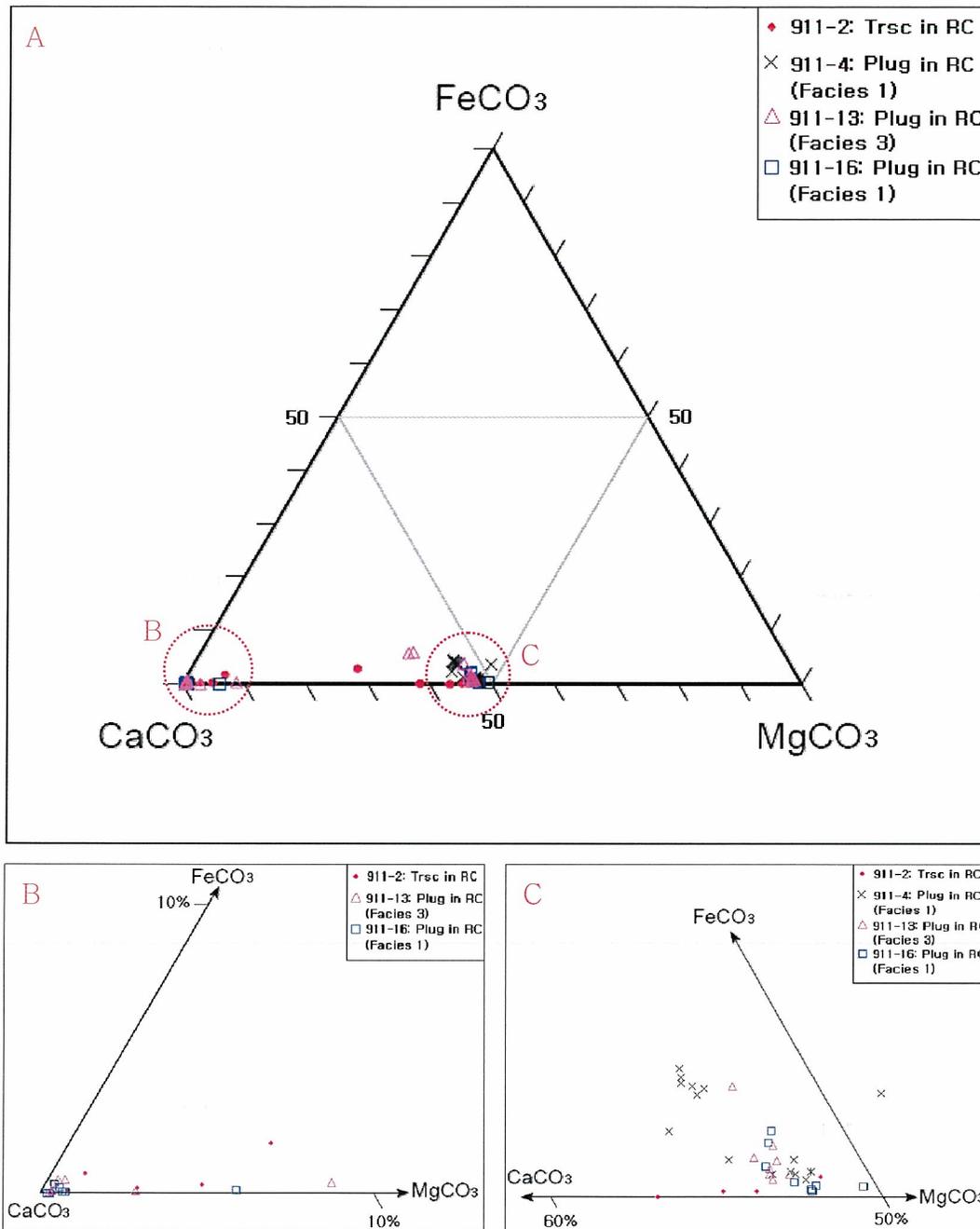


Figure 18. Fe-Ca-Mg compositions of carbonate minerals. The samples selected for the analysis are 911-2 (Sloan Canyon Formation), 911-4 (Facies 1 of Plug RC), 911-13 (Facies 3 of Plug RC), and 911-16 (Facies 1 of Plug RC).

Similarities and differences in petrography

The diagram shown in Fig. 19 indicates that only Plug M (highly Fe-oxidized

plug) and the plugs from Reynolds (1979) are classified as quartzarenite (Folk, 1974). Each researcher collected samples from four plugs, obtaining different results. The results of this study differ from Reynolds (1979) because this research was based on samples with varied composition. This resulted in the wide distribution of compositions from quartzarenite to arkose to litharenite. Internal lithofacies (Facies 2-4) have abundant lithic fragments from host rocks, causing different classifications from Reynolds (1979).

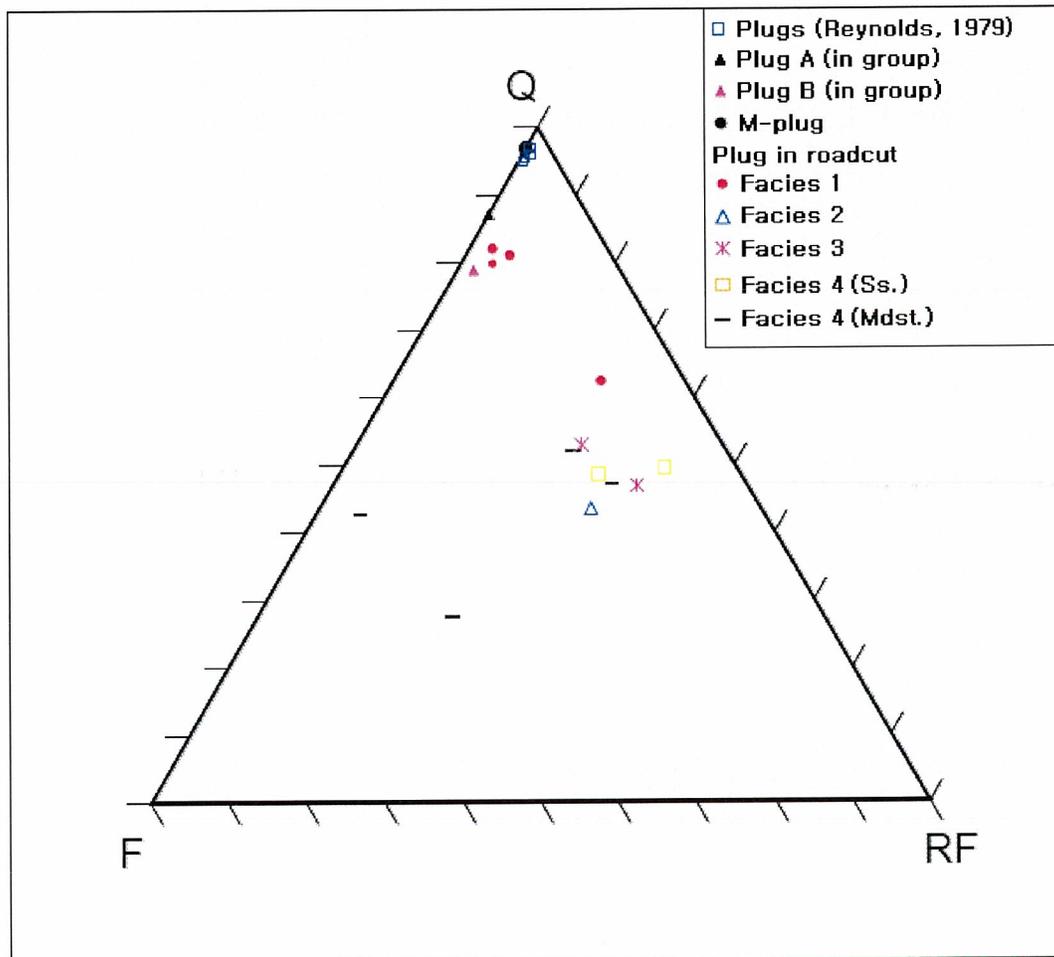
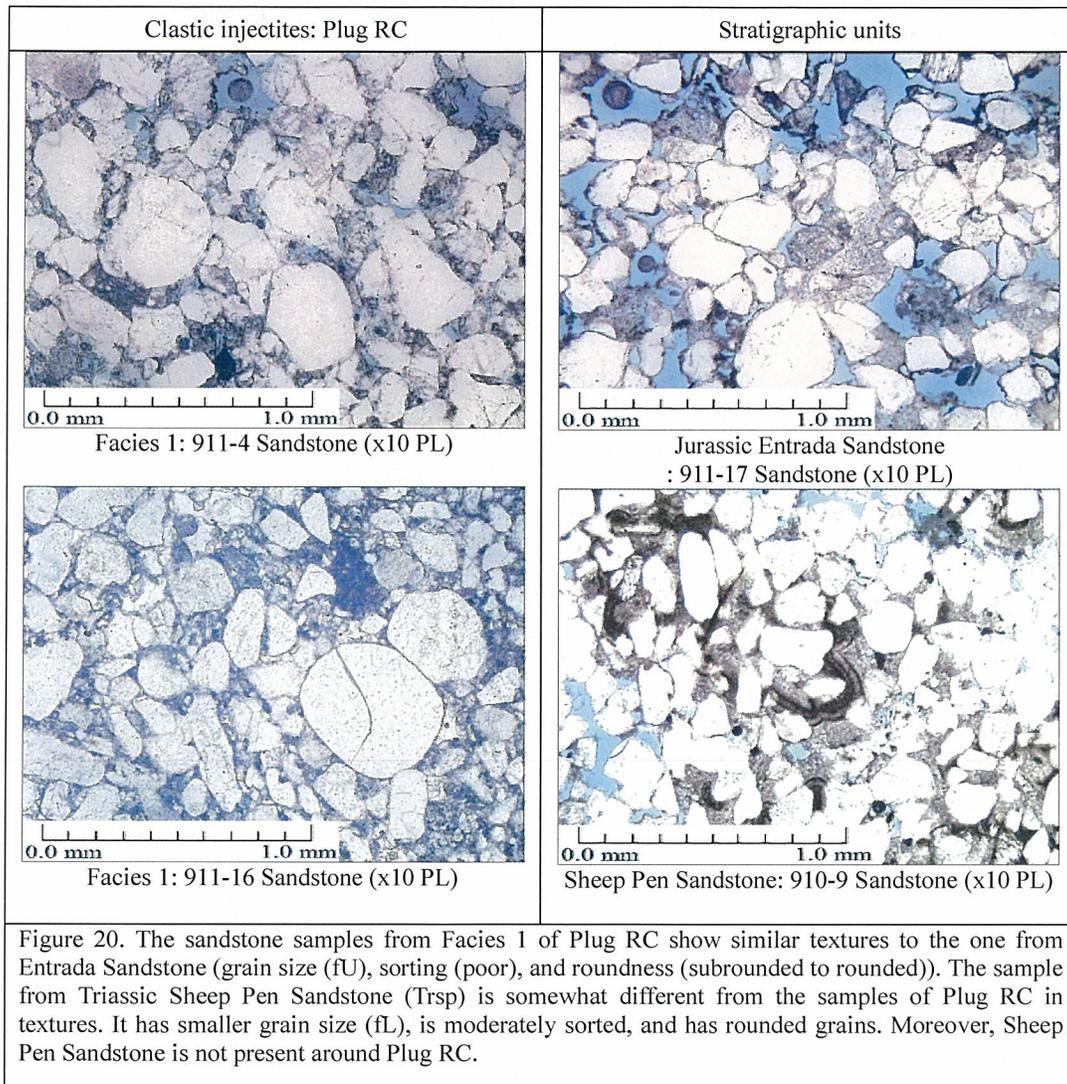
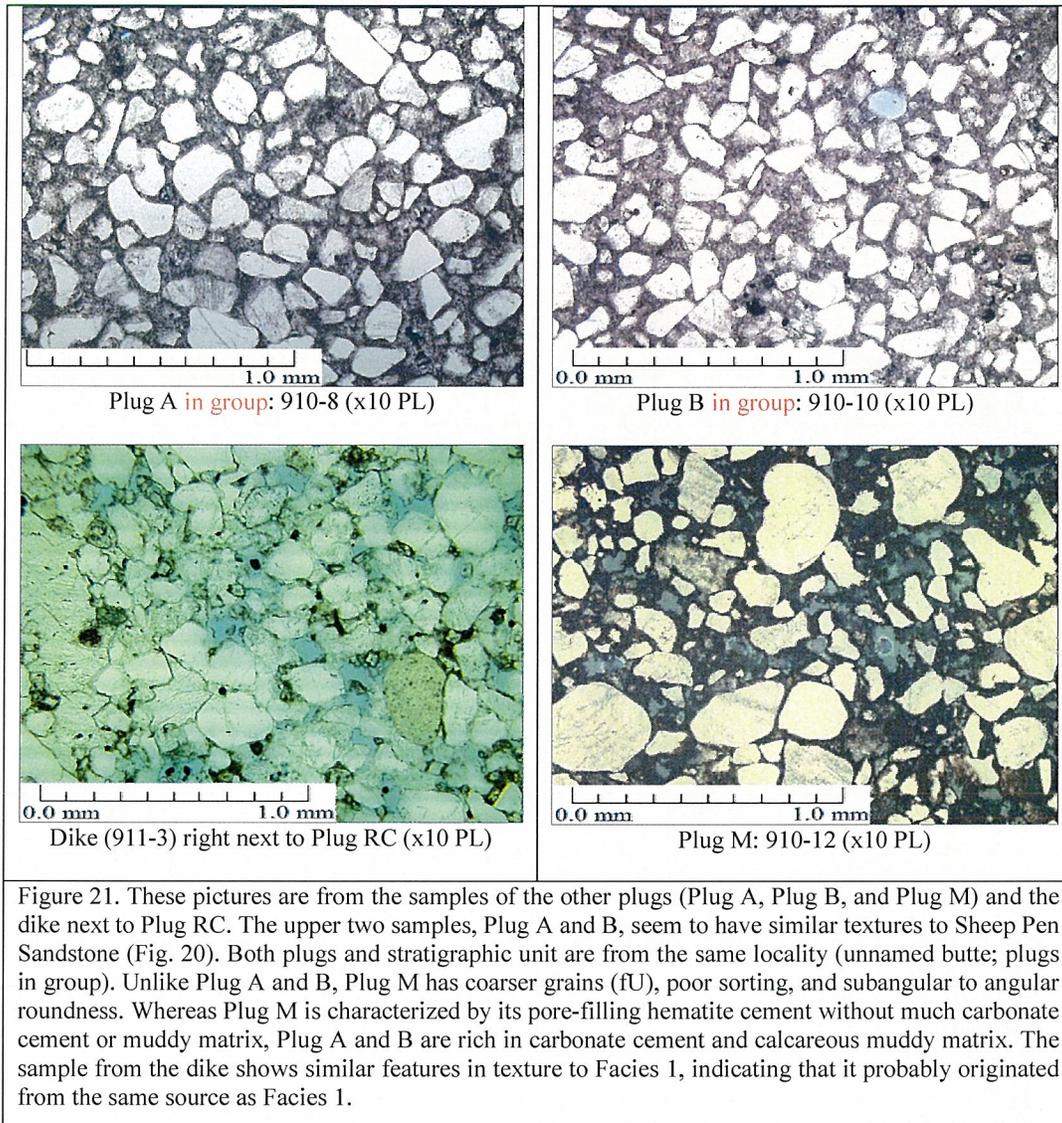
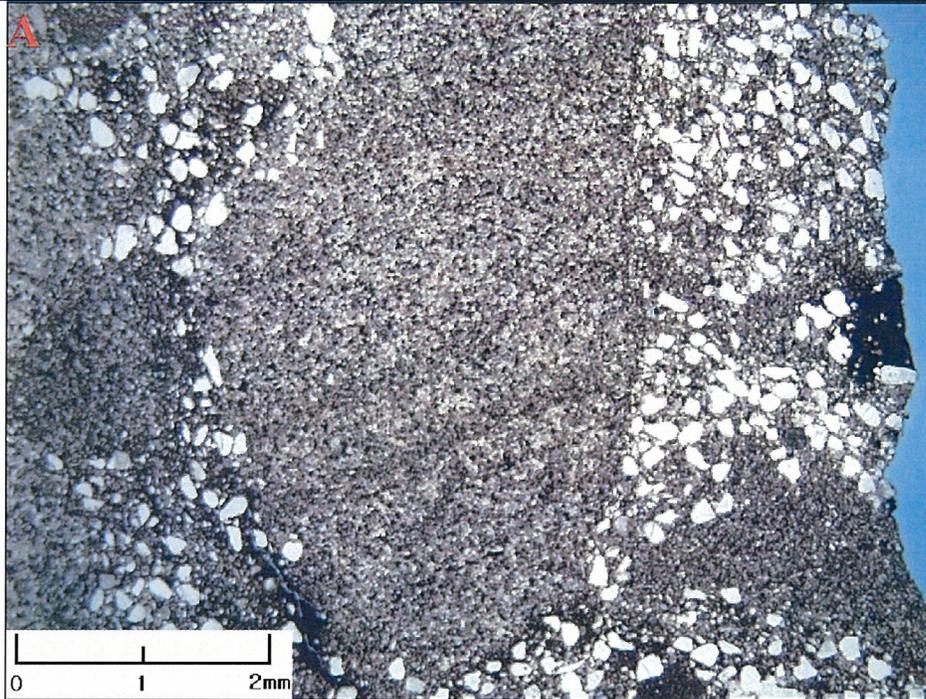


Figure 19. This Sandstone classification (Folk, 1974) shows compositional differences among all the samples from the plugs including the plugs from Reynolds (1979).

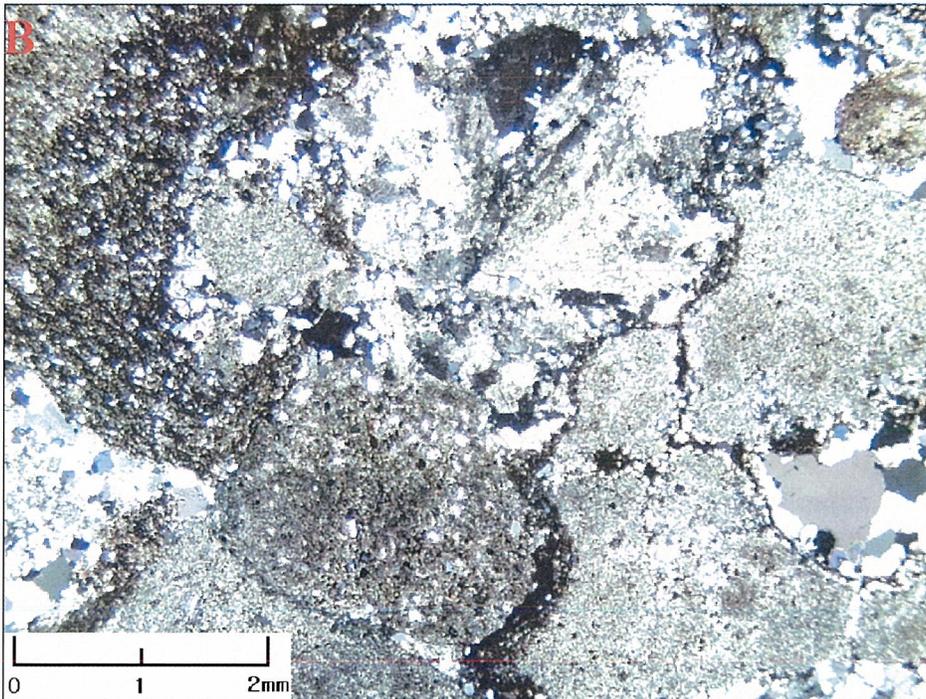
The photomicrographs shown in Figs. 20-30 reveal varied petrographic characteristics, and illustrate many similarities and differences between plug materials and stratigraphic units. This may suggest the possible origins of the materials.





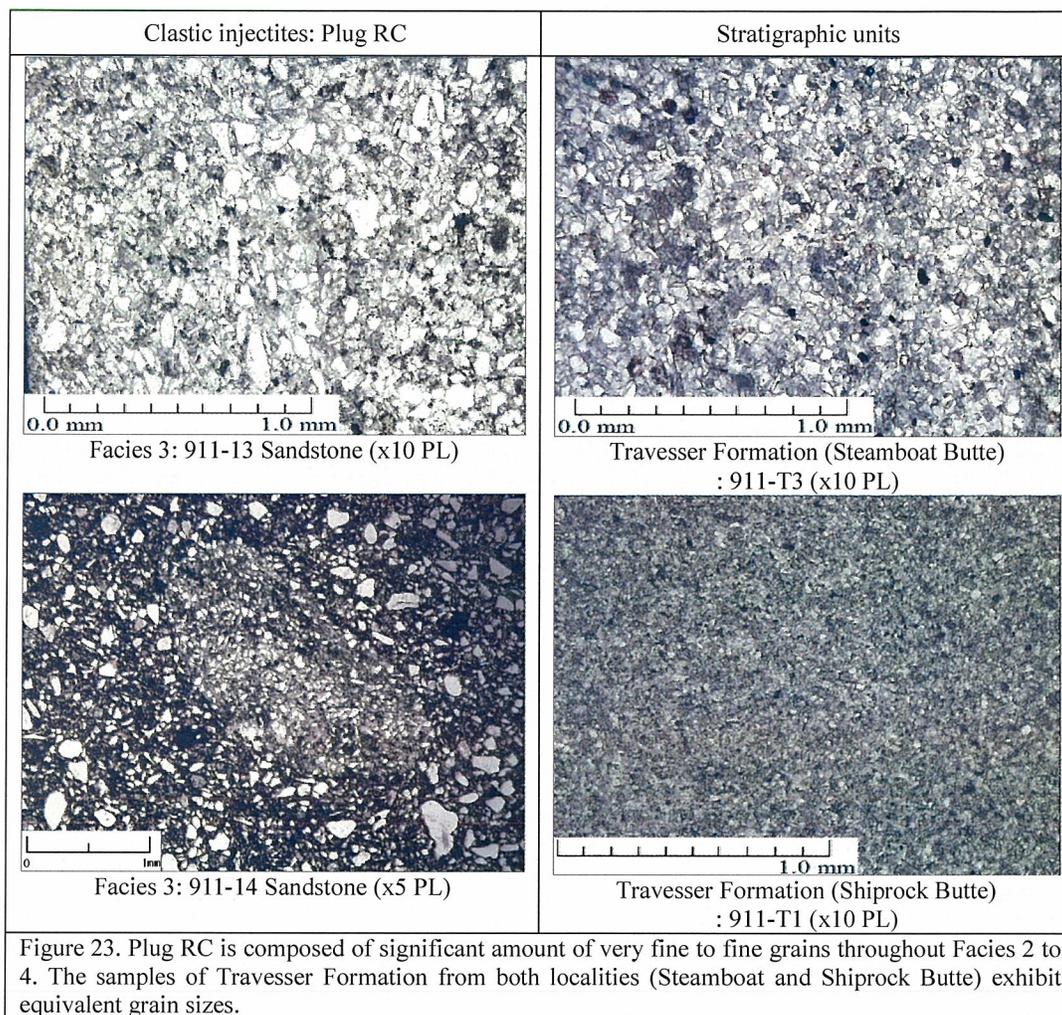


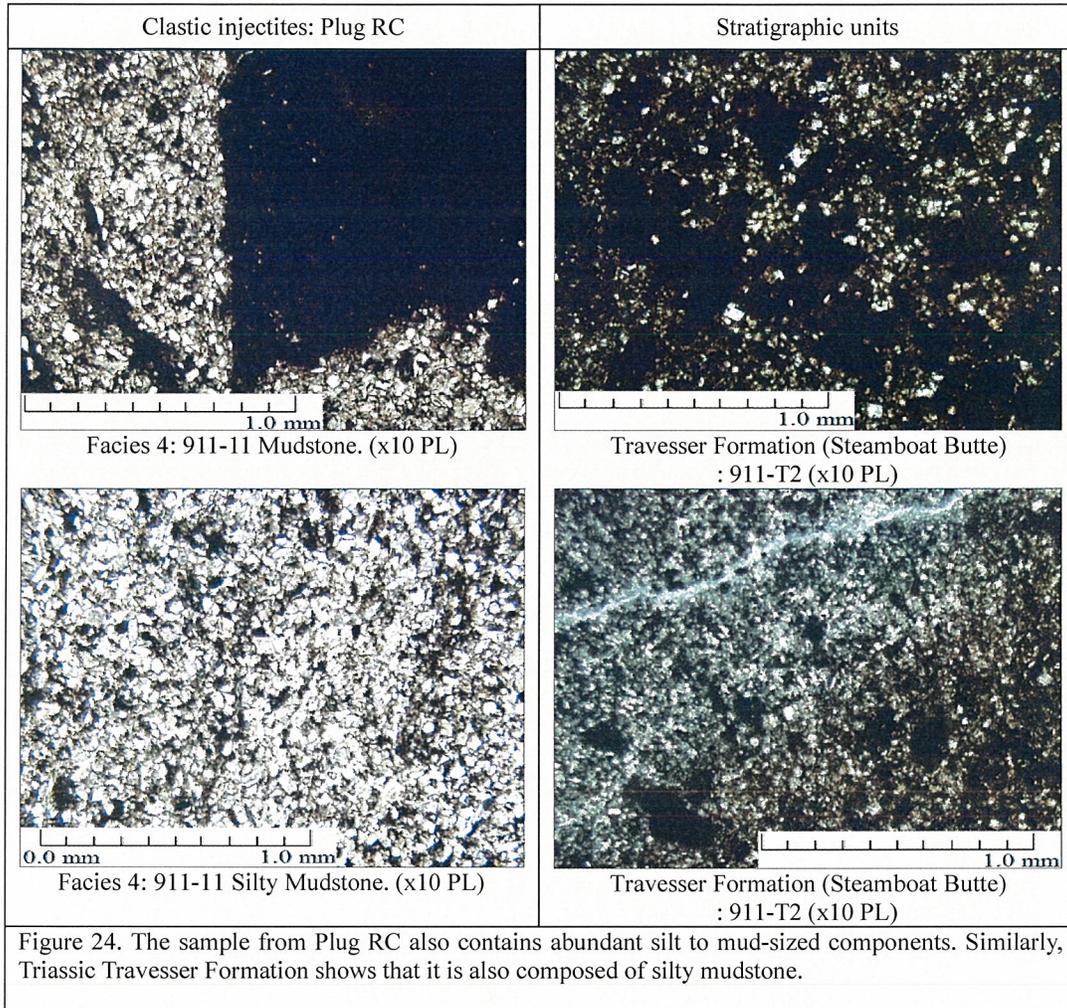
Facies 2: 911-15 Sandstone (x2 PL)

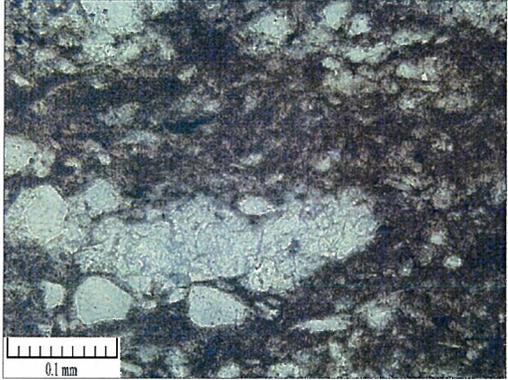
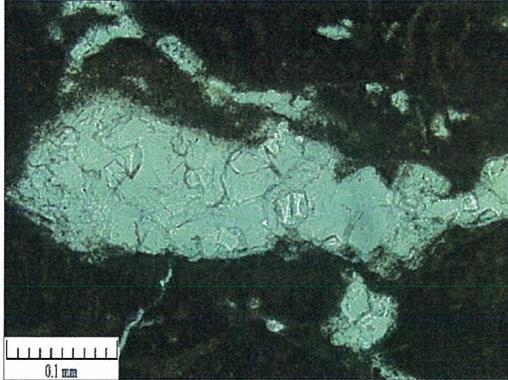
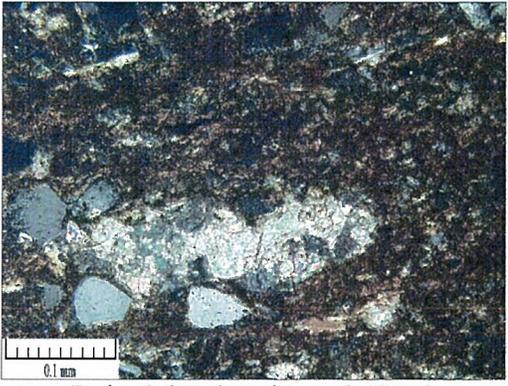
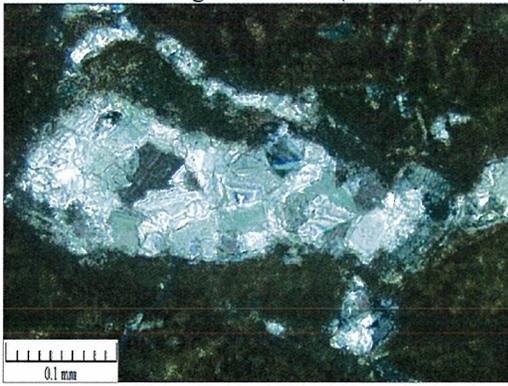


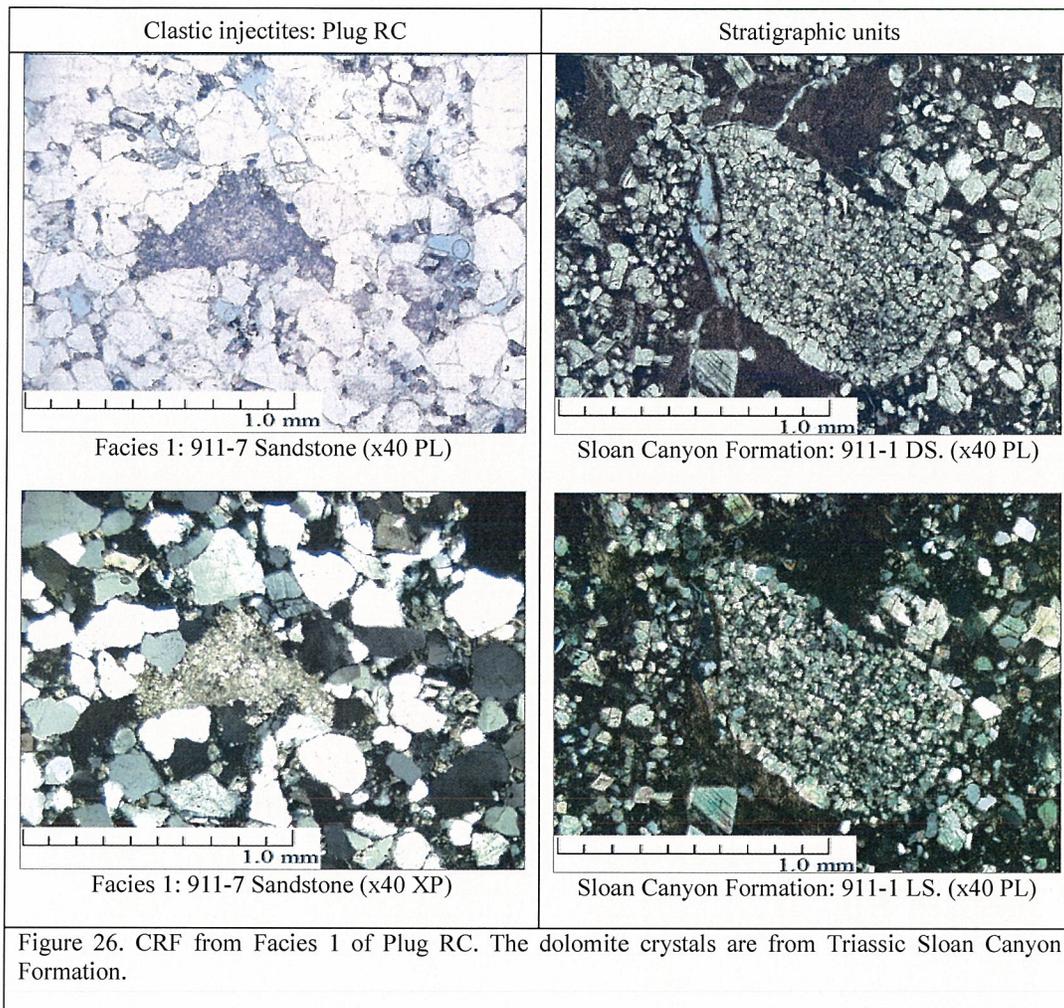
Travesser Formation: 911-C (x2 XP)

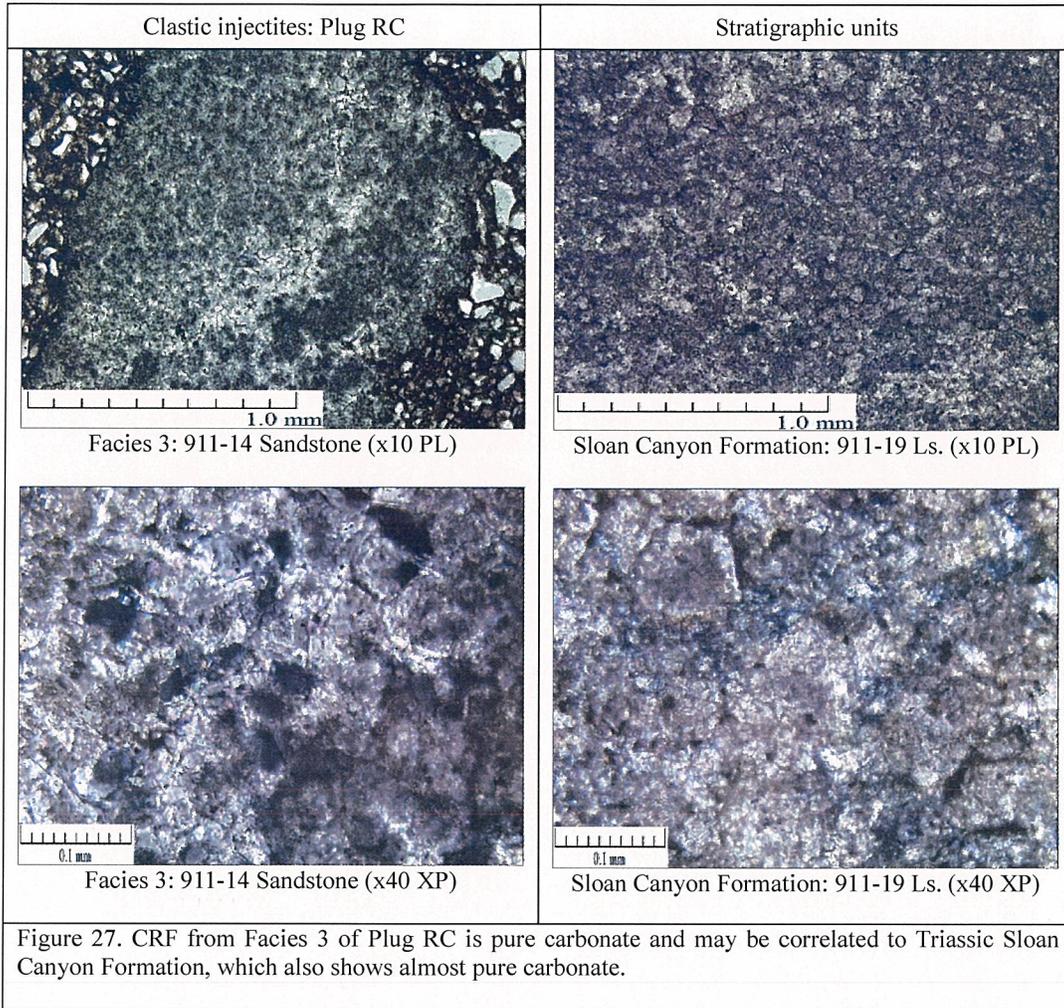
Figure 22. The sample (A) with a gravel-sized sandstone rock fragment (?) from Facies 2 may have originated from Triassic Travesser Formation which partially contains conglomerate carbonate rocks (B) in the Steamboat Butte.



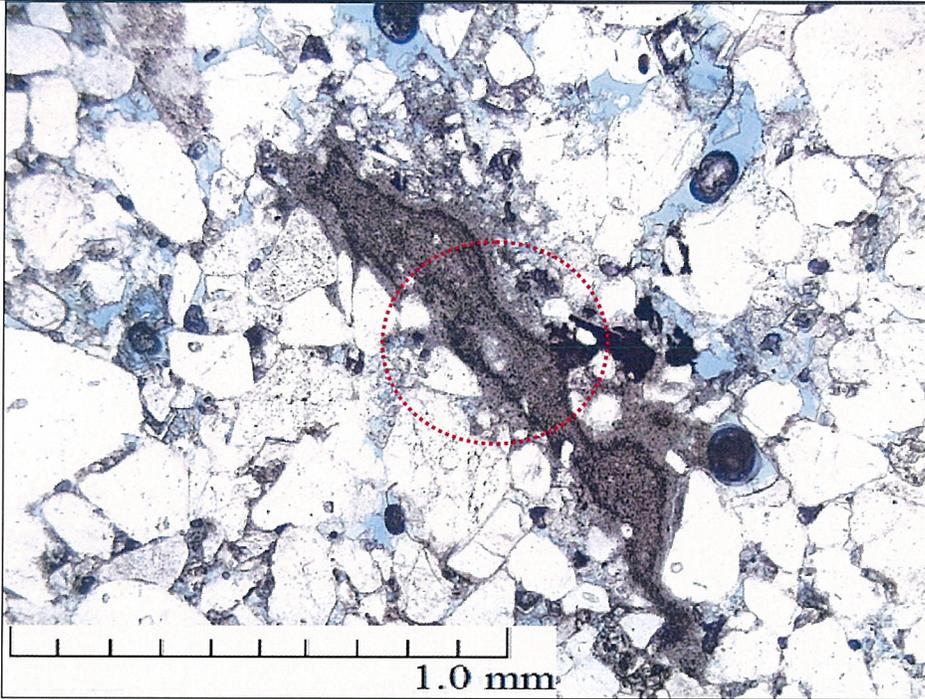


Clastic injectites: Plug RC	Stratigraphic units
 <p data-bbox="358 726 724 751">Facies 4: 911-6 Mudstone. (x40 PL)</p>	 <p data-bbox="906 726 1243 783">Sloan Canyon Formation : 910-2 Argillaceous Ls. (x40 PL)</p>
 <p data-bbox="358 1167 724 1192">Facies 4: 911-6 Mudstone. (x40 XP)</p>	 <p data-bbox="906 1167 1243 1224">Sloan Canyon Formation : 910-2 Argillaceous Ls. (x40 PL)</p>
<p data-bbox="285 1224 1333 1308">Figure 25. The probable CRFs (Carbonate Rock Fragments) in Facies 4 are similar to those from Triassic Sloan Canyon Formation, which is mainly composed of calcareous mud and probable intraclast or void-filling carbonates filling moldic porosity.</p>	

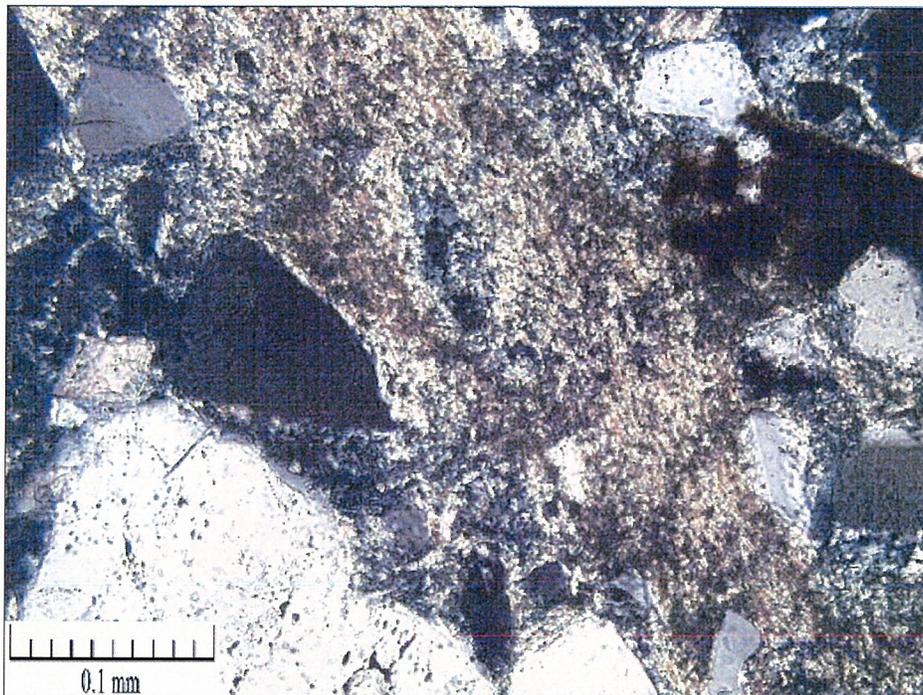




Clastic injectites: Plug RC



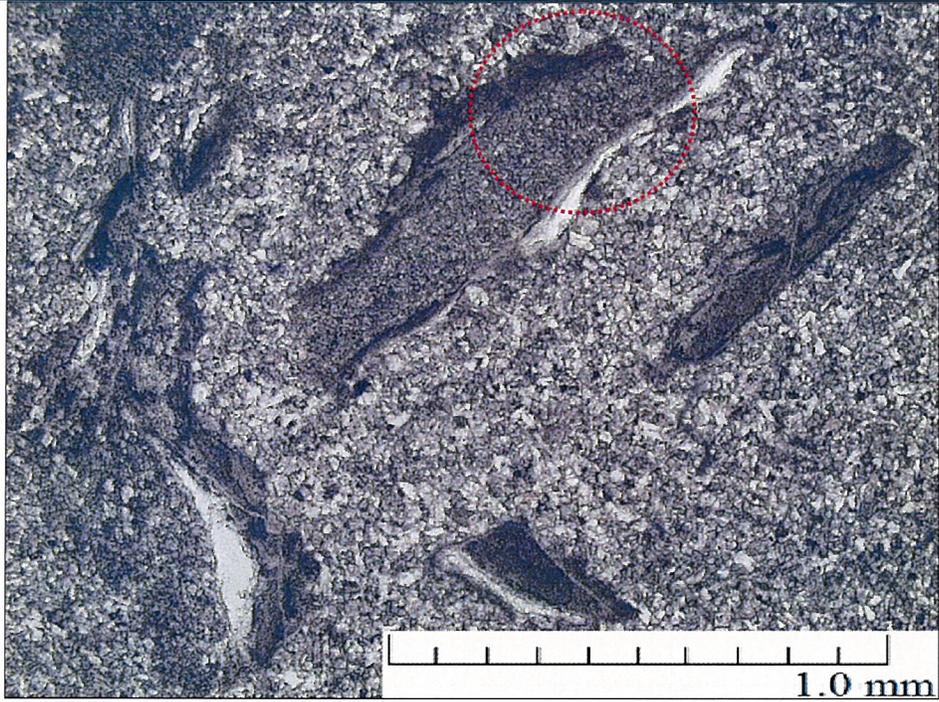
Facies 1: 911-5 Sandstone (x10 PL)



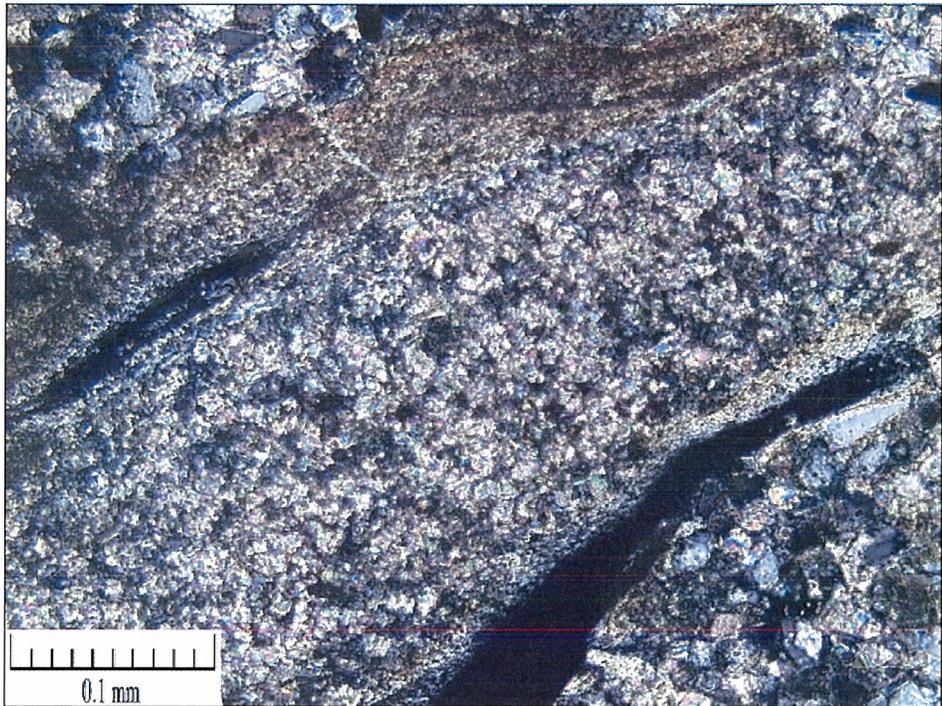
Facies 1: 911-5 Sandstone (x40 XP)

Figure 28-1. Probable fossil fragment in Plug RC may be correlated to those (Fig. 28-2) from Triassic Travesser Formation. The photo (bottom) is magnified from the one (top) in circle.

Stratigraphic units



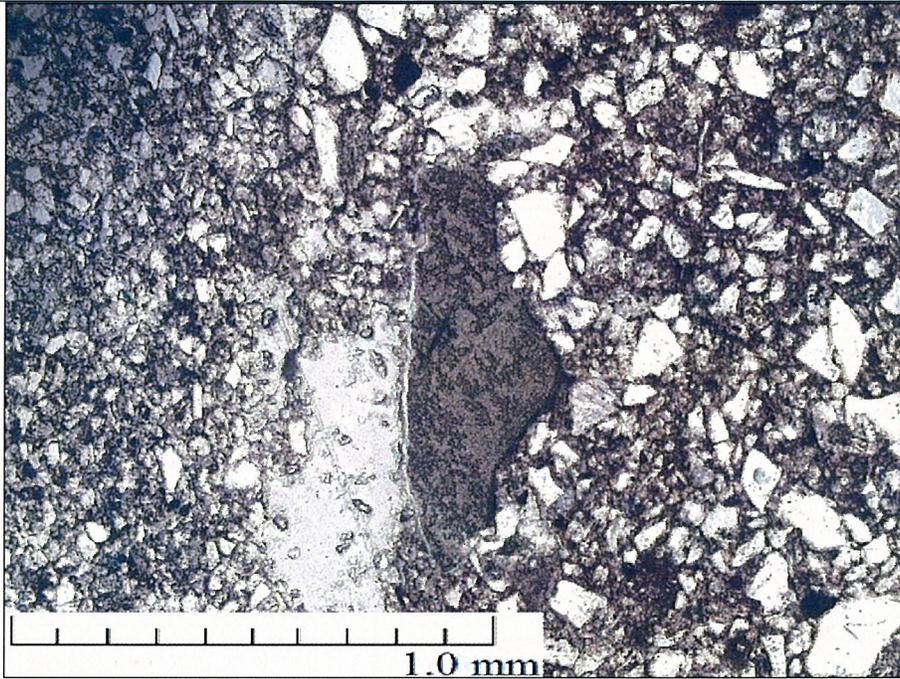
Travesser Formation: 911-T1 Arenaceous Ds. (x10 PL)



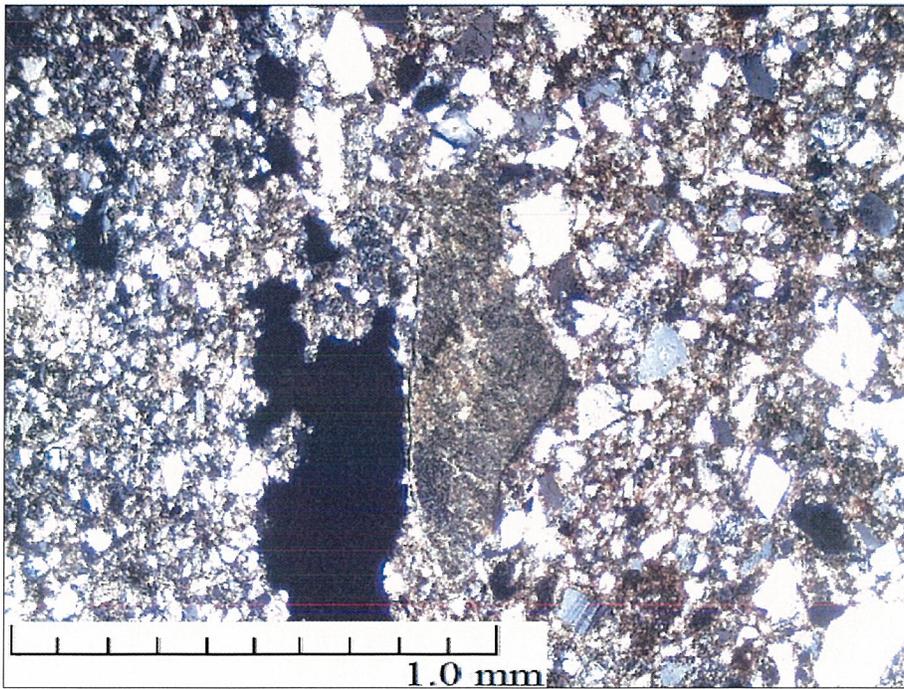
Travesser Formation: 911-T1 Arenaceous Ds. (x40 XP)

Figure 28-2. Probable fossil fragments from Triassic Travesser Formation are similar to the ones (Fig. 28-1) from Plug RC. The photo (bottom) is magnified from the one (top) in circle.

Clastic injectites: Plug RC

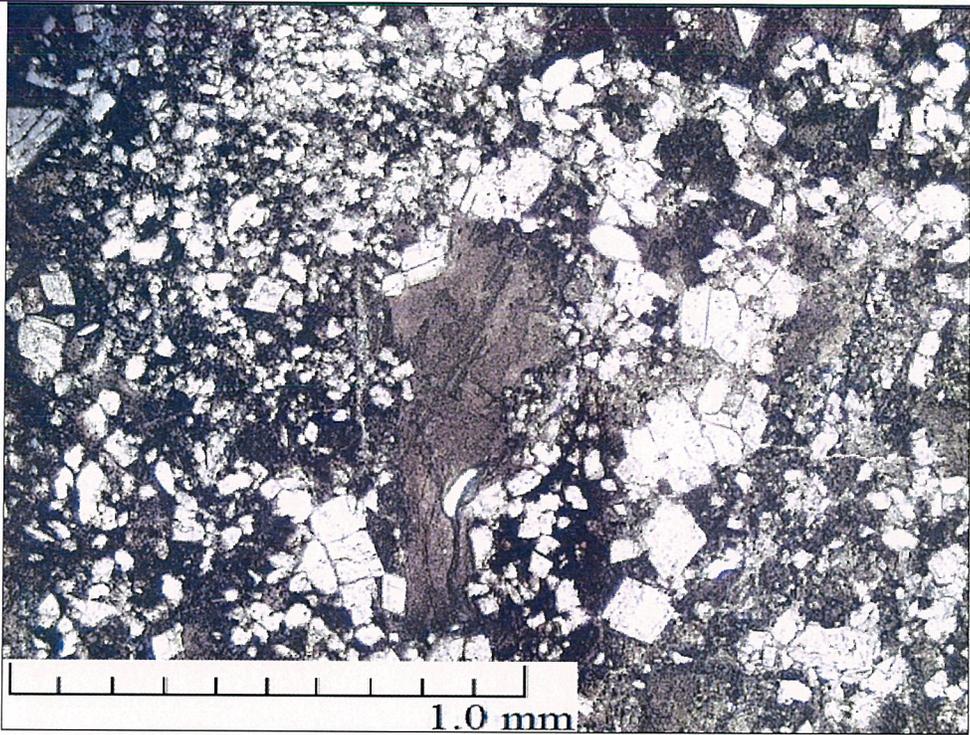


Facies 3: 911-13 Ss (x10 PL)

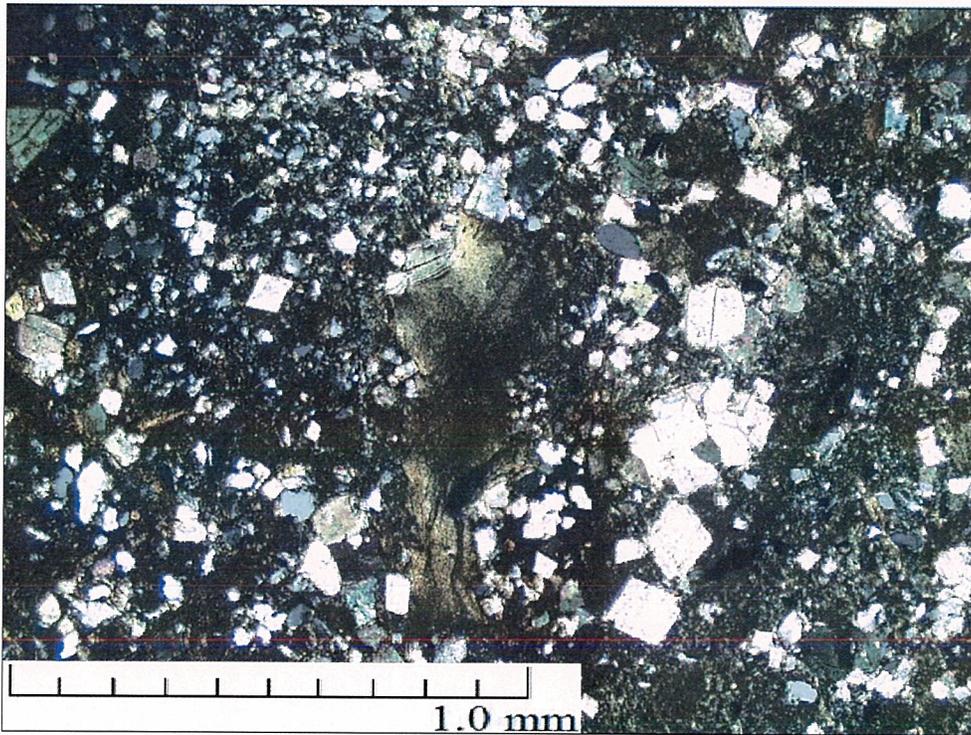


Facies 3: 911-13 Ss (x10 PL)

Figure 29-1. Probable fossil fragment in Plug RC may be correlated to those (Fig. 29-2) from Triassic Sloan Canyon Formation.

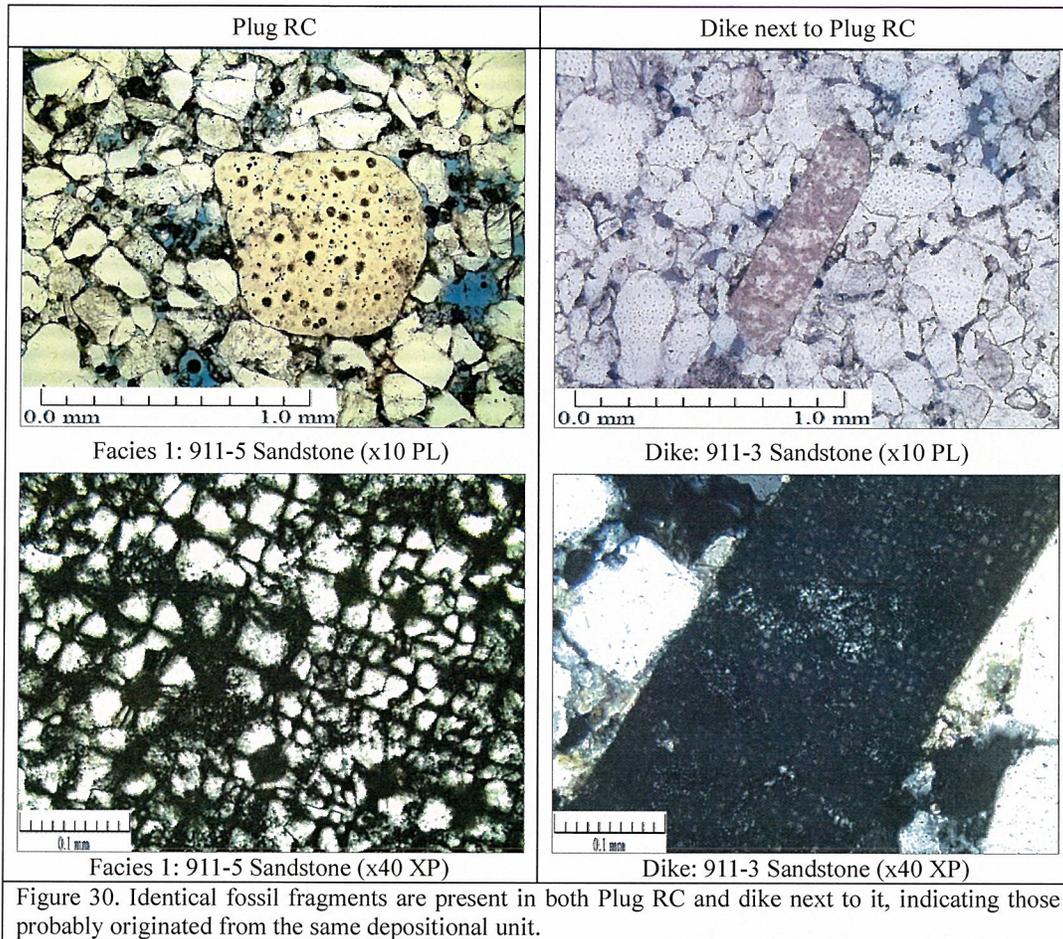


Sloan Canyon Formation: 911-2 Argillaceous Ds. (x10 PL)



Sloan Canyon Formation: 911-2 Argillaceous Ds. (x10 PL)

Figure 29-2. Probable fossil fragment from Triassic Sloan Canyon Formation is similar to the one (Fig. 29-1) from Plug RC.



Porosity and permeability

The diagram shown in Fig. 31 is the result of 300-point counts for porosity and the measurement of permeability with Tinyperm 2. The samples from all of the stratigraphic units and clastic injectites were measured for porosity and permeability. The porosity and permeability of the probable host rocks (Trsp, Trsc, and Travesser Formation) range from 0 to 5% and from 0.48 to 26.9mD, respectively. The clastic injectites (plugs and dikes) have similar results that range from 0 to 8.7% in porosity and from 0.42 to 97.9 mD in permeability. The Entrada Sandstone, however, shows a much wider range in values for porosity and permeability, 4.3-25.7% and 22.1-13,666mD, respectively.

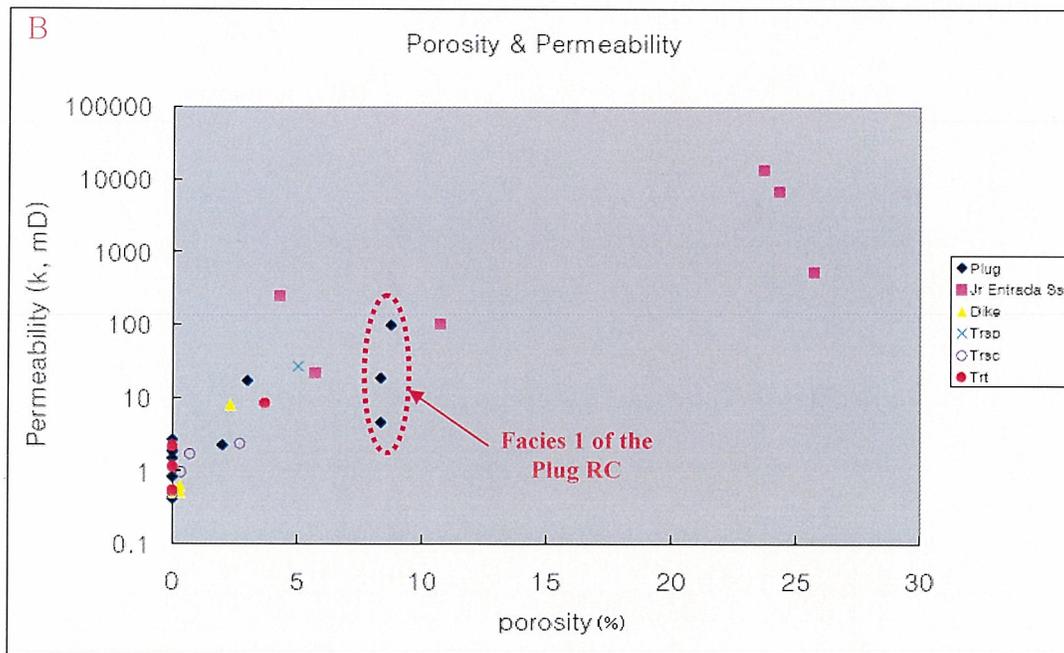
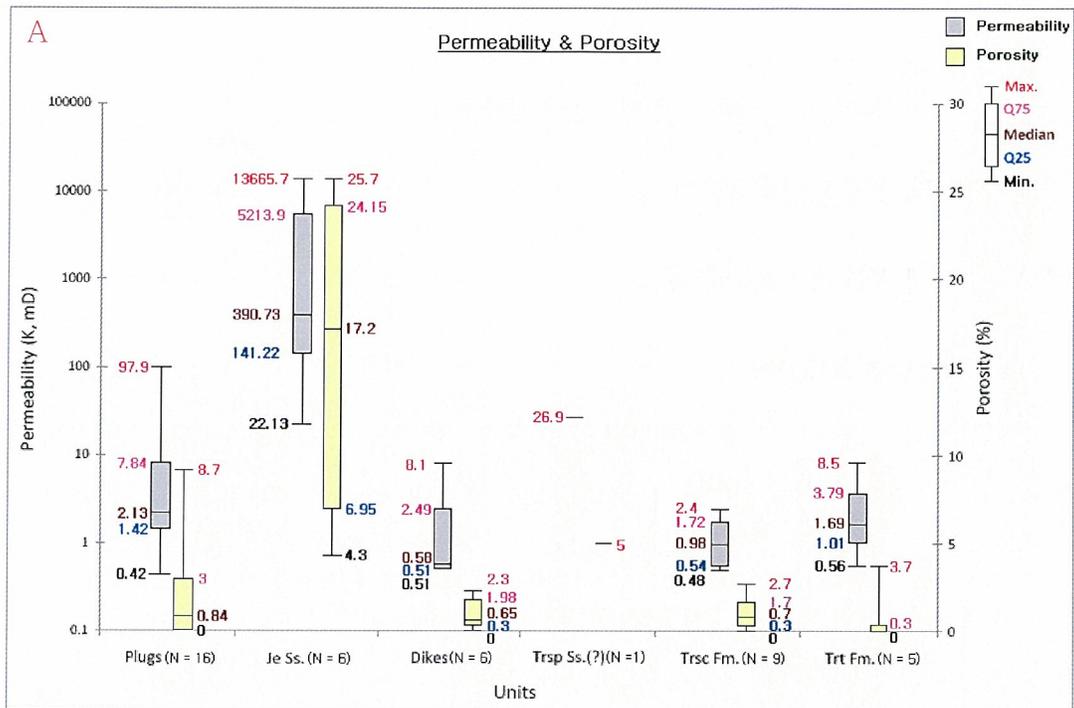


Figure 31. Porosity and permeability for 42 samples from all the stratigraphic units and clastic injectites. The Jurassic Entrada Sandstone shows the highest and widest values of both porosity and permeability (A and B). The other samples display much lower porosity and permeability except for the ones (A; marked in dotted circle) from Facies 1 of the Plug RC.

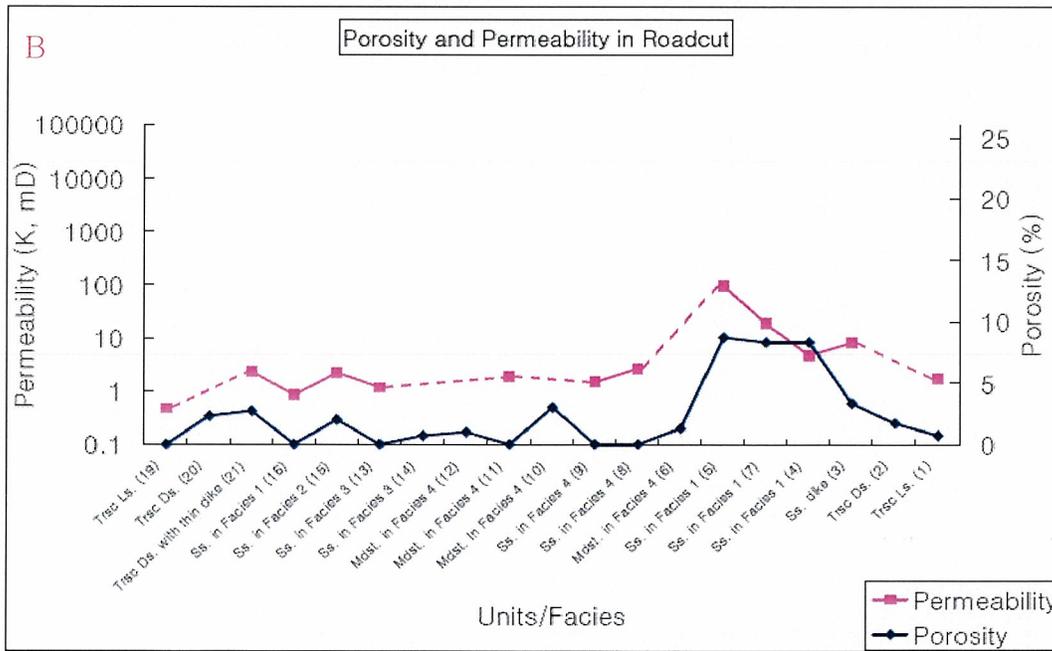
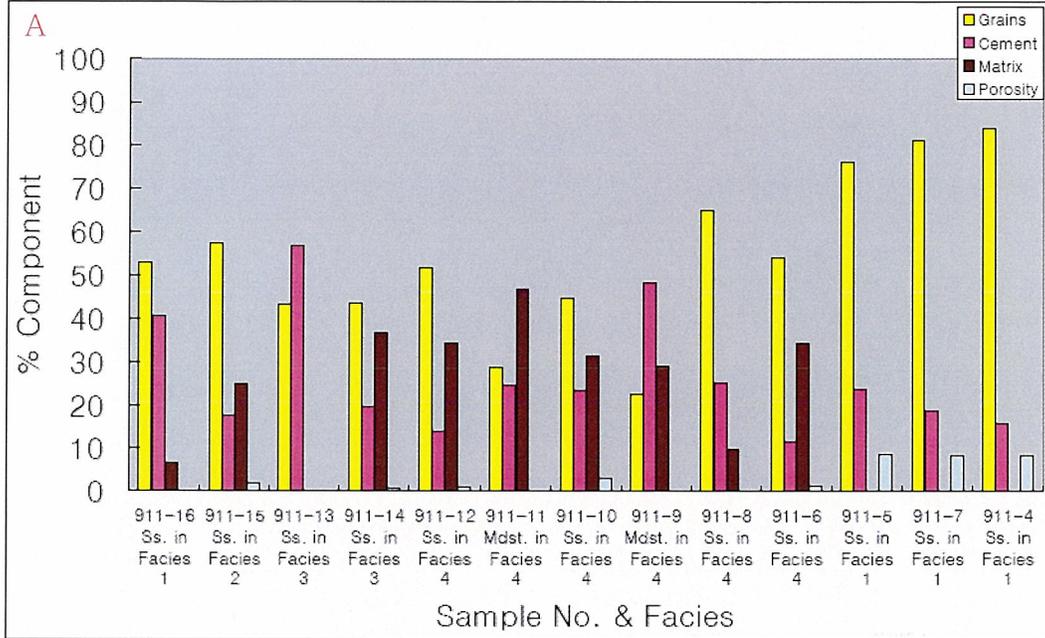


Figure 32. (A) Exhibits compositional variation (grains-matrix-cement) in the plug in the road cut. (B) Shows that porosity and permeability in Plug RC and the adjacent units (Triassic Sloan Canyon Formation) are not particularly variable, except for facies 1 on the east rim. The dotted line is for (calcareous) mudstone, which is below detection limit for permeability with Tinyperm 2.

Although 911-4, 5 and 7 (on the east rim) and 911-16 (on the west rim) are from the same lithofacies (Facies 1), they exhibit completely different compositions and porosity and permeability. Samples 911-4, 5 and 7 have higher porosity (8.3 – 8.7%) and permeability (4.7 - 97.9mD) due to higher values for intergranular and intragranular porosity (because of a lack of matrix, Fig. 32). In contrast, sample 911-16 on the west side has no porosity and very low permeability (0.85mD) due to a high percentage of cement and some matrix with little grain dissolution (Fig. 32).

Diagenesis

Paragenetic sequence

The paragenetic sequences displayed in Figure 54 have been obtained by petrographic examination using thin sections from the Jurassic Entrada Sandstone and clastic injectites. These paragenetic sequences are based mainly on sandstone samples without much clay and/or calcareous matrix.

Sample 911-17 has been selected to represent the Entrada Sandstone. Absence of quartz overgrowths at long and concavo-convex contacts indicates that quartz overgrowths precipitated after compaction (Fig. 33). Quartz overgrowths occurred concurrent with kaolinite precipitation. Primary pore-filling kaolinite is in direct contact with either authigenic quartz overgrowths or detrital quartz (Fig. 34 and 35). Because secondary porosity in feldspar and lithic fragments is not filled with kaolinite, but rather hematite (Fig. 36) and/or calcite cements, dissolution most likely took place after kaolinite precipitation, but before hematite and/or calcite precipitation (Fig. 37). Hematite precipitated either at the margins of or on kaolinite cement (Fig. 37 and 38), indicating that hematite precipitated after kaolinite.

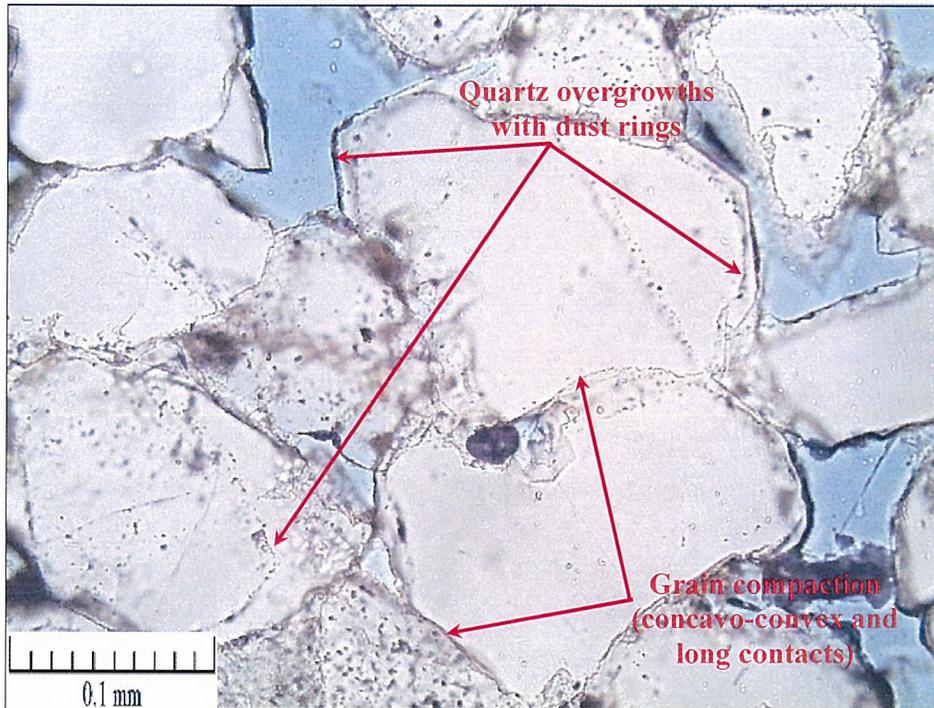


Figure 33. This picture shows the evidence for compaction with long and concavo-convex contacts. Quartz overgrowths delineated by euhedral forms and dust rings are present (911-17, x40 in PL).

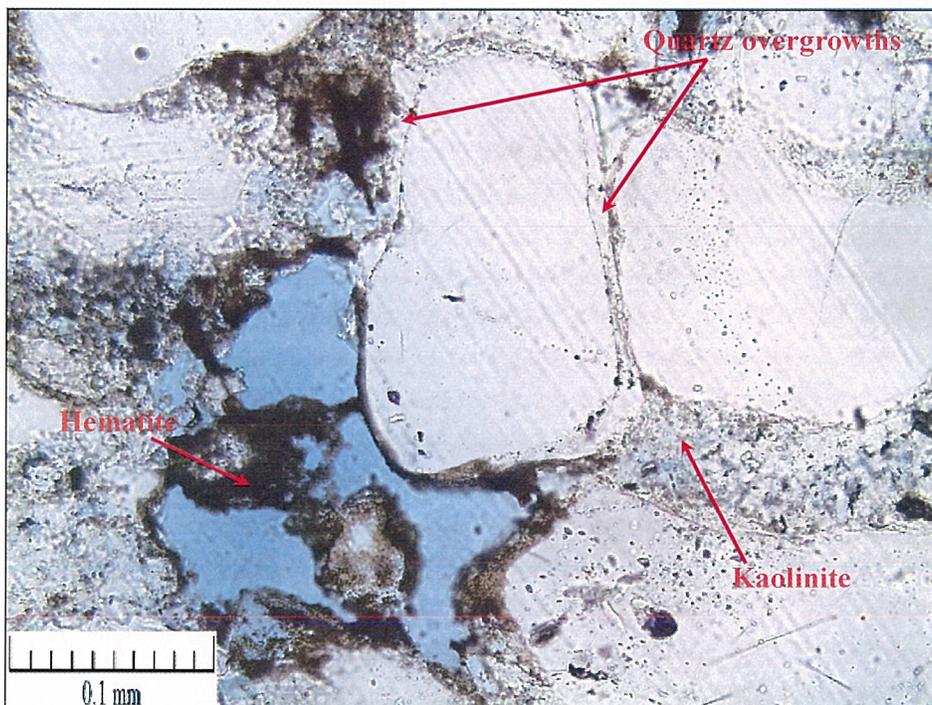


Figure 34. Quartz overgrowths with euhedral to subeuhedral forms partly contact with kaolinite and hematite (911-17, x40 in PL).

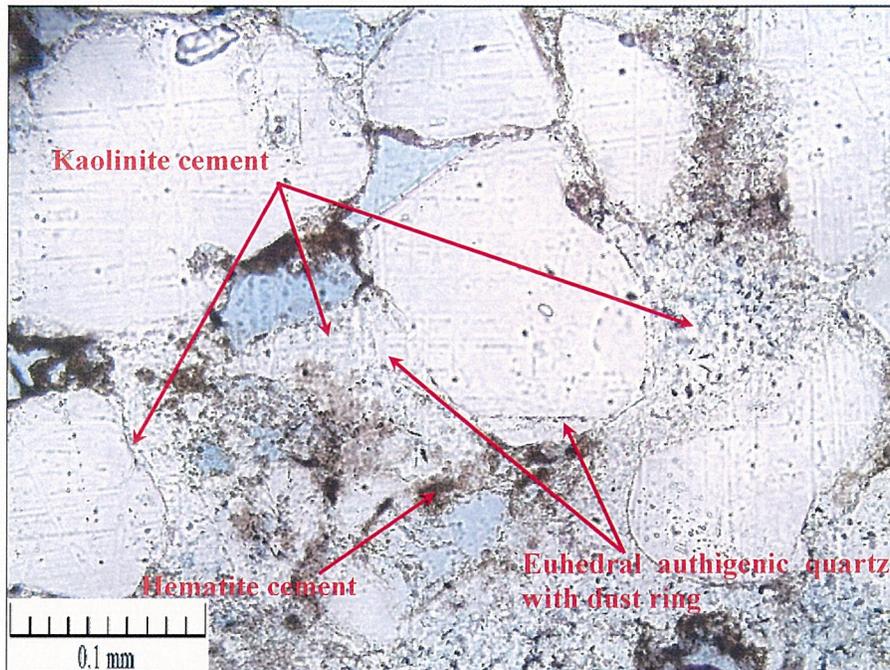


Figure 35. Quartz overgrowths were followed by both authigenic minerals of kaolinite and hematite on account of their precipitating the outlines of quartz overgrowths (911-17, x40 in PL).

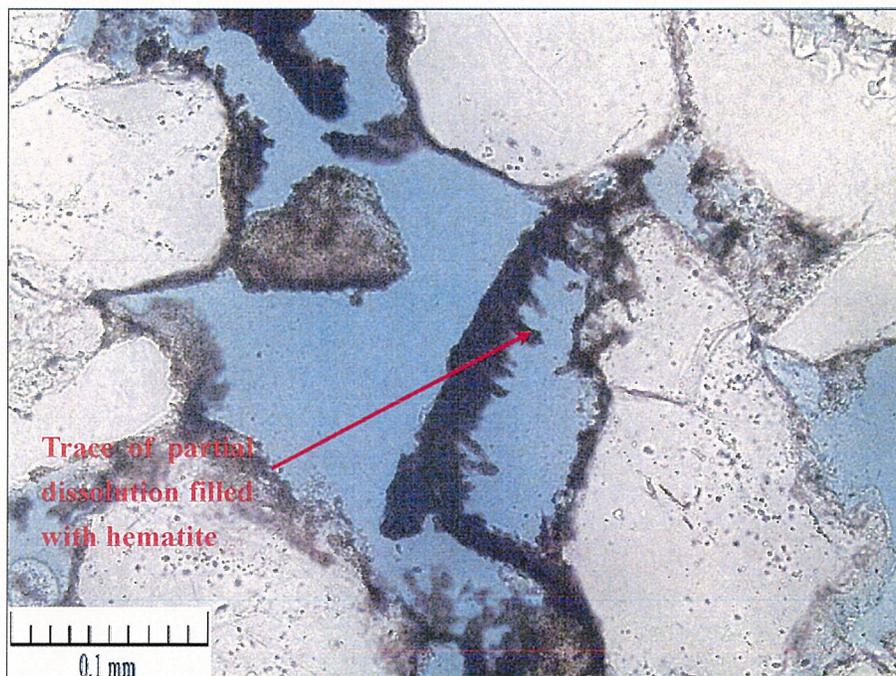


Figure 36. Grain (feldspar?) dissolution preceded hematite cement because hematite filled in the partially dissolved part, which was subsequently followed by complete dissolution, forming a ghost texture (911-17, x40 in PL).

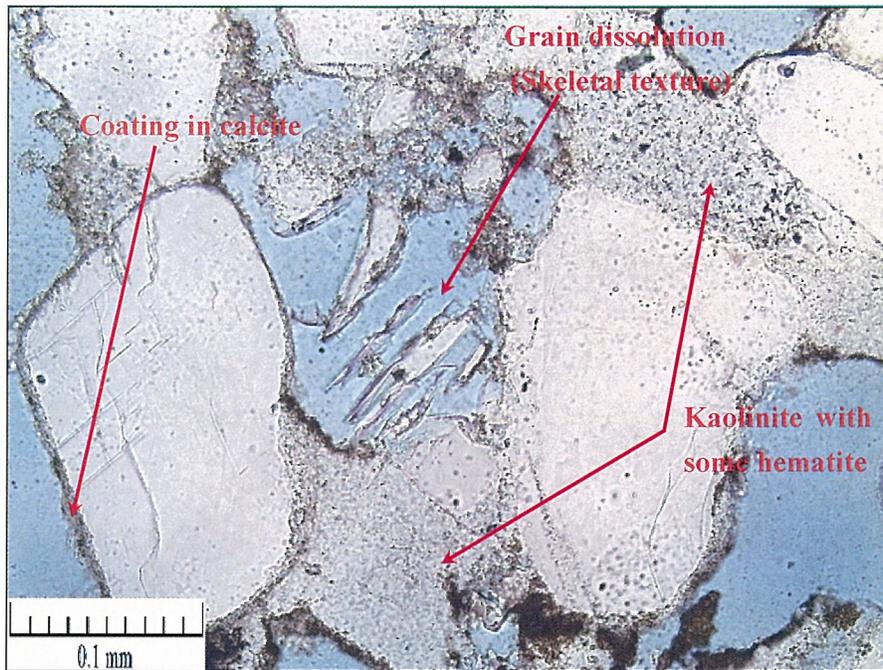


Figure 37. Partial dissolved feldspar grain exhibits skeletal texture with some precipitation of calcite and hematite. The kaolinite acted as primary pore-filling cement. The kaolinite, which is less densely precipitated in the upper part, presumably preceded iron oxides (hematite) which probably filled the remaining pore spaces. Coatings in calcite are common in this sample (911-17, x40 in PL).

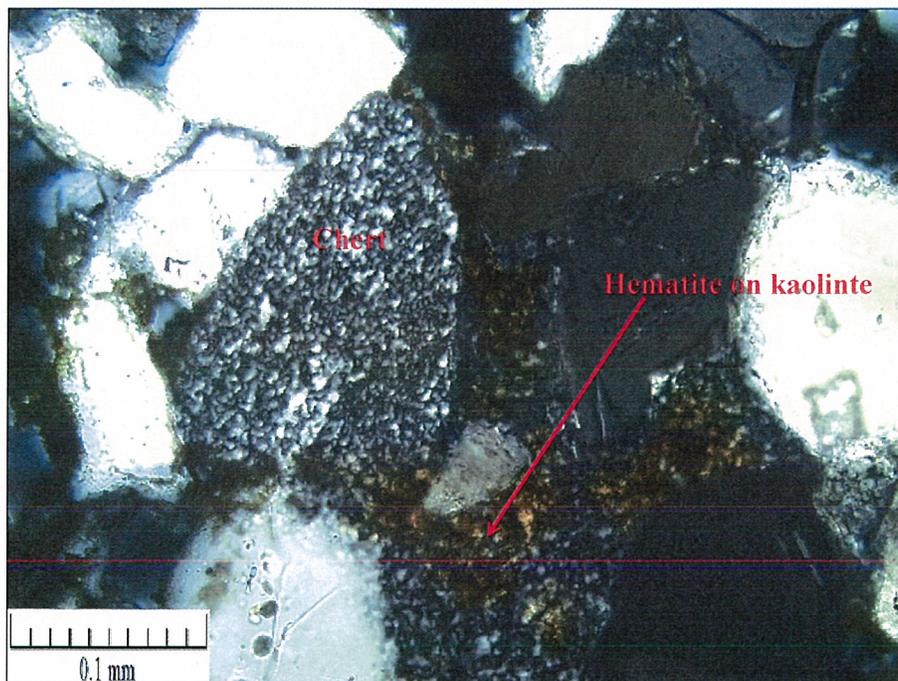


Figure 38. Hematite precipitated on primary pore-filling kaolinite cement (911-17, x40 in PL).

Clastic dikes were examined for diagenetic analysis. Compaction (Fig. 39) occurred after dolomite precipitation, because rhombic dolomite makes a concavo-convex contact with adjacent grains. Dolomite precipitation predated quartz overgrowths and calcite cement due to quartz overgrowths blocked by dolomite and calcite cement surrounding dolomite (Fig. 40). Kaolinite precipitation predated quartz overgrowths and calcite, because its earlier precipitation prevented quartz overgrowths, and is surrounded by calcite cement (Fig. 39 and 41). Calcite cement precipitated in the latest stage of diagenesis, postdating quartz overgrowths, since calcite cement precipitated on quartz overgrowths (Fig. 39-41). Kaolinite precipitation also predated grain dissolution (probably feldspar) because kaolinite is not present in the secondary porosity of grain dissolution even though kaolinite filled up the adjacent intergranular porosity (Fig. 42). Kaolinite also precipitated earlier than hematite precipitated in the grain dissolution because hematite seems to precipitate grain dissolution.

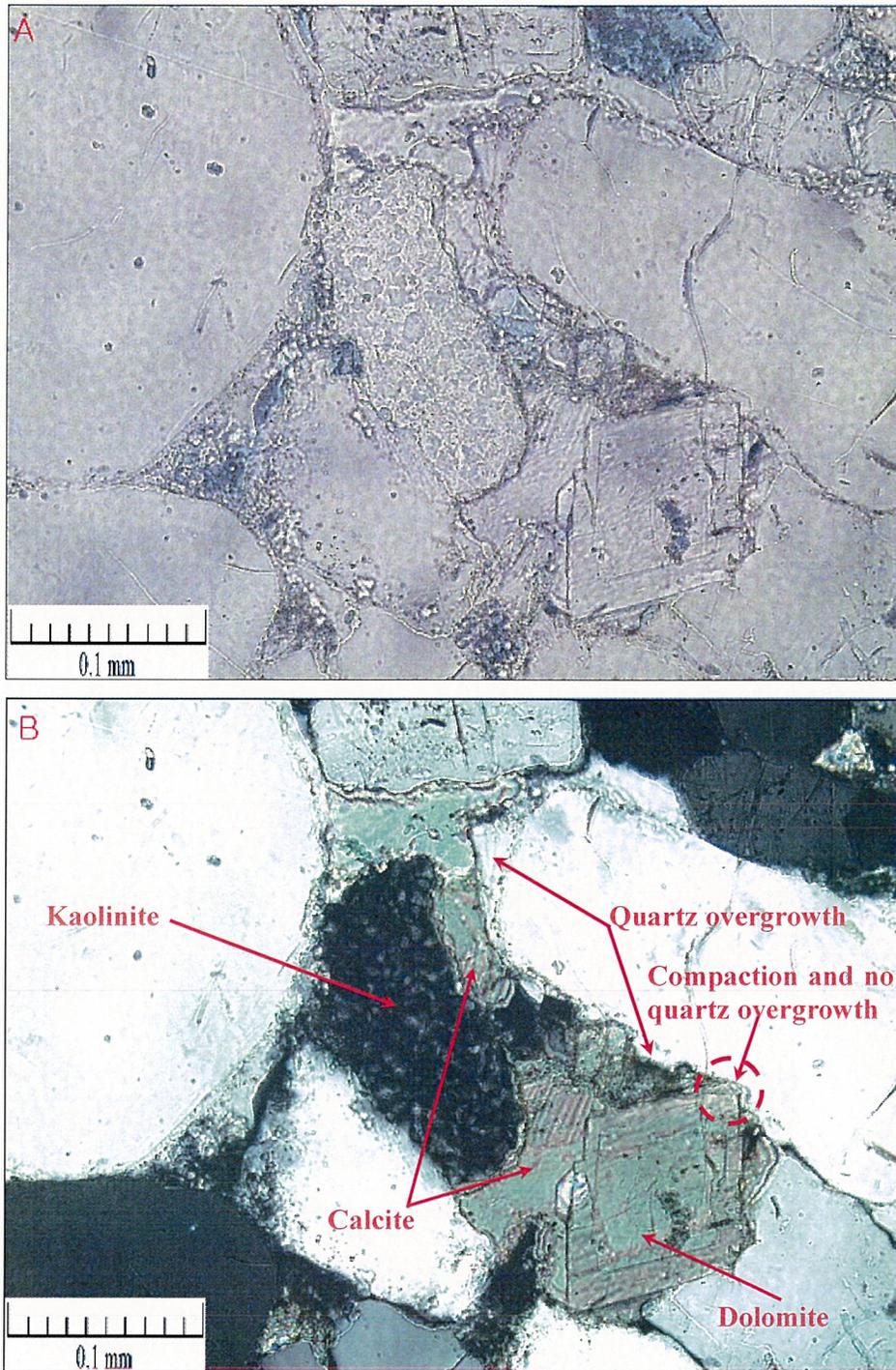


Figure 39. Compaction occurred after dolomite precipitation. Kaolinite precipitated prior to quartz overgrowths and calcite. Quartz overgrowths also postdated dolomite precipitation (A and B from 911-3 Dike in RC, x40PL and XP, respectively).

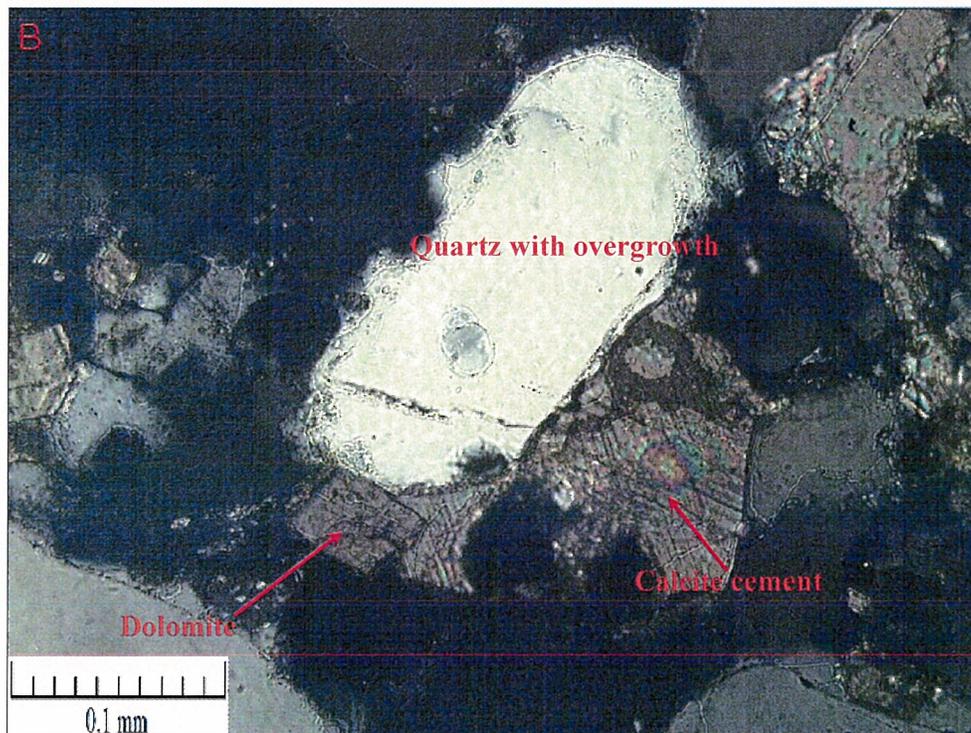
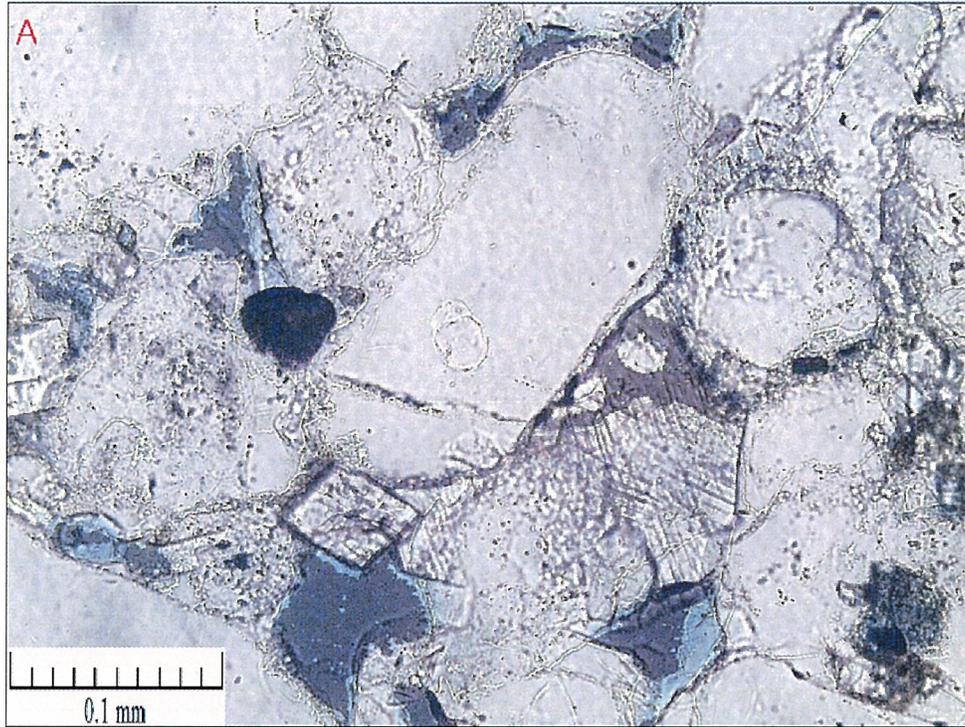


Figure 40. Dolomite predated quartz overgrowth and calcite cement (A and B from 911-3 Dike in RC, X40PL and XP, respectively).

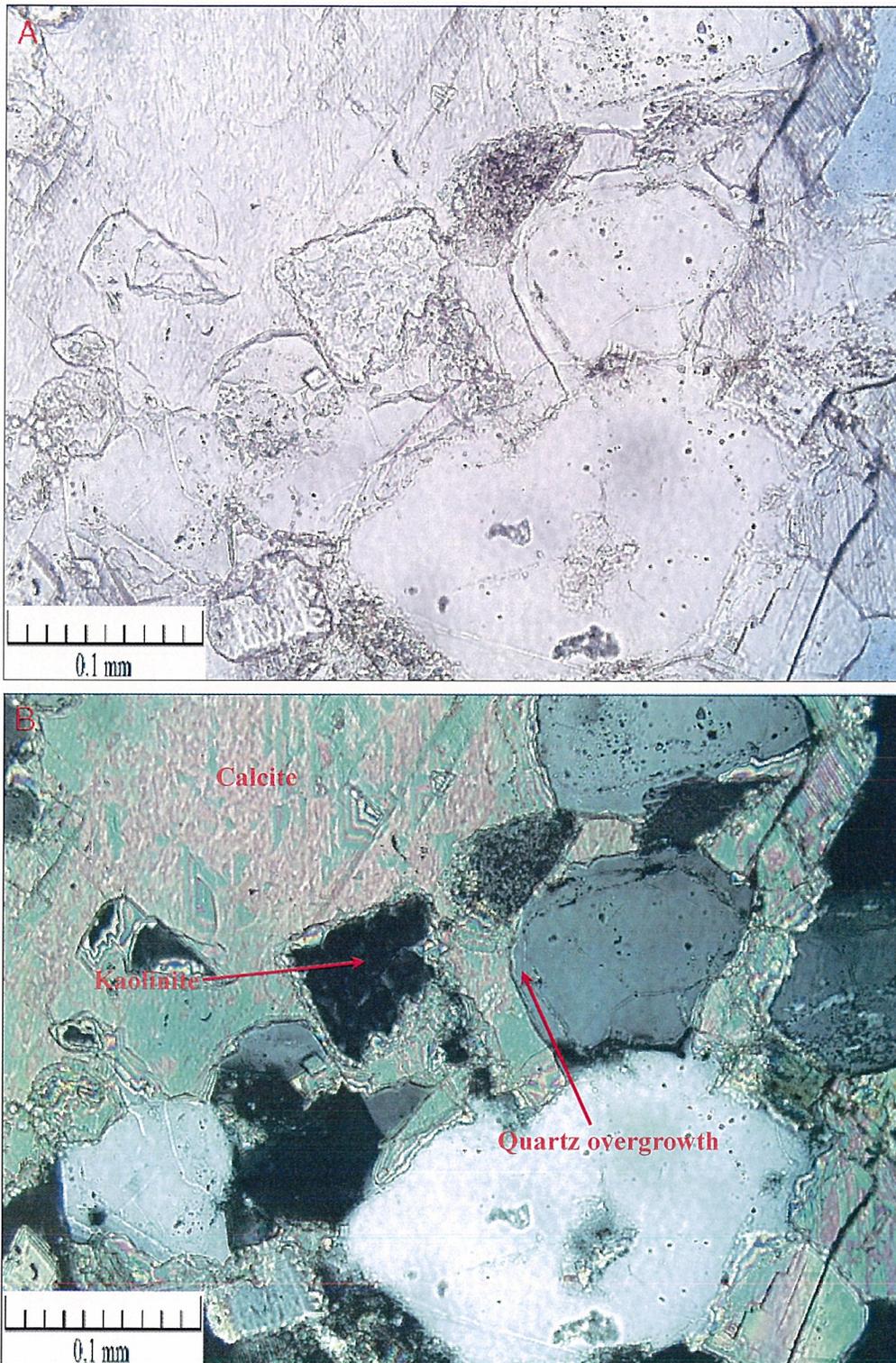


Figure 41. Calcite cement postdated both kaolinite and quartz overgrowths (A and B from 911-3 Dike in RC, X40PL and XP, respectively).

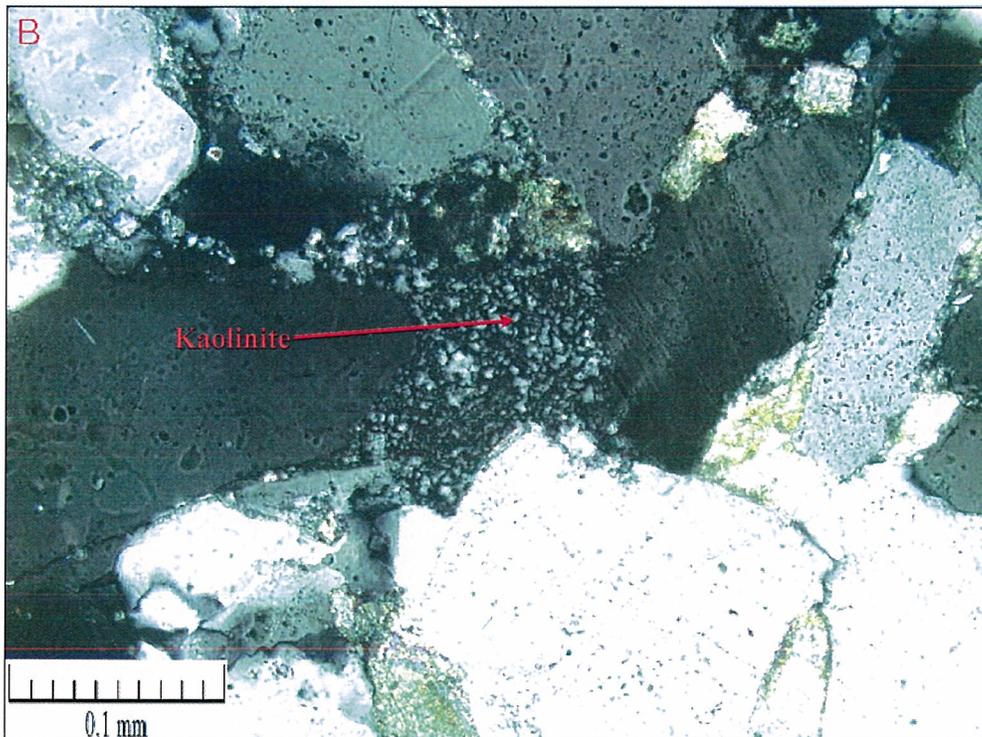
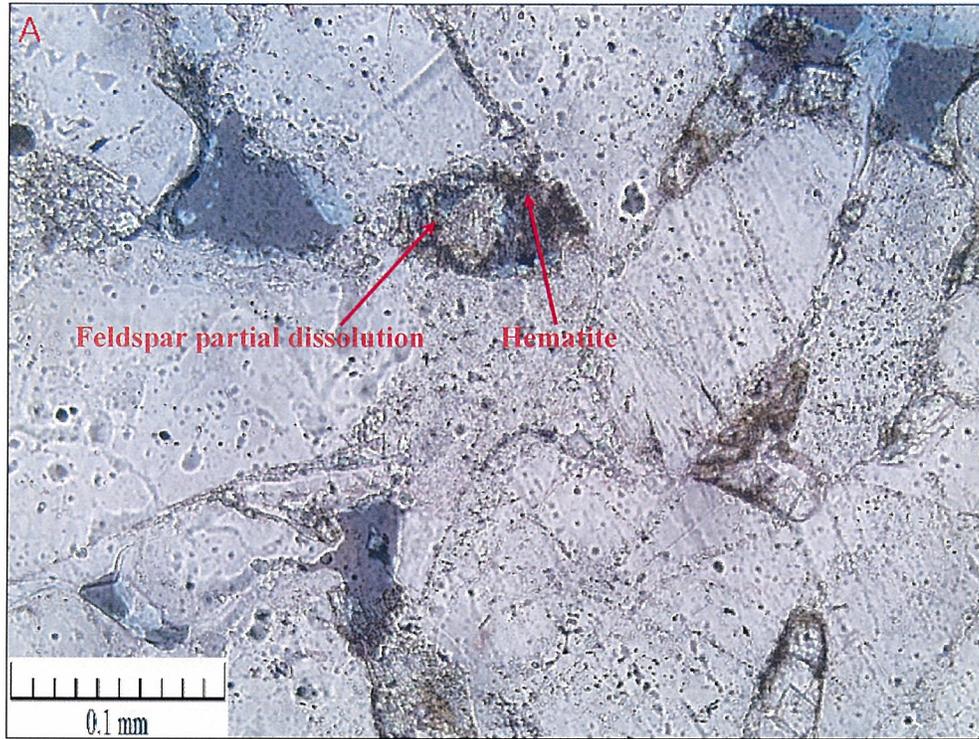


Figure 42. Kaolinite predated grain dissolution (probably feldspar) and possibly hematite precipitation (A and B from 911-3 Dike in RC, X40PL and XP, respectively).

For the paragenetic sequence of Plug RC, the samples from Facies 1, 2 and 4 (911-4-6, 15, and 16) have been used together due to insufficient information from a single thin section. Grain compaction probably continued after dolomite precipitation and partial dissolution because some dolomite shows distorted outlines and fractures between quartz grains (Fig. 43). Dolomite precipitation predated kaolinite precipitation because dolomite occupied pore space earlier than kaolinite (Fig. 44). Kaolinite precipitated earlier than the formation of quartz overgrowths because quartz overgrowths have been blocked by kaolinite precipitation (Fig. 45). Since kaolinite is not present in secondary pore spaces (Fig. 46-47), kaolinite precipitation predated grain dissolution. Kaolinite also likely predated hematite precipitation (Fig. 45). Hematite precipitated at two different times: an early stage that predated grain dissolution (probable feldspar), and a late stage that postdated dolomite dissolution (Fig. 46). The formation of quartz overgrowths likely postdated dolomite because quartz overgrowths have been blocked by dolomite (Fig. 45-46). Dedolomitization with hematite precipitated on dolomite took place after poikilotopic calcite cement because calcitized dolomite still maintains its original outline (Fig. 48). Unlike Facies 1 on the east side (911-4, 5, and 7), dolomite in other facies has undergone dedolomitization (Fig. 49).

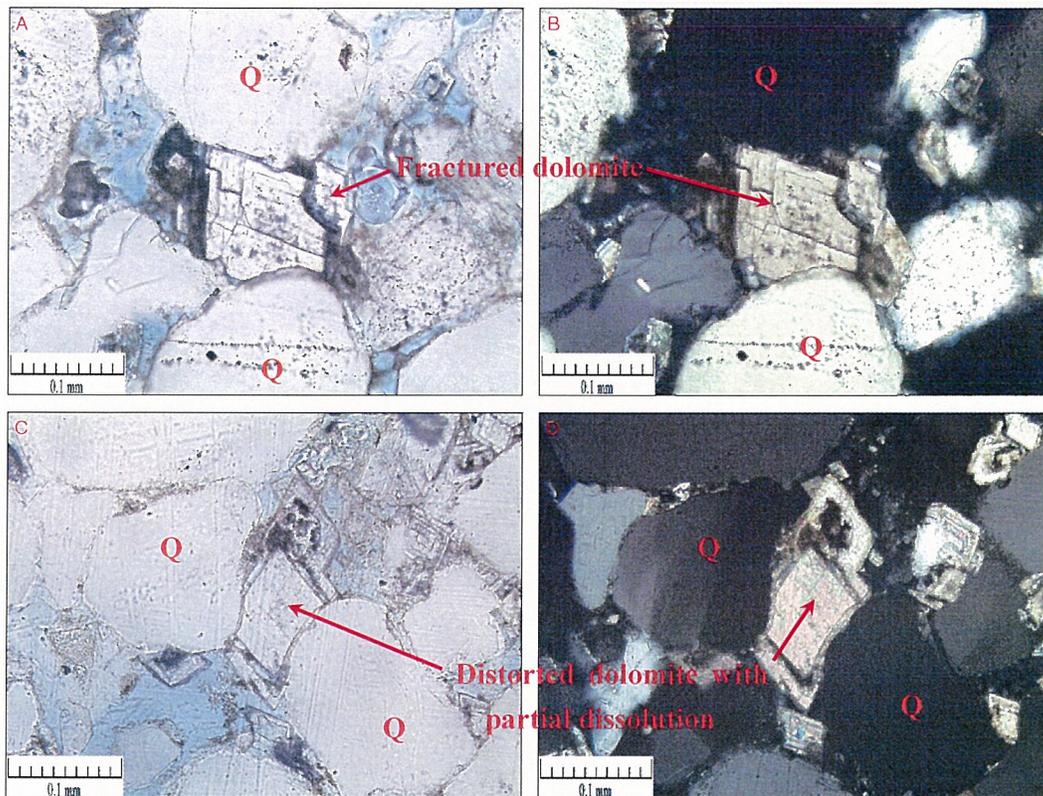


Figure 43. Grain compaction probably went on even after dolomite precipitation and partial dissolution (A-D from 911-5 Facies 1 of Plug RC, A and C: x40 PL, B and D: XP).

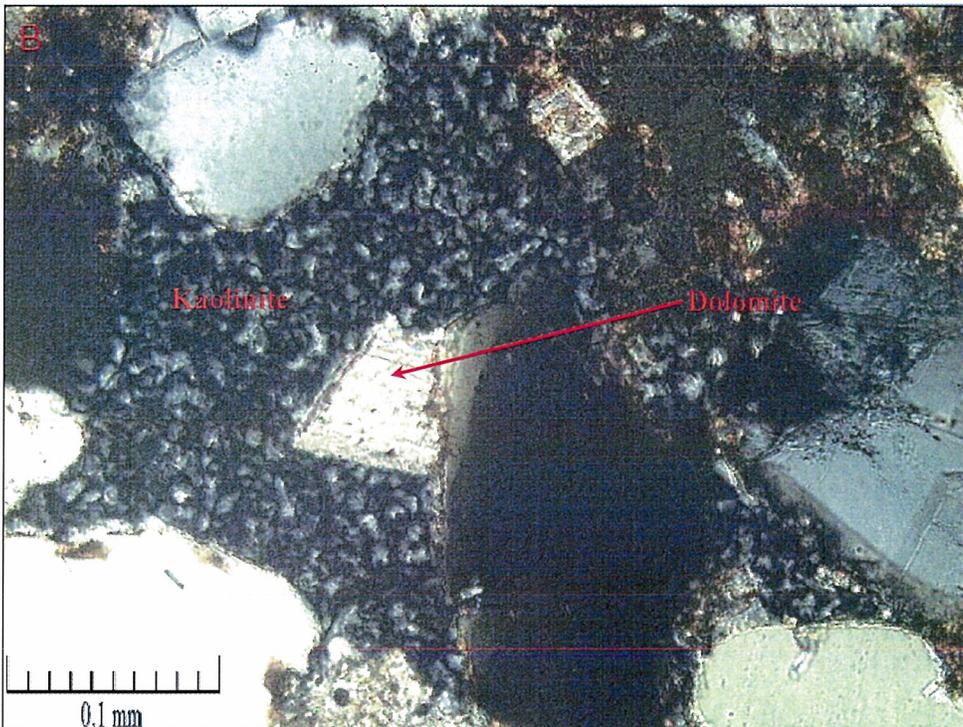
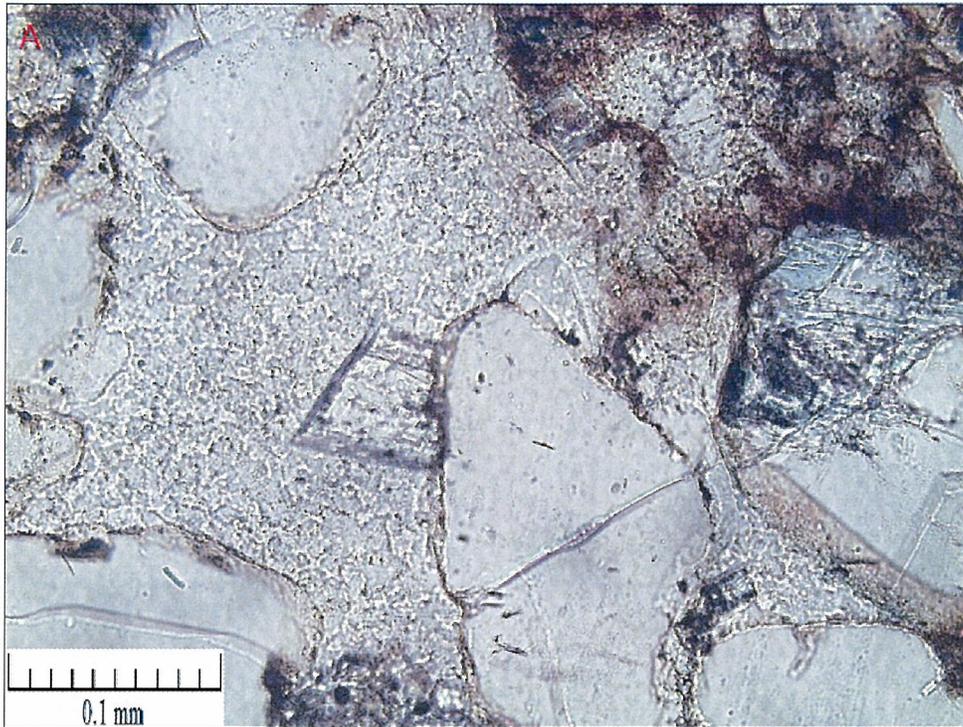


Figure 44. Dolomite precipitated earlier than kaolinite because kaolinite occupied all the pore space except for dolomite precipitation (911-15 Facies 2 of Plug RC, X40PL and XP, respectively).

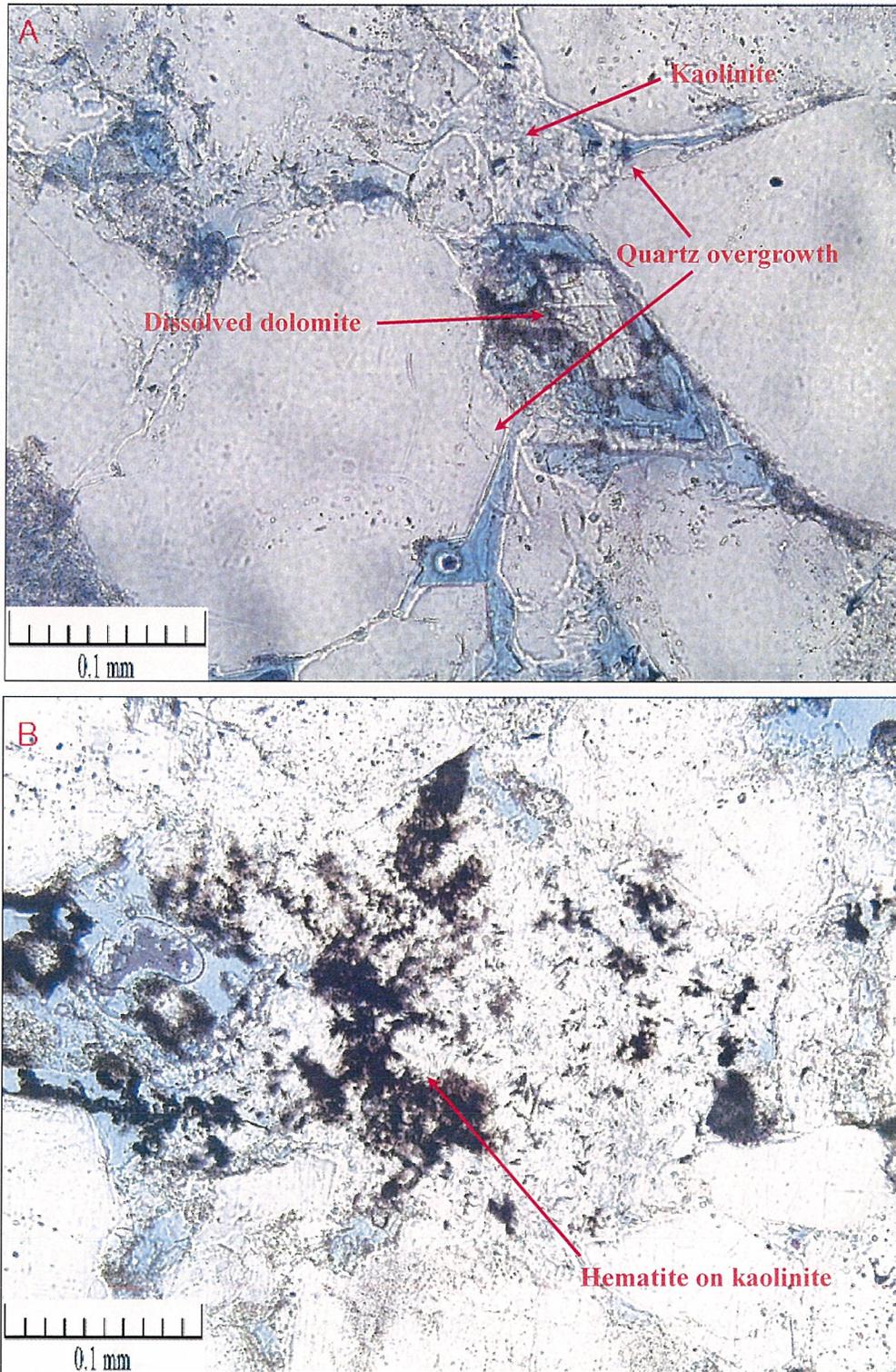


Figure 45. Kaolinite precipitated earlier than quartz overgrowth and grain dissolution. Kaolinite probably predated hematite as well (911-4 Facies 1 of Plug RC, Both X40 PL).

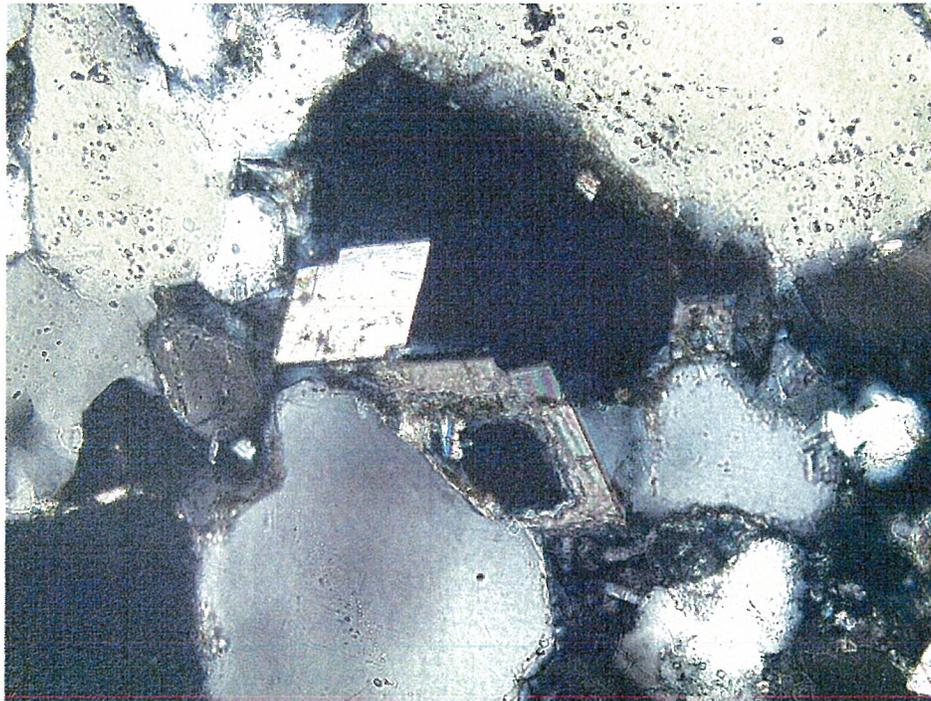
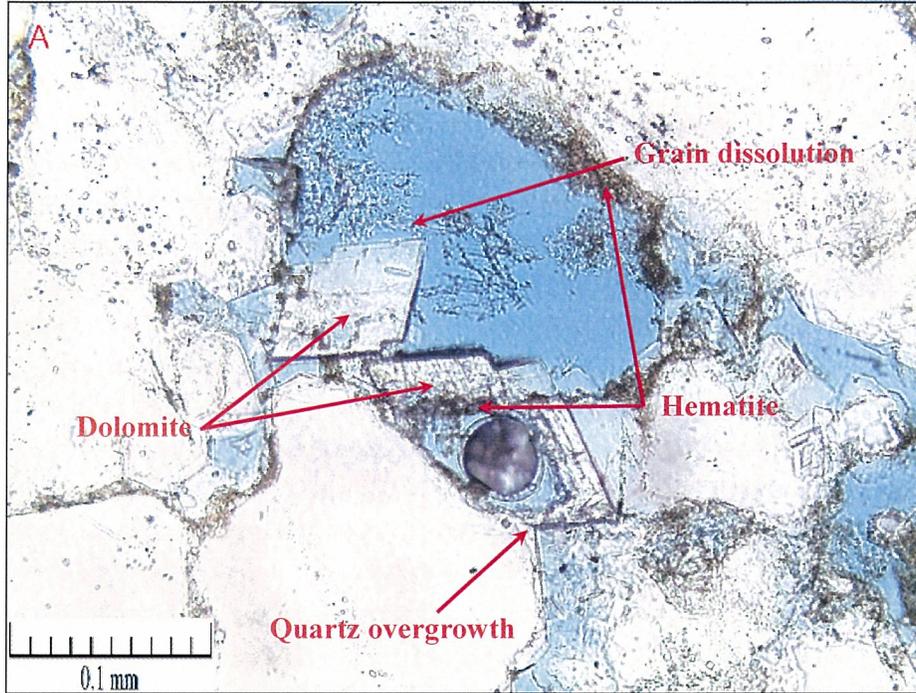


Figure 46. Hematite precipitated at two different times: One predated grain dissolution of probable feldspar; the other postdated dolomite dissolution. Quartz overgrowth postdated dolomite (911-4 Facies 1 of Plug RC, X40PL and XP, respectively).

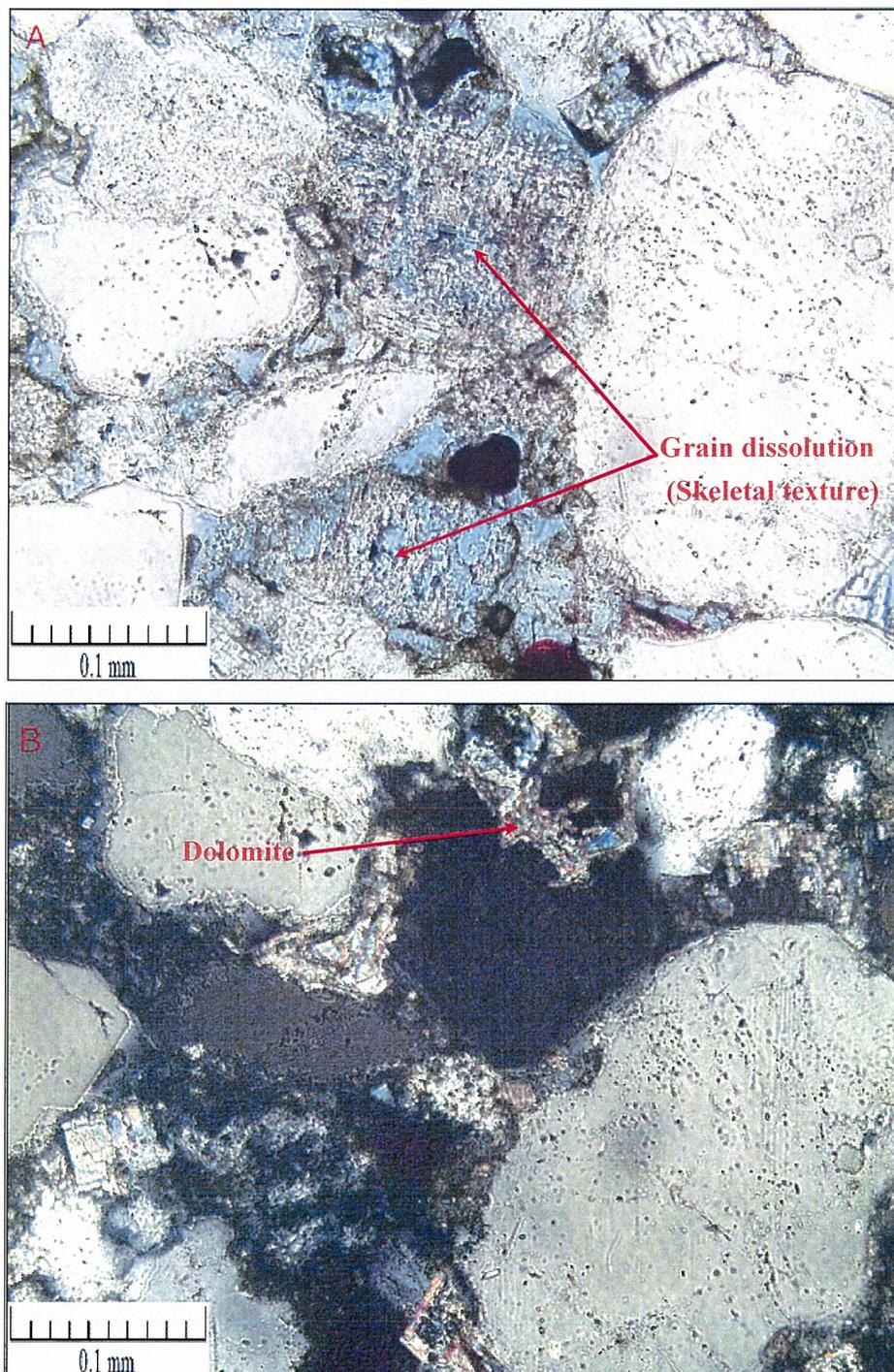


Figure 47. Grain dissolution contributes considerable porosity to Facies 1. Dolomite probably postdates grain dissolution (probably feldspar), but it is not clear due to possible 3D effects (911-4 Facies 1 of Plug RC, X40PL and XP, respectively).

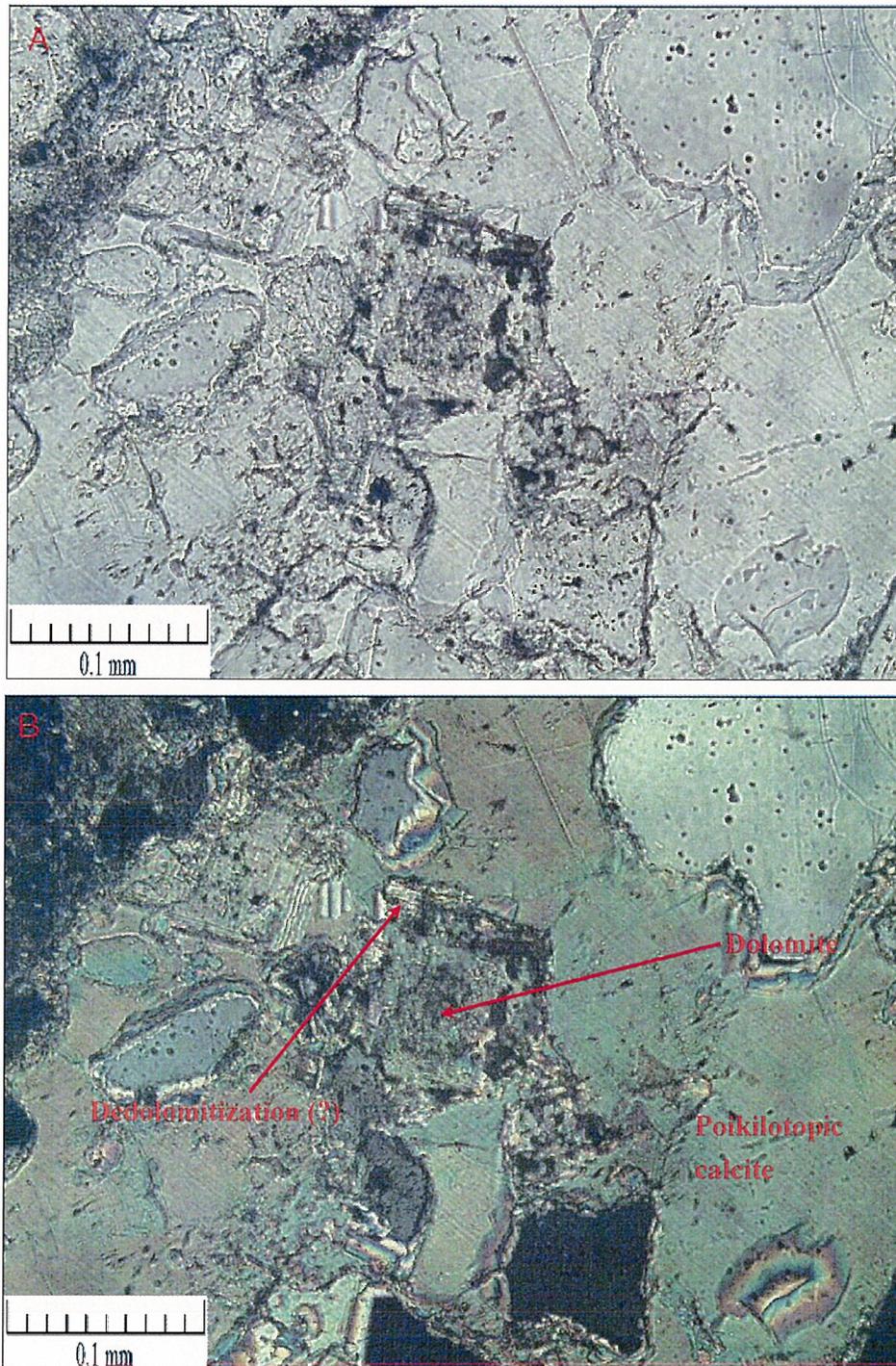


Figure 48. Dolomite predated poikilotopic calcite and probably underwent dedolomitization after calcite precipitation because calcitized dolomite still maintains its original outline (911-16 Facies 1 of Plug RC, X40PL and XP, respectively).

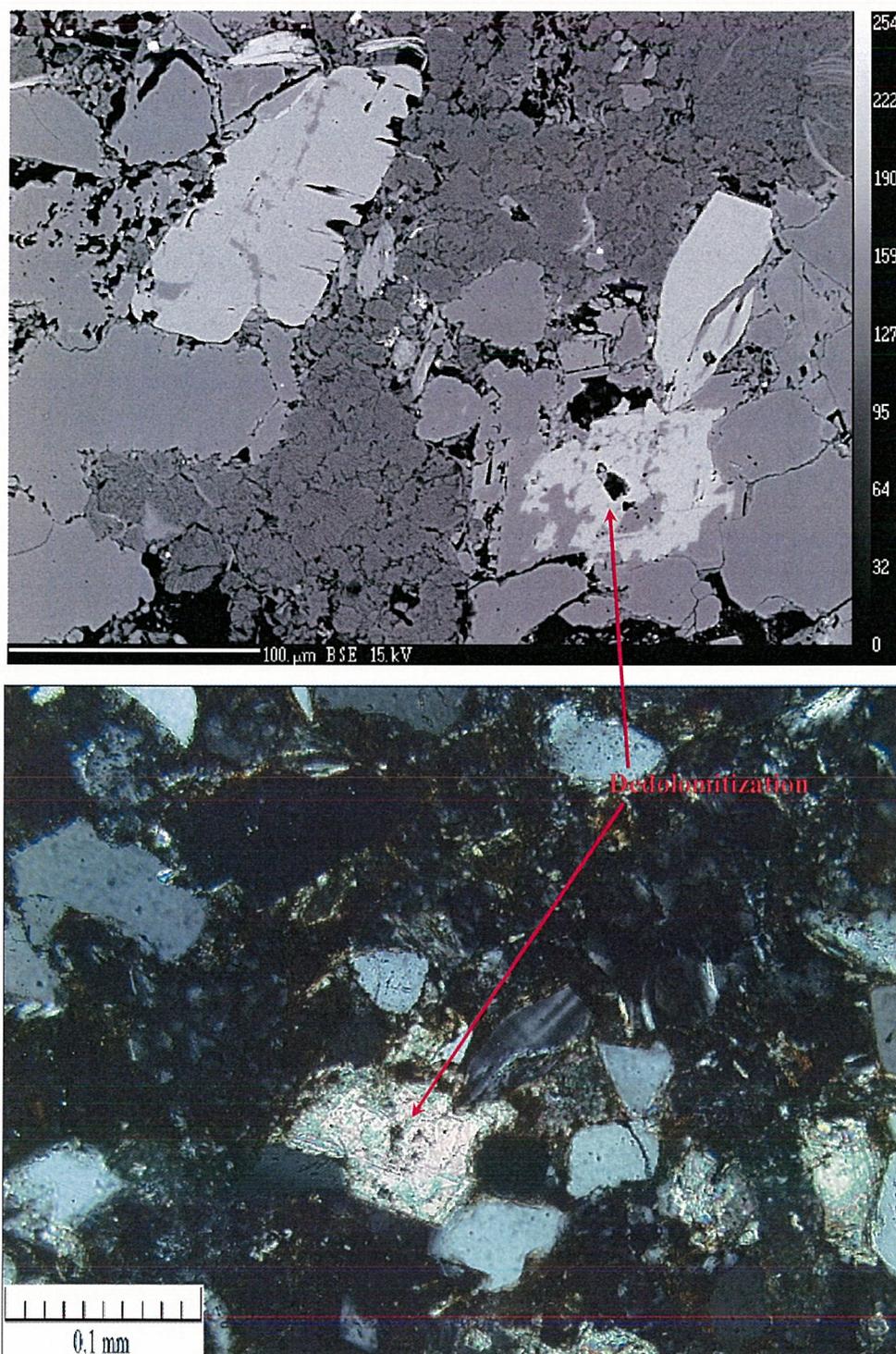


Figure 49. This sample (Facies 4; 911-6) displays partial dedolomitization. BSE image above indicates that the whitish bright color is Ca and gray one is Mg; the heavier chemical element is the brighter.

Plug A (910-8) has a somewhat different paragenetic sequence. Grain compaction took place after fluidization of both sandstone grains and carbonate mud (Fig. 50). Early dolomite presumably crystallized from calcareous mud or in pore spaces after fluidization (Fig. 51). Hematite precipitated earlier than grain dissolution and kaolinite subsequently precipitated in grain-dissolved pore spaces (Fig. 51). Calcite cement in secondary porosity (Fig. 52) indicates that calcite precipitation postdates grain dissolution. During the late diagenetic stage, finely crystallized dolomite underwent dedolomitization (Fig. 53).

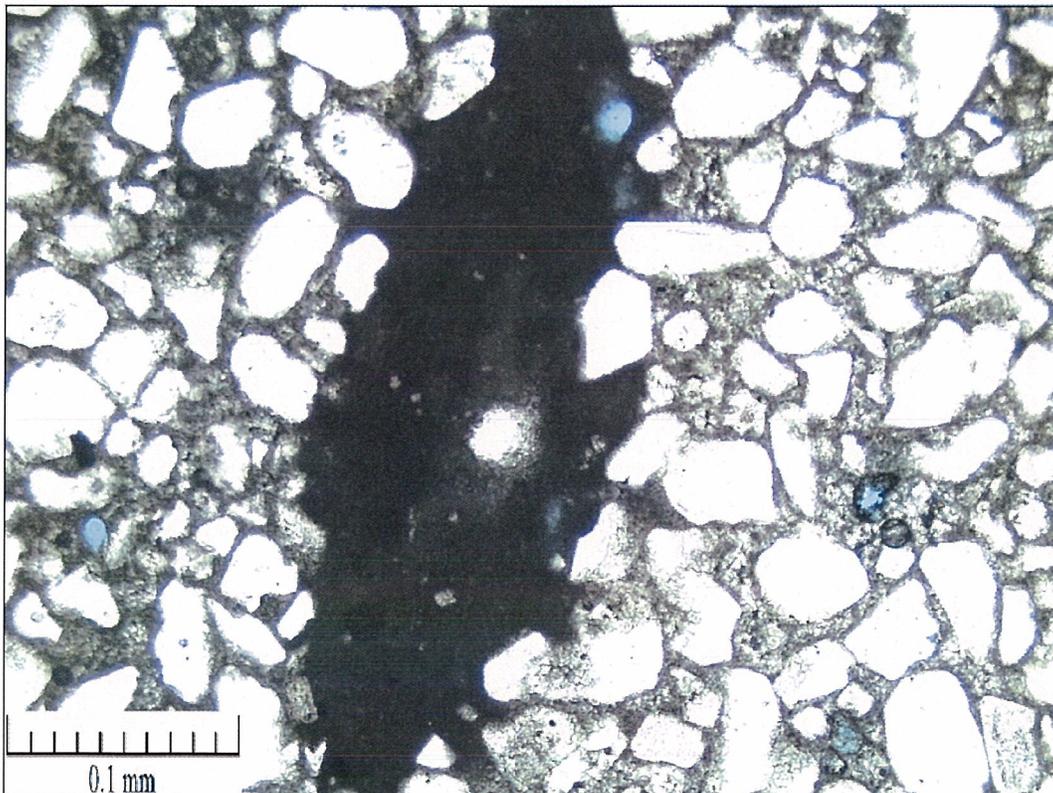


Figure 50. Grain compaction probably took place after fluidization of both sandstone grains and carbonate mud (910-8 Plug A, X10 PL).

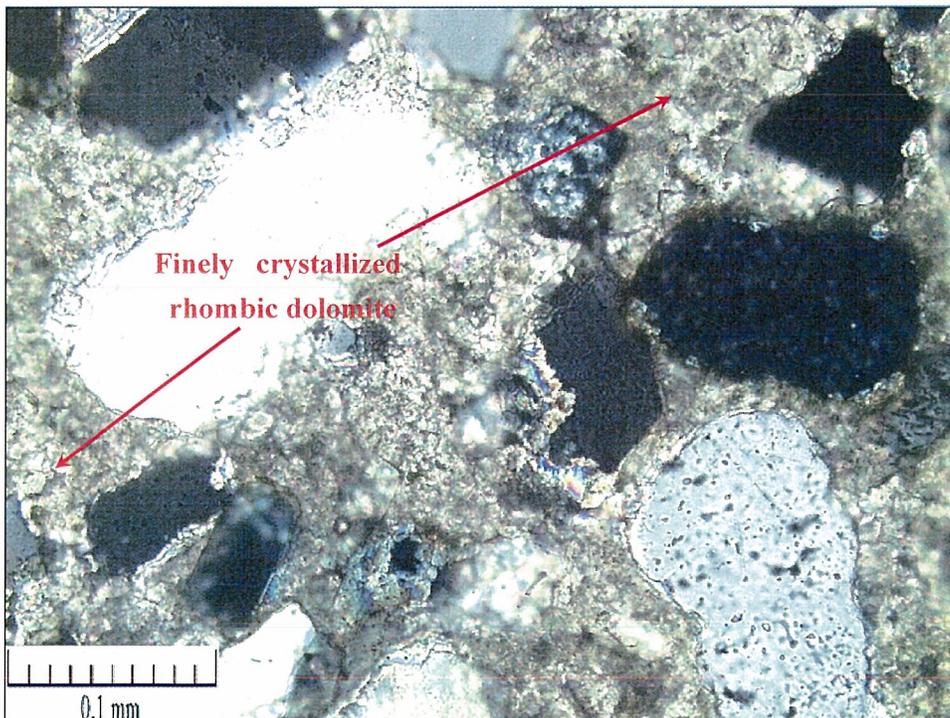
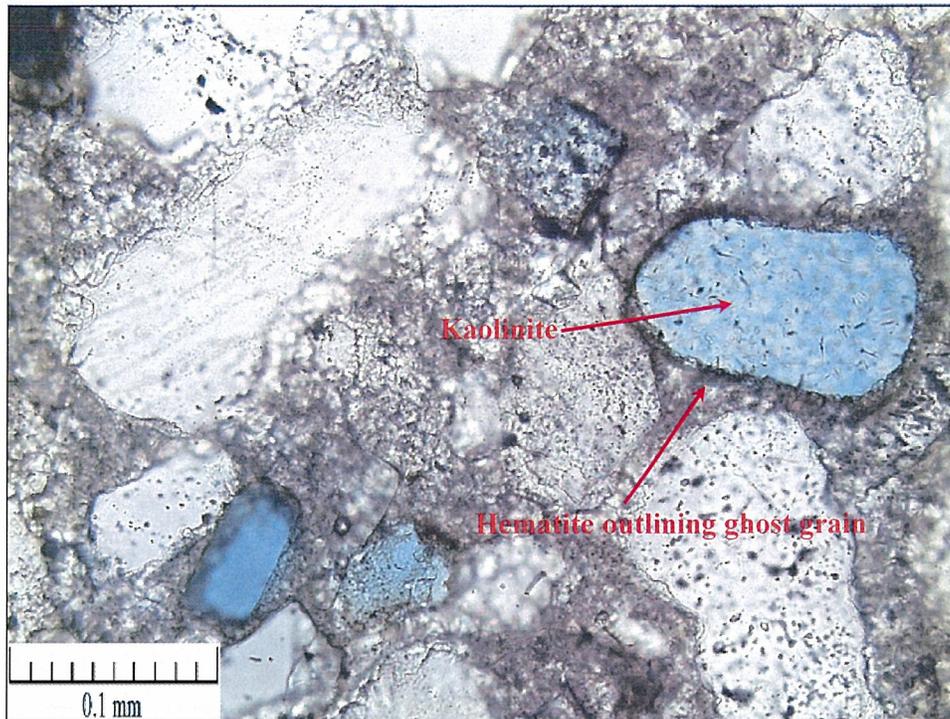


Figure 51. Dolomite presumably crystallized from calcareous mud or in pore spaces during early diagenesis. Kaolinite postdated both grain dissolution and hematite precipitation (910-8 Plug A, X40PL and XP, respectively).

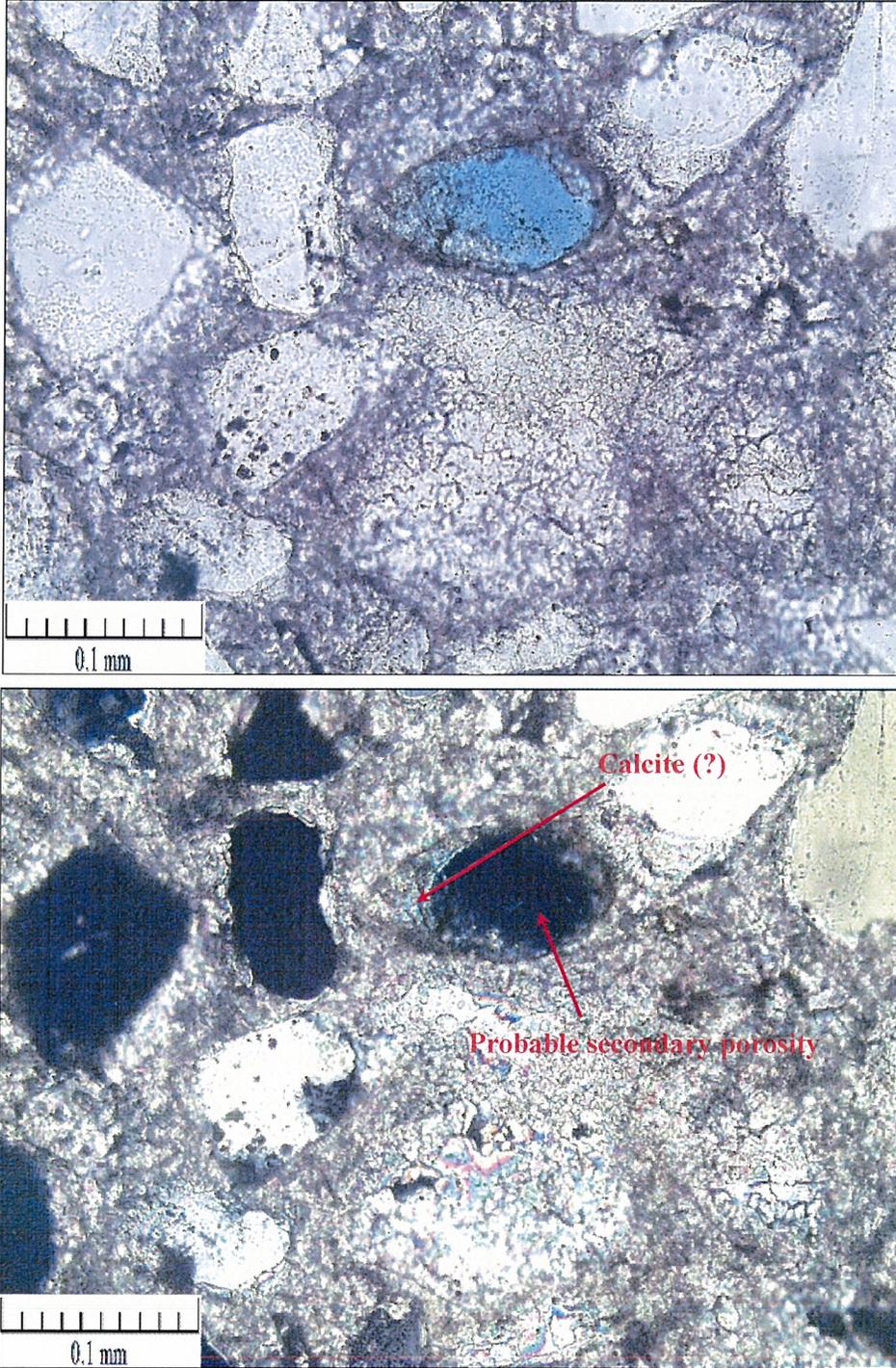


Figure 52. Grain dissolution predated calcite (?) cementation (910-8 Plug A, X40PL and XP, respectively).

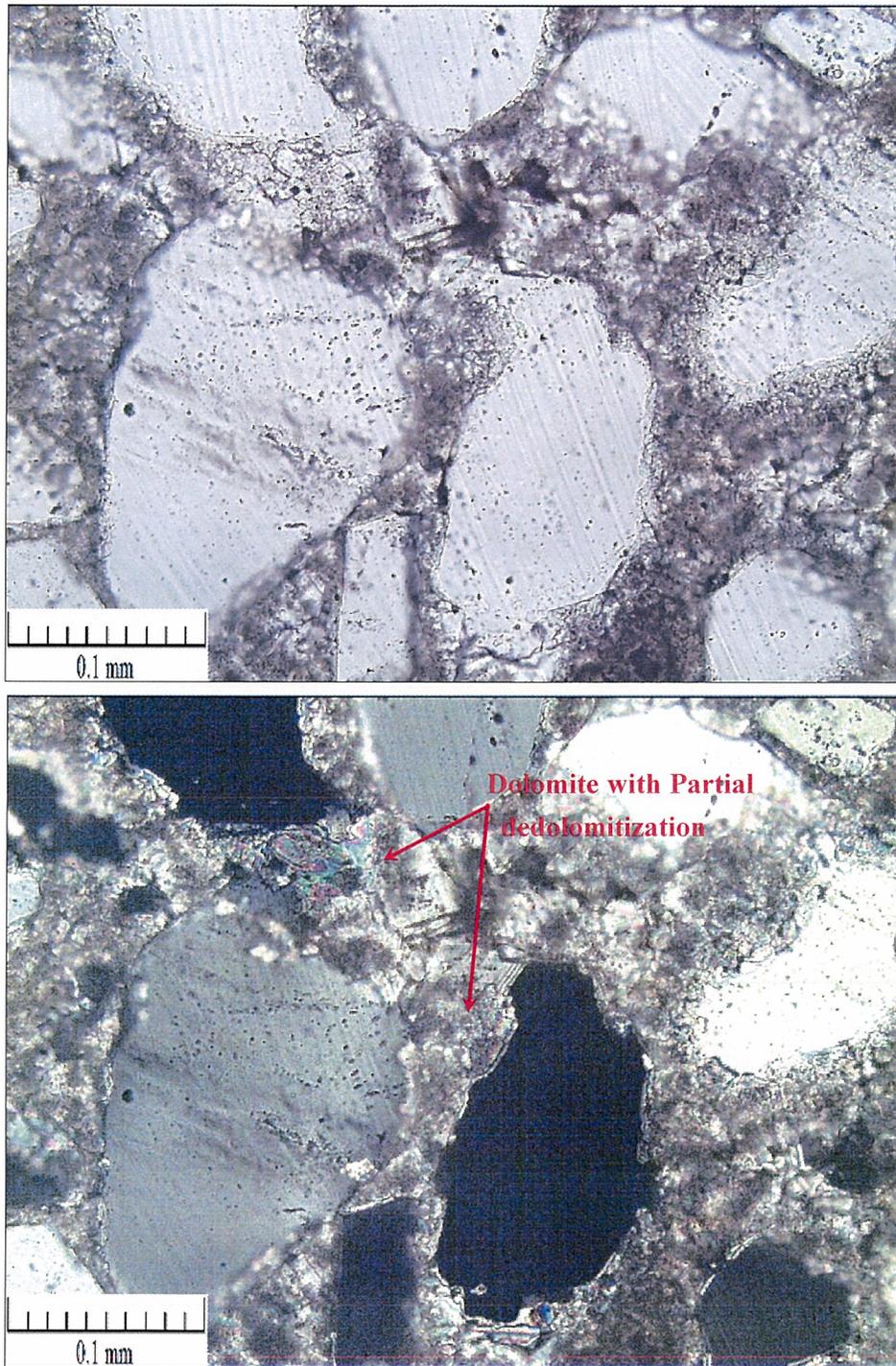


Figure 53. Early dolomite, probably crystallized from calcareous mud, and presumably may have undergone calcitization (dedolomitization) during late diagenesis (910-8 Plug A, X40PL and XP, respectively).

Units		Events	<u>Paragenetic sequence</u>	
			Early	Late
Jurassic Sandstone (911-17)	Entrada	Grain compaction	—————	— — —
		Quartz overgrowth		— — — — —
		Kaolinite precipitation		— — — — —
		Calcite cementation		— — — — — — — — — — —
		Hematite precipitation		— — — — — — — — — —
		Dissolution of feldspar		—————
Clastic Dike (911-3)		Grain compaction	—————	— — — — — — — — — —
		Kaolinite precipitation	— — — — —	
		Dolomite Precipitation		— — — — — .
		Dissolution of Feldspar		— — — — — .
		Quartz overgrowth		— — — — — .
		Calcite cementation		— — — — — — — — — —
		Hematite precipitation	— — — — —
Plugs	Plug RC (911-4-6, 15, and 16)	Grain compaction	—————	— — — — —
		Dolomite Precipitation	— — — — —	
		Kaolinite precipitation	— — — — —	
		Hematite precipitation	— — — — —	— — — — —
		Dissolution of grains Feldspar		— — — — —
		Dolomite		— — — — —
		Quartz overgrowth		— — — — —
		Calcite cementation		— — — — —
		Dedolomitization		— — — — —

Plug A (910-8)	Grain compaction	—————
	Dolomite Precipitation
	Hematite precipitation	-----
	Dissolution of grains	-----
	Kaolinite precipitation	-----
	Calcite cementation (Dedolomitization)	-----

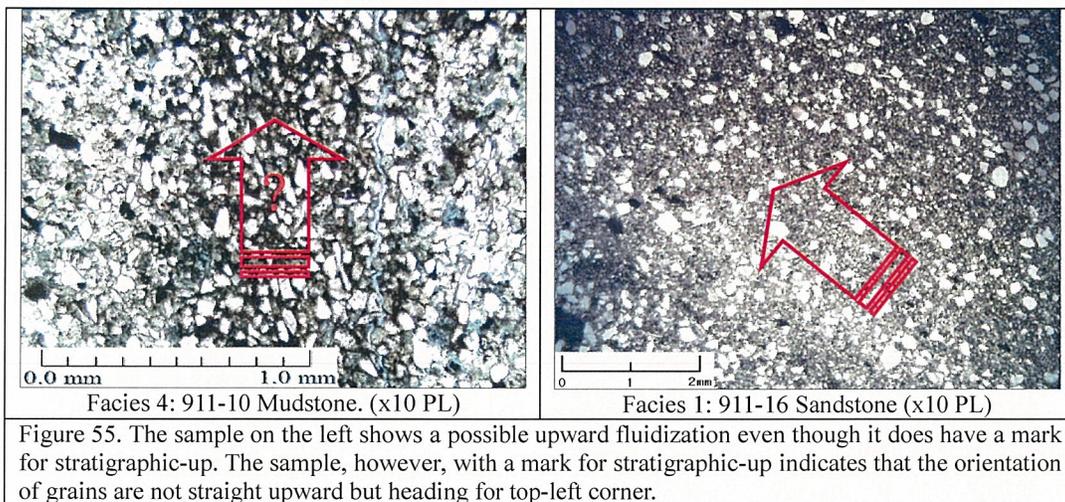
Figure 54. Paragenetic sequences in Jurassic Entrada Sandstone and clastic injectites.

CHAPTER 5: DISCUSSION

Origin of plugs

Fluidization

Unidirectional grain orientation observed in thin sections (Fig. 55: Facies 1 and 4) from Plug RC indicates that the plug was formed by upward fluidization. Field observations of upward drag of host layers and flute features also support sediment movement by upward fluidization (Parker, 1933; Baldwin and Muehlberger, 1959; Lucas et al., 1987) This evidence does not support solution collapse as the mechanism for injectite formation as suggested by McLemore and North (1987).



Source of injectite material

The origin of the injectites in this area has been a somewhat controversial issue. However, detailed examinations of samples from Plug RC help constrain the source of injectite materials. Plug RC provides abundant clues as to the source beds, including intact blocks of mobilized rock, smaller rock fragments, probable fossil fragments, and lithologic textures.

Petrographic examination suggests that the injectite materials were derived mainly from the Sloan Canyon Fm (Trsc), Travesser Fm (Travesser Formation), and possibly the Baldy Hill Fm (Trbh). Since the Entrada Sandstone (Je) and Sheep Pen Sandstone (Trsp) can be ruled out as possible source beds due to their presence above the unconformity that truncates Plug RC, there are no other possible sources for sandstone components. Therefore, as some previous studies suggested, the Baldy Hill Formation is a probable source bed for the sand grains, although other studies rejected this possibility mainly on the basis of petrography.

Textures

Sandstone textures can play a critical role in determining the origin of the plugs because sand grains serve as a main component of the plugs. Facies 1 of Plug RC may be considered texturally equivalent to facies in other plugs, especially Plug M (Table 2 and Fig. 56). Samples from the plugs are similar in texture to the Sheep Pen Sandstone, but differ in texture from the Sloan Canyon Formation and Travesser Formation. The Sheep Pen Sandstone is not considered as a source bed because it is the uppermost unit of the relevant stratigraphy and also does not exist in Plug RC. The upper two units, Sloan Canyon Formation and Travesser Formation, also are not considered as source beds because they have fewer coarse grains (i.e., up to ~0.2mm, fU; mean grain size).

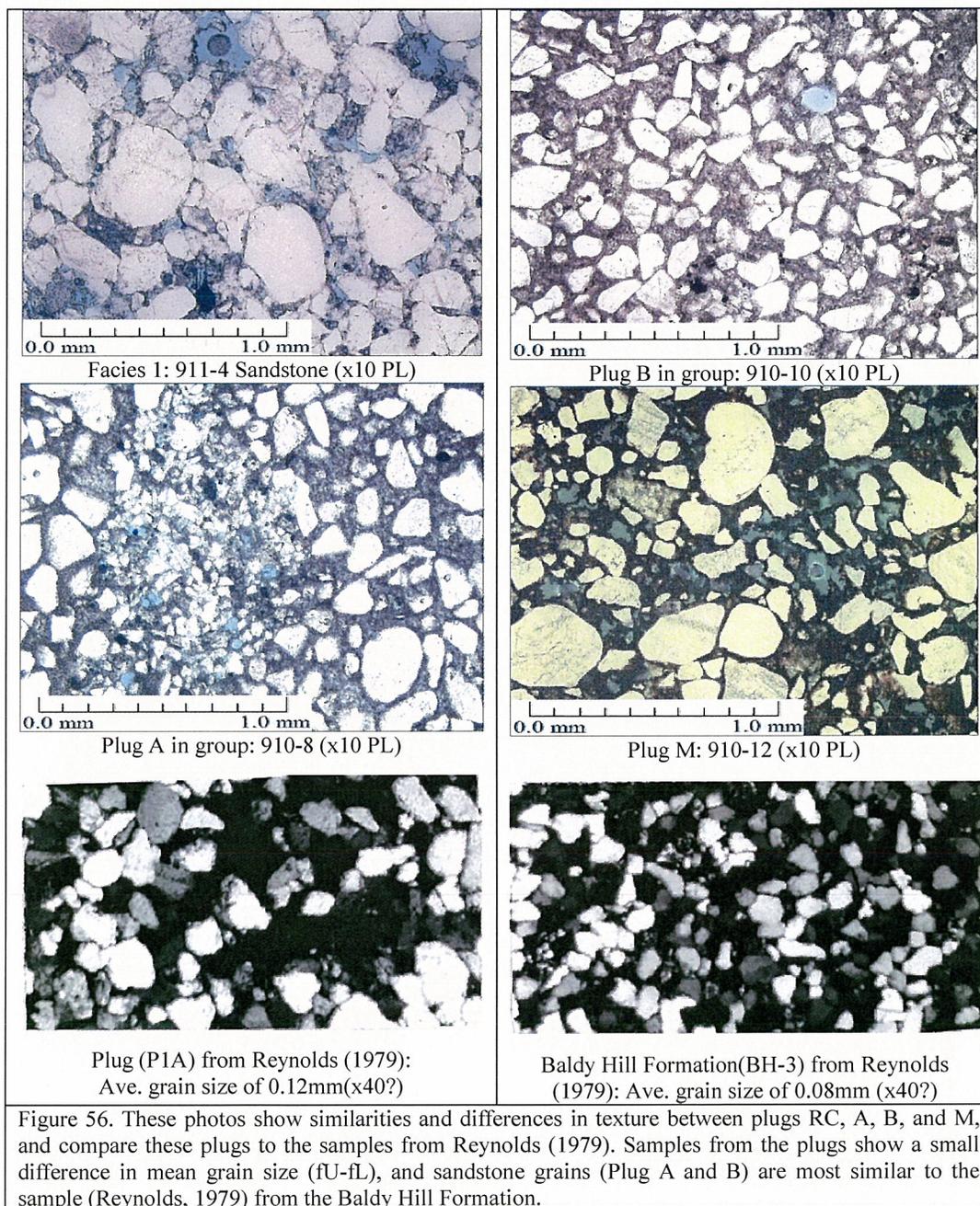
The two previous studies based on petrographic analysis came to different conclusions on the source beds. Smith (1975) suggested that the Travesser Formation is the most probable source rock according to his interpretation of petrographic parameters (correlation coefficients; Q-mode). Reynolds (1979) expressed a different opinion, concluding that the plug materials do not match any of the stratigraphic units

in his textural comparison.

Unlike the previous petrographic results above, it is estimated that the Baldy Hill Formation (Trbh) is still the most likely source bed from the viewpoint of textural similarity. Note that the textural information on the Baldy Hill Formation was derived from the previous study (Reynolds, 1979) since we were not granted permission to visit the outcrop. The comparison in texture may lead to negative conclusions in finding an exact matching unit due to limited sampling and confined localities for sampling. It should be noted that the petrographic results (Fig. 55) indicate that the plugs do not show a single uniform texture (Table 4). Facies 1 and Plug M have fU (~0.2mm) and mL (~0.3mm) in mean and maximum grain sizes, respectively. Plugs A and B, however, have a smaller grain size (fL: ~0.15mm). The plugs examined by Reynolds (1979), consist of even smaller grain sizes (0.12mm in mean size). Potential source beds should contain sand grains ranging from 0.12 to 0.3mm in mean grain size. Identifying the source bed will require sampling from much greater number of plugs.

Table 2. Sandstone textures for plug samples

Plug	Sample No.	Lithology	Textures		
			Mean size	Roundness	Sorting
Plug RC	911-4	Sandstone	fU (max. mL)	Subrounded~rounded	Very poor
	911-5	Sandstone	fU (max. mL)	Subrounded~rounded	Poor
	911-7	Sandstone	fU	Subrounded~rounded	Poor
	911-16	Sandstone	fU (max. mL)	Subrounded~rounded	Very Poor
Plug A	910-8	Calcareous Sandstone	fL	Rounded	Moderately sorted
Plug B	910-10	Calcareous Sandstone	fL	Rounded	Moderately sorted
M- plug	910-12	Fe-oxidized Sandstone	fU (max. mL)	Subangular~sburounded	Very Poor
Plugs (Reynolds, 1979)	P1A, P1B, P2A	Quartzarenite sandstone	Fine to very fine (ave. 0.12mm)	Rounded ~ well-rounded	Moderately sorted



Models for origin of injectites

Fluidization by tectonic activities

The petrographic results and field observations provide evidence for upward

mobilization of fluidized sediment. When fluidized, subsurface sediments may have entrained host-rock fragments as they moved upward. The petrographic data present probable evidence for upward fluidization including unidirectional grain orientation (Fig. 55) and the presence of lithic (Fig. 22, 24-27) and fossil fragments (Fig. 28-29).

Fluidized materials likely moved upward through fractures and weak areas of the host rock. The sandstone samples from Facies 1 have relatively coarser grains and little to no matrix, allowing fluids to dissipate into either surrounding host rocks or onto the surface. Dissipation reduced fluid pressure that was produced in source beds by tectonic activities such as folding (Parker, 1933; Baldwin and Muehlberger, 1959; Lucas, 1987). In contrast, fluids carried significant amounts of very fine grains (calcareous and/or muddy particles) into the plug where reduced pore spaces blocked upward fluidization. This directed movement created aligned grains (Fig. 55) and banded layers (Fig. 57).

A hypothesis for formation of the plugs is shown in Figure 58, based upon field observations, petrographic examination, and the regional geologic setting described by previous workers (Parker, 1933; Baldwin and Muehlberger, 1959; Lucas, 1987). The fluidization mechanism has the following sequence: (A) undeformed depositional strata of the Upper Triassic units were present; (B) fractures were generated by tectonic events associated with folding and/or earthquakes; (C) fractures were developed and liquefaction of sand layers took place; (D) liquefied sand grains (sediments) moved upward, scouring and entraining host-rock fragments; (E) sediments released on the surface experienced weathering and partially eroded; (F) Entrada Sandstone was deposited on the eroded surface, giving rise to the unconformity. Faulting (Fig. 59) and fracturing (Fig. 13A-C) observed in the field

show evidence of tectonic activity. Observations in thin sections showed unidirectional grain orientation (Fig. 55) and the presence of lithic (Fig. 24-27) and fossil (Fig. 28-29) fragments from host rocks. Circular depressions (Fig. 7B) were commonly observed forming the inside surfaces of plugs and were unconformably overlain by Entrada Sandstone (Fig. 11 and 12).

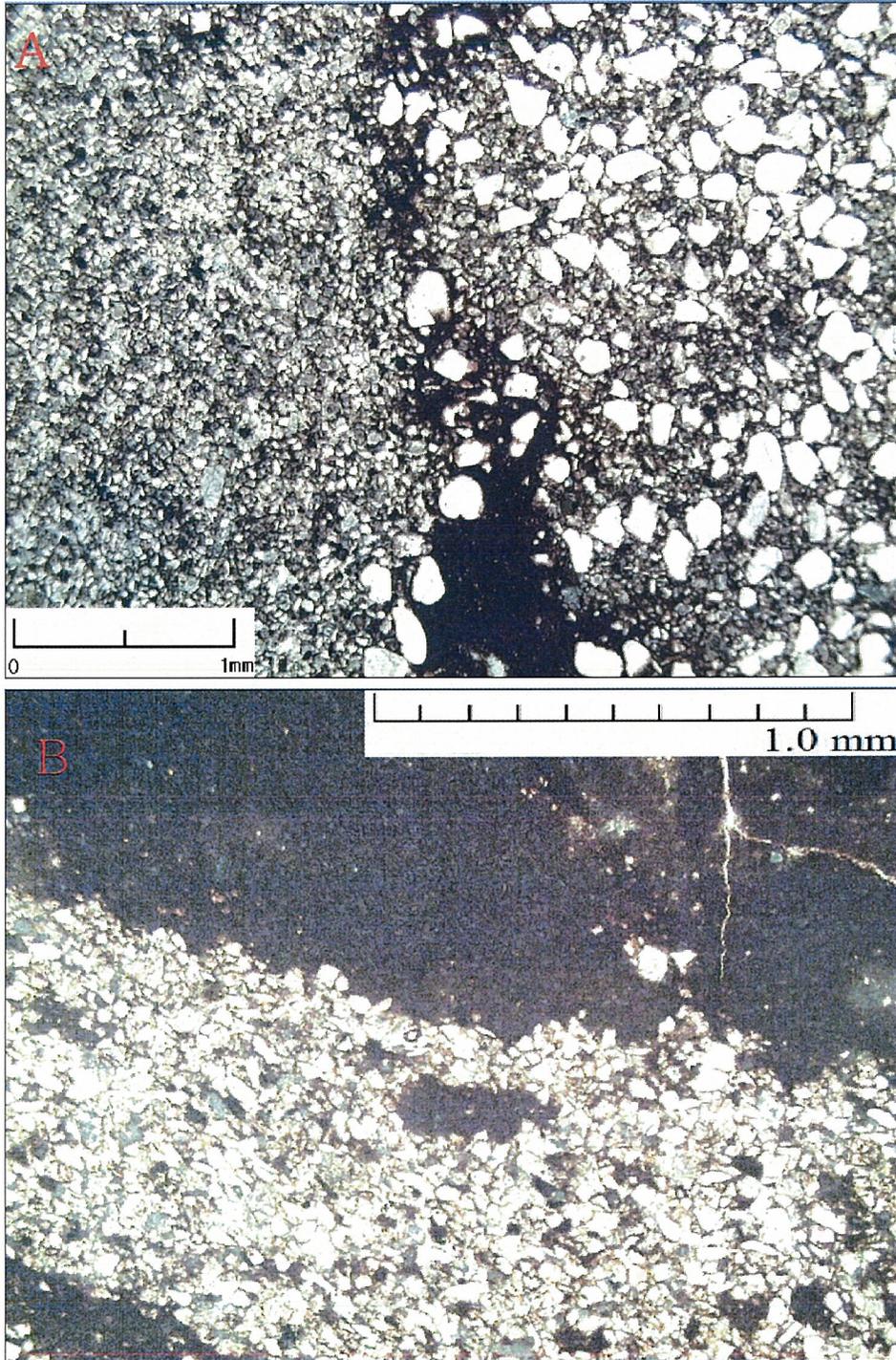


Figure 57. These two pictures indicate that fluidized materials may have followed preferential flow paths, creating band-like grain alignments (A: Facies 2, 911-15; B: Facies 4, 911-11).

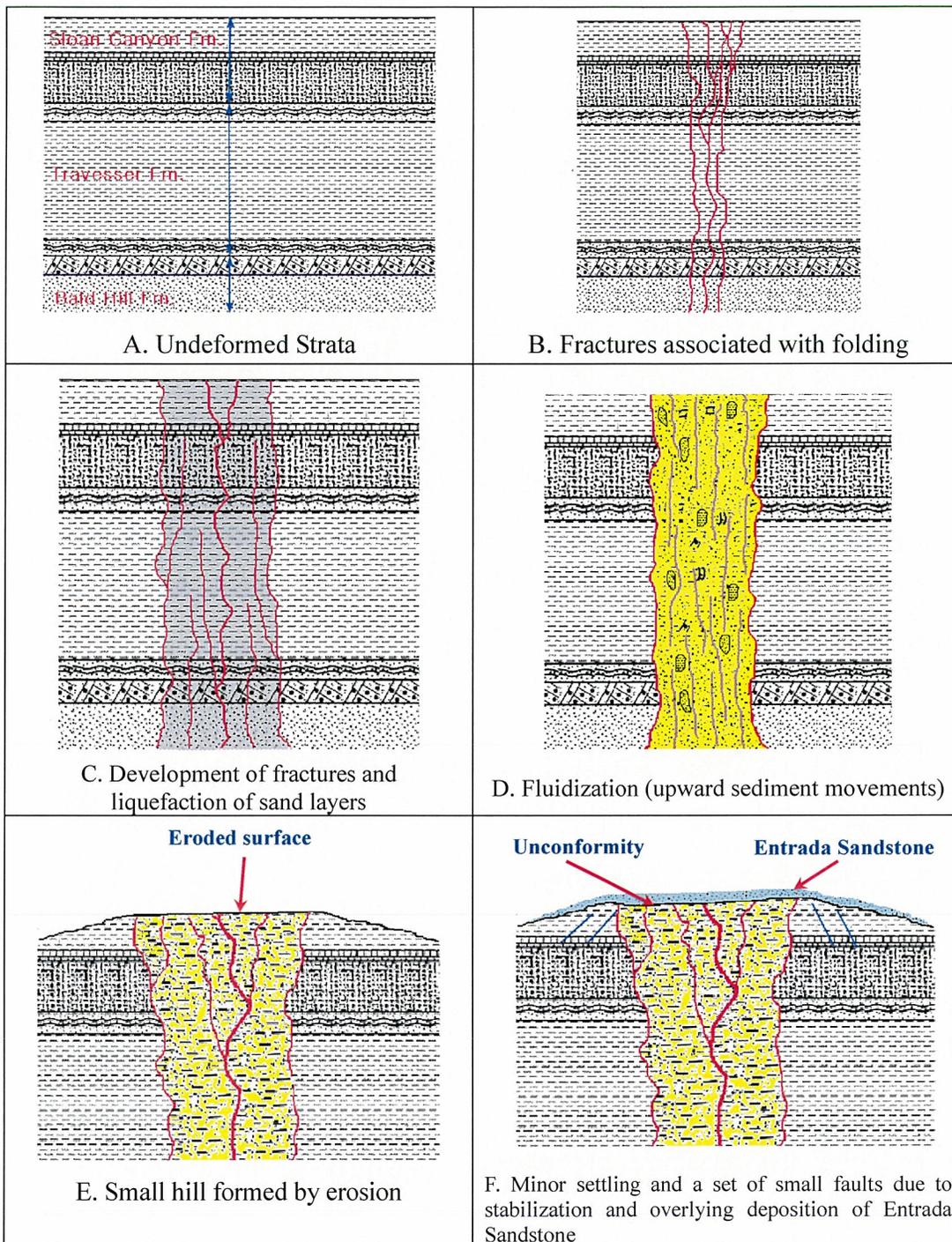


Figure 58. Diagram illustrating a possible mechanism for clastic plugs formation. (A) Undeformed depositional strata of the Upper Triassic units are present; (B) fractures were generated by tectonic events associated with folding and/or earthquakes; (C) fractures were further developed and liquefaction of sand layers took place; (D) liquefied sand grains (sediments) moved upward, scouring and entraining host-rock fragments; (E) sediments released on the surface experienced weathering and partially eroded away; (F) Entrada Sandstone was deposited on the eroded surface, giving rise to the unconformity. The stratigraphic column used here is modified from Lucas et al. (1987).

Faults adjacent to Plug RC may help constrain the origin of the plug. These faults indicate that the area near the plug experienced both compression and extension, resulting in a reverse fault (Fig. 59A) and a normal fault (Fig. 59B), respectively. The compression may have occurred during emplacement, followed by a relaxation phase related to settling after fluidization.

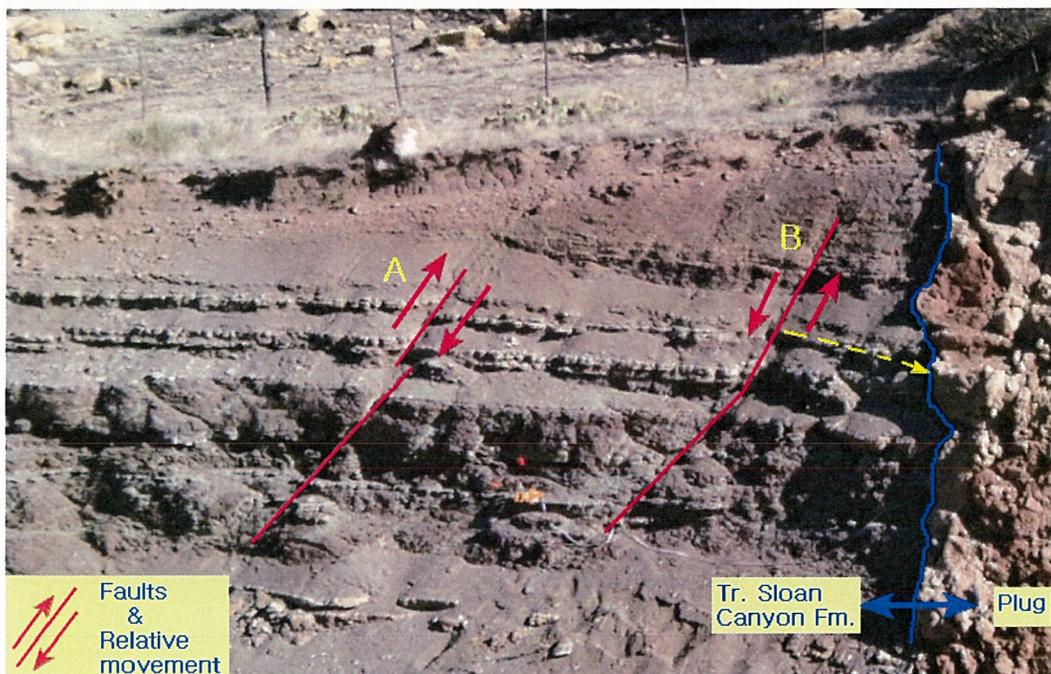


Figure 59. A set of small faults coexist with a number of fractures and thin dikes in the roadcut. Fault A is a reverse fault, which probably took place by compressional forces and fault B is a normal fault, probably due to subsequent relaxation. It indicates that some collapse- or sagging-like features right next to the plug may have occurred in relation to hardening and settling after fluidization.

Alternative hypotheses: Solution-collapsed pipes and spring conduit pipes

An alternative hypothesis for plug formation was suggested by Mulvany (2011). He believes that plugs were probably induced by upward flow along a spring conduit. The sequence of events suggested by Mulvany (2011) is as follows;

Excavation ⇒ Collapse ⇒ Liquefaction ⇒ Injection ⇒ Desiccation and Settling

This sequence suggests a different mechanism for the formation of the chaotically-oriented fragments of brecciated Exeter Sandstone and upper Sloan Canyon Formation observed in the plug. Mulvany (2001) believes that the upper Sloan Canyon Formation collapsed and dropped down into the relatively undeformed lower Sloan Canyon Formation, which is the host rock surrounding the plugs. This mechanism suggests that the complex components of the pipe, dike and pod sandstones in the clastic plug uniquely formed in situ by the spring.

McLemore and North (1987) suggested a different hypothesis for how these plugs formed. They compared the clastic plugs to collapse-brecciated pipes in northwestern Arizona, which formed through solution collapse of underlying Paleozoic limestone. They claimed that compressional folds, which are believed by most of the researchers to be strong evidence for upward fluidization, could be formed by ring fractures during solution collapse according to experiments by McCallum (1985).

Seal bypass

Porosity evolution

It is very likely that fluidized injectites with initial high porosity were capable of significant seal bypass, but underwent dramatic porosity loss due to cement precipitation (Fig. 60), reducing their potential for bypass. Indeed, the presence of abundance carbonate cement in the plug sandstones is strong evidence for significant fluid flux through the plugs, and thus direct evidence of bypass. The paragenetic sequence (Fig. 43-49 and 54) of Plug RC indicates that porosity changed subsequent to fluidization. Sandstone samples had higher porosity immediately after fluidization.

Mudstone and argillaceous sandstone samples would have had less permeability because of abundant fine-grained components.

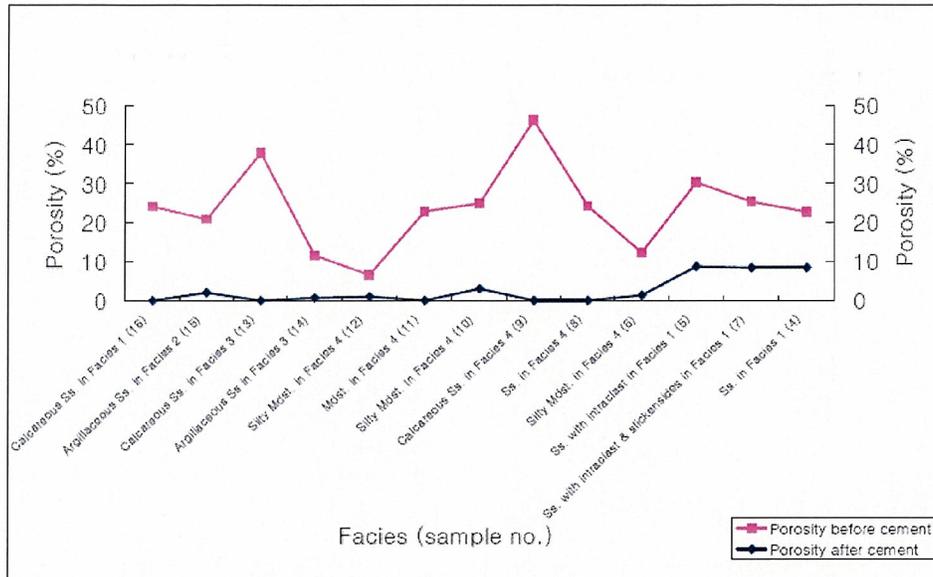


Figure 60. Diagram A shows porosity change before and after cementation and B displays compositional differences among sandstone from all the plugs.

General observation on permeability

Although Plug RC had initial high porosity and permeability, flow would have been restricted to facies 1, and thus much less than the initial status suggested by the diameter of the plug. Only in the east, Facies 1 was found to have relatively higher porosity and permeability because of intergranular and intragranular macroporosity. Facies 1 initially was composed of relatively coarser sand grains without (or much less) matrix due to dissipation of very fine muddy particles through pore spaces, resulting in initial high porosity and permeability. Subsequently, dolomite and other cements such as kaolinite and hematite precipitated into the pore spaces. During late diagenesis, Facies 1 regained some porosity through grain dissolution (dolomite and feldspar grains). Other parts of Plug RC did not undergo diagenetic grain dissolution, and therefore did not gain porosity.

CHAPTER 6: CONCLUSIONS

(1) Many clastic plugs and dikes in this research area exhibit characteristic morphologies, often occurring together in groups. There are two main types of plugs: knob-like plugs; and complex, brecciated plugs. Dikes vary in thickness from less than 2mm to a few decimeters and vary in shape: circular around plugs, linear associated with bleached fracture systems, and sinuous apparently unrelated to plugs.

(2) Plug RC is composed of four characteristic lithofacies that may provide a better picture of how plugs appear in the subsurface.

(3) Plugs show abundant evidence for upward fluidization both in outcrop and thin section.

(4) Petrographic examination indicates that the materials forming Plug RC are composed of Sloan Canyon Formation, Travesser Formation, and likely Baldy Hill Formation, ruling out the Sheep Pen Sandstone and Entrada Sandstone as source beds.

(5) Petrographic examination indicates that Plug RC, Plugs A and B, and Plug M have different compositions and experienced different diagenetic events. Unlike Plug RC and Plugs A and B, which are mainly composed of carbonate cement, Plug M consists predominantly of hematite cement.

(6) Potential source beds should contain sand grains ranging from 0.12 to 0.3mm in mean grain size. Identifying the source bed will require sampling from a much greater number of plugs.

(7) Although the petrographic features of Plug RC were initially capable of significant seal bypass, they were subsequently modified by cement precipitation and are no longer high permeability features. The main controlling factors for seal bypass through clastic injectites are timing of petroleum migration and development of

cementation.

(8) Although Plug RC had initial high permeability, flow would have been restricted to facies 1, much less than is suggested by the diameter of the plug.

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APPENDIX

1. Results of 300-point counts
2. Microprobe results

Dikes, Trsc and Je In Wedding Cake Butte	910-1-1	Dolostone	7	5	6	0	78	0	0	1	0	0	3	0	0
	910-1-2	Dolostone	6	2	12	0	74	0	0	0	0	0	5	0	0
	910-1-2	Limestone	0	0	4	0	89	0	0	0	0	0	3	0	2
	910-2	Mudstone	1	0	0	0	54	0	0	0	0	0	0	43	0
	910-3	Sandstone	46	4	8	1	25	0	0	1	0	3	4	0	4
	910-4	Limestone	1	2	0	0	85	1	0	0	0	0	11	0	0
	910-5	Sandstone	35	15	11	2	32	0	0	1	0	0	0	0	5
	910-6	Mudstone	4	4	1	0	23	0	0	0	0	0	0	66	1
	910-7	Sandstone	48	8	5	1	16	0	0	1	0	5	3	0	2
	910-8	Limestone	36	5	0	0	56	0	0	0	0	0	1	0	0
	910-9	Sandstone	41	13	0	0	33	0	0	0	0	0	6	0	2
910-10	Limestone	37	9	1	0	52	0	0	0	0	0	0	0	1	
910-11	Limestone	1	1	0	0	97	0	0	0	0	0	0	0	0	
910-12	Sandstone	42	1	0	0	0	0	0	0	0	0	2	50	0	
911-C	Limestone	3	2	0	0	90	0	0	0	0	0	0	5	0	
911-T2	Mudstone	1	2	1	0	28	0	0	0	0	0	0	68	1	
911-T3	Limestone	17	14	0	0	60	0	0	0	0	0	7	0	2	
911-T4	Sandstone	34	17	1	0	28	0	0	0	0	0	6	6	4	
911-E	Sandstone	56	3	5	1	2	0	0	0	0	4	2	0	0	
911-N	Sandstone	51	2	2	0	33	0	0	0	0	3	2	0	1	
911-T1	Dolostone	10	15	0	0	67	1	0	0	0	0	8	0	0	

* Symbols: Q (quartz), F (feldspar), SRF (Sedimentary rock fragments), CRF (Carbonate rock fragments), C (Carbonate), FF (Fossil fragment), Mus (Muscovite), UK (Unknown), QO (Quartz overgrowth), Kao (Kaolinite), Fe (Hematite), Cl (Clay), In (Inclusions: Opaque), Ø (Macro and microporosity)

Settings for Quantitative Analysis

Common informations :

File Name : carb-10-oh.qtiSet
 File Date : May/18/12-2:32 PM
 Comment :

Column conditions :

Cond 1 :
 HV (kV) : 15 I (nA) : 10
 Size (µm) : 10.
 Scanning : Off
 RasterLength (µm) : .03

Xtal informations :

Xtal parameters:

Mg Ka 1	Sp2	TAP	(2d= 25.745	K= 0.00218)
Si Ka 1	Sp2	TAP	(2d= 25.745	K= 0.00218)
Mn Ka 1	Sp3	LLIF	(2d= 4.0267	K= 0.000058)
Fe Ka 1	Sp3	LLIF	(2d= 4.0267	K= 0.000058)
Ca Ka 1	Sp1	PET	(2d= 8.75	K= 0.000144)

Pha parameters :

Elt. Line	Spec	Xtal	Bias (V)	Gain	Dtime (µs)	Blin (mV)	Wind (mV)	Mode
Mg Ka 1	Sp2	TAP	1283	2539	3			Inte
Si Ka 1	Sp2	TAP	1287	2612	3			Inte
Mn Ka 1	Sp3	LLIF	1813	359	3			Inte
Fe Ka 1	Sp3	LLIF	1814	355	3			Inte
Ca Ka 1	Sp1	PET	1329	924	3			Inte

Acquisition informations :

Elt. Line	Spec	Xtal	Peak	Pk Time (S)	Bg Off1	Bg Off2	Slope/IBg	Bg Time (S)	Calibration	Intensity (cps/nA)
Mg Ka 1	Sp2	TAP	38502	20	-1800	1800		10	MgCO3_MgSp2_017	150.5
Si Ka 1	Sp2	TAP	27734	20	-1000	1000		10	ortho_SiSp2_157	594.0
Mn Ka 1	Sp3	LLIF	52197	40	-1000	1000		20	MnO_MnSp1_MnSp3_038280.8	
Fe Ka 1	Sp3	LLIF	48080	10	-500	500		5	FeCO3_FeSp3_013	182.2
Ca Ka 1	Sp1	PET	38389	20	-800	800		10	CaCO3_CaSp1_023	295.1

When carbonate is analyzed, the elements Si, S, Mg, Ca, Mn, Fe, Sr, and Ba are analyzed directly, and O is determined stoichiometrically for each element. Then, CO2 is assigned to make up the difference between the analytical total of above oxides and a total of 100%. This is done in order to have an appropriate ZAF correction to get back to a true analytical total, recalculate MgO, CaO, MnO, FeO, SrO (and BaO if appropriate) as carbonate. (see "recalculated as carbonate" area of worksheet) to do this, paste your data (and comments) into the "raw data" area. The recalculations will happen automatically.

Raw data, normalized to 100%, CO2 by difference

Wt% Oxide	CO2	SiO2	SO2	MgO	CaO	MnO	FeO	SrO	BaO	Total
Comment										
CaCO3-01	43.98	0.02		0.00	55.86	0.09	0.00			99.94
CaCO3-02	44.09	0.02		0.00	55.73	0.11	0.00			99.95
CaCO3-03	43.87	0.01		0.02	55.92	0.16	0.00			99.97
CaCO3-04	43.71	0.00		0.02	56.09	0.16	0.01			99.99
MgCO3-01	46.76	0.01		22.26	30.86	0.01	0.10			100.00
MgCO3-02	47.09	0.01		22.11	30.74	0.02	0.03			100.00
MgCO3-03	46.83	0.00		22.13	30.94	0.01	0.10			100.00
MgCO3-04	46.84	0.00		22.12	30.96	0.01	0.08			100.00
FeCO3-01	38.68	0.03		0.14	0.05	2.84	58.27			100.00
FeCO3-02	39.02	0.01		0.12	0.01	2.90	57.94			100.00
FeCO3-03	38.59	0.01		0.13	0.01	2.81	58.45			100.00
FeCO3-04	39.37	0.05		0.12	0.02	2.90	57.55			100.00
911-2-01	42.84	0.25		0.33	56.36	0.12	0.11			100.00
911-2-02	45.70	0.46		18.99	34.73	0.10	0.03			100.00
911-2-03	42.50	0.84		1.14	55.26	0.11	0.15			100.00
911-2-04	41.43	0.13		0.30	57.94	0.12	0.07			100.00
911-2-05	45.40	0.28		16.75	37.31	0.17	0.09			100.00
911-2-06	41.82	0.17		0.46	56.93	0.16	0.47			100.00
911-2-07	42.46	0.79		2.48	52.88	0.09	1.30			100.00
911-2-08	42.05	0.21		2.06	54.65	0.15	0.88			100.00
911-2-09	46.20	0.00		19.86	33.55	0.21	0.16			99.97
911-2-010	46.35	0.16		20.23	32.81	0.25	0.21			100.00
911-2-011	43.92	0.16		1.90	53.78	0.00	0.24			100.00
911-2-012	62.51	0.12		0.08	37.13	0.02	0.14			100.00
911-2-013	28.29	19.21		1.85	0.57	0.20	49.88			100.00
911-2-014	21.38	6.40		0.48	0.51	0.30	70.94			100.00
911-2-015	44.78	1.62		19.45	30.28	0.24	3.64			100.00
911-2-016	44.95	0.25		11.25	40.96	0.42	2.17			100.00
911-2-017	46.05	1.37		20.76	31.15	0.15	0.53			100.00
911-2-018	25.95	21.69		1.90	0.65	0.05	49.76			100.00
911-2-019	26.59	29.14		2.06	0.56	0.01	41.65			100.00
911-2-020	42.51	0.13		0.40	56.30	0.13	0.53			100.00

911-16-01	45.80	0.15	20.83	32.28	0.53	0.40	100.00
911-16-02	46.57	0.29	20.90	31.59	0.46	0.20	100.00
911-16-03	43.45	0.01	0.08	56.25	0.18	0.03	100.00
911-16-04	35.78	15.62	4.42	42.00	0.15	2.03	100.00
911-16-05	42.85	0.12	0.27	56.56	0.15	0.05	100.00
911-16-06	46.98	0.06	19.93	32.00	0.23	0.80	100.00
911-16-07	43.50	0.11	0.31	55.87	0.17	0.04	100.00
911-16-08	43.22	0.23	0.12	56.19	0.20	0.04	100.00
911-16-09	43.27	0.12	0.14	56.19	0.06	0.22	100.00
911-16-10	46.64	0.29	20.93	31.75	0.20	0.20	100.00
911-16-11	45.31	2.39	15.04	36.26	0.25	0.76	100.00
911-16-12	44.54	3.68	15.51	35.20	0.27	0.81	100.00
911-16-13	47.14	0.05	19.56	31.36	0.42	1.47	100.00
911-16-14	43.70	0.06	0.15	55.99	0.09	0.02	100.00
911-16-15	47.60	0.17	19.29	30.78	0.44	1.73	100.00
911-16-16	47.08	0.57	20.61	31.08	0.37	0.29	100.00
911-16-17	44.88	0.01	0.20	54.63	0.17	0.11	100.00
911-16-18	48.17	0.34	20.89	29.76	0.57	0.26	100.00
911-16-19	45.35	0.00	2.32	52.13	0.16	0.03	100.00
911-16-20	43.55	0.54	25.17	30.19	0.28	0.28	100.00
911-16-21	37.59	0.02	25.26	31.28	0.21	5.63	100.00
CaCO3-05	39.96	0.01	5.58	54.31	0.10	0.04	100.00
CaCO3-06	45.36	0.03	0.01	54.40	0.15	0.06	100.00
MgCO3-05	47.49	0.00	22.16	30.26	0.00	0.09	100.00
MgCO3-06	47.87	0.00	22.06	29.96	0.01	0.10	100.00
FeCO3-05	40.27	0.03	0.15	0.00	2.86	56.69	100.00
FeCO3-06	39.29	0.04	0.15	0.05	2.86	57.62	100.00

Recalculated as carbonate (non-normalized)

Comment	SiO2	SO2	MgCO3	CaCO3	MnCO3	FeCO3	SrCO3	BaCO3	Total	Comment
CaCO3-01	0.02		0.00	99.75	0.14	0.00			99.90	CaCO3-01
CaCO3-02	0.02		0.00	99.51	0.18	0.00			99.71	CaCO3-02
CaCO3-03	0.01		0.03	99.85	0.25	0.00			100.15	CaCO3-03
CaCO3-04	0.00		0.04	100.16	0.25	0.02			100.47	CaCO3-04
MgCO3-01	0.01		46.56	55.11	0.02	0.16			101.85	MgCO3-01
MgCO3-02	0.01		46.24	54.89	0.04	0.04			101.22	MgCO3-02
MgCO3-03	0.00		46.28	55.25	0.01	0.15			101.70	MgCO3-03
MgCO3-04	0.00		46.28	55.28	0.01	0.12			101.69	MgCO3-04
FeCO3-01	0.03		0.29	0.08	4.60	93.95			98.95	FeCO3-01
FeCO3-02	0.01		0.25	0.01	4.70	93.42			98.40	FeCO3-02
FeCO3-03	0.01		0.27	0.01	4.55	94.25			99.09	FeCO3-03
FeCO3-04	0.05		0.24	0.03	4.70	92.79			97.81	FeCO3-04
911-2-01	0.25		0.68	100.64	0.19	0.18			101.93	911-2-01
911-2-02	0.46		39.72	62.02	0.16	0.05			102.41	911-2-02
911-2-03	0.84		2.39	98.67	0.18	0.25			102.32	911-2-03
911-2-04	0.13		0.64	103.46	0.20	0.12			104.55	911-2-04
911-2-05	0.28		35.04	66.62	0.27	0.15			102.37	911-2-05
911-2-06	0.17		0.95	101.66	0.26	0.76			103.80	911-2-06
911-2-07	0.79		5.18	94.44	0.14	2.10			102.65	911-2-07
911-2-08	0.21		4.31	97.58	0.25	1.43			103.77	911-2-08
911-2-09	0.00		41.53	59.91	0.33	0.26			102.03	911-2-09
911-2-010	0.16		42.31	58.59	0.40	0.34			101.79	911-2-010
911-2-011	0.16		3.98	96.04	0.00	0.38			100.55	911-2-011
911-2-012	0.12		0.16	66.30	0.03	0.23			66.84	911-2-012
911-2-013	19.21		3.88	1.02	0.32	80.43			104.86	911-2-013
911-2-014	6.40		1.00	0.91	0.48	114.38			123.17	911-2-014
911-2-015	1.62		40.68	54.07	0.39	5.86			102.62	911-2-015
911-2-016	0.25		23.53	73.14	0.69	3.50			101.11	911-2-016
911-2-017	1.37		43.42	55.62	0.24	0.86			101.50	911-2-017
911-2-018	21.69		3.97	1.16	0.09	80.23			107.13	911-2-018
911-2-019	29.14		4.30	1.00	0.02	67.15			101.61	911-2-019
911-2-020	0.13		0.84	100.53	0.22	0.86			102.57	911-2-020

111-16-01	0.15	43.58	57.65	0.86	0.64	102.88	911-16-01
111-16-02	0.29	43.73	56.40	0.74	0.33	101.48	911-16-02
111-16-03	0.01	0.18	100.45	0.29	0.05	100.97	911-16-03
111-16-04	15.62	9.25	75.01	0.25	3.28	103.39	911-16-04
111-16-05	0.12	0.56	101.00	0.25	0.08	102.01	911-16-05
111-16-06	0.06	41.69	57.15	0.36	1.29	100.55	911-16-06
111-16-07	0.11	0.64	99.76	0.28	0.07	100.86	911-16-07
111-16-08	0.23	0.25	100.34	0.32	0.07	101.21	911-16-08
111-16-09	0.12	0.29	100.34	0.10	0.35	101.20	911-16-09
111-16-010	0.29	43.78	56.69	0.32	0.32	101.41	911-16-010
111-16-011	2.39	31.46	64.75	0.40	1.22	100.22	911-16-011
111-16-012	3.68	32.45	62.86	0.43	1.30	100.71	911-16-012
111-16-013	0.05	40.92	55.99	0.68	2.37	100.01	911-16-013
111-16-014	0.06	0.31	99.98	0.14	0.02	100.52	911-16-014
111-16-015	0.17	40.34	54.97	0.70	2.78	98.97	911-16-015
111-16-016	0.57	43.12	55.50	0.60	0.47	100.26	911-16-016
111-16-017	0.01	0.41	97.55	0.28	0.18	98.43	911-16-017
111-16-018	0.34	43.70	53.15	0.93	0.42	98.54	911-16-018
111-16-019	0.00	4.85	93.10	0.26	0.05	98.26	911-16-019
111-16-020	0.54	52.66	53.91	0.45	0.45	108.00	911-16-020
111-16-021	0.02	52.85	55.86	0.34	9.08	118.15	911-16-021
CaCO3-05	0.01	11.67	96.99	0.17	0.07	108.90	CaCO3-05
CaCO3-06	0.03	0.01	97.14	0.24	0.10	97.52	CaCO3-06
MgCO3-05	0.00	46.35	54.03	0.00	0.14	100.53	MgCO3-05
MgCO3-06	0.00	46.15	53.50	0.01	0.15	99.82	MgCO3-06
FeCO3-05	0.03	0.32	0.00	4.63	91.40	96.38	FeCO3-05
FeCO3-06	0.04	0.31	0.08	4.64	92.91	97.97	FeCO3-06

Recalculated as carbonate (normalized to 100%)

SiO2	SO2	MgCO3	CaCO3	MnCO3	FeCO3	SrCO3	BaCO3	Total
0.02	0.00	0.00	99.85	0.14	0.00	0.00	0.00	100.00
0.02	0.00	0.00	99.80	0.19	0.00	0.00	0.00	100.00
0.01	0.00	0.03	99.70	0.25	0.00	0.00	0.00	100.00
0.00	0.00	0.04	99.69	0.25	0.02	0.00	0.00	100.00
0.01	0.00	45.71	54.10	0.02	0.16	0.00	0.00	100.00
0.01	0.00	45.68	54.23	0.04	0.04	0.00	0.00	100.00
0.00	0.00	45.51	54.33	0.01	0.15	0.00	0.00	100.00
0.00	0.00	45.51	54.36	0.01	0.12	0.00	0.00	100.00
0.03	0.00	0.30	0.08	4.65	94.94	0.00	0.00	100.00
0.01	0.00	0.26	0.01	4.78	94.94	0.00	0.00	100.00
0.01	0.00	0.27	0.01	4.60	95.11	0.00	0.00	100.00
0.05	0.00	0.25	0.03	4.81	94.87	0.00	0.00	100.00
0.24	0.00	0.67	98.73	0.19	0.17	0.00	0.00	100.00
0.44	0.00	38.79	60.56	0.15	0.05	0.00	0.00	100.00
0.82	0.00	2.33	96.43	0.17	0.24	0.00	0.00	100.00
0.13	0.00	0.61	98.96	0.19	0.11	0.00	0.00	100.00
0.28	0.00	34.23	65.08	0.26	0.14	0.00	0.00	100.00
0.16	0.00	0.92	97.94	0.25	0.73	0.00	0.00	100.00
0.77	0.00	5.04	92.00	0.14	2.05	0.00	0.00	100.00
0.20	0.00	4.15	94.03	0.24	1.37	0.00	0.00	100.00
0.00	0.00	40.71	58.72	0.33	0.25	0.00	0.00	100.00
0.15	0.00	41.56	57.56	0.39	0.33	0.00	0.00	100.00
0.16	0.00	3.95	95.51	0.00	0.38	0.00	0.00	100.00
0.18	0.00	0.23	99.19	0.05	0.34	0.00	0.00	100.00
18.32	0.00	3.70	0.97	0.30	76.70	0.00	0.00	100.00
5.20	0.00	0.81	0.74	0.39	92.87	0.00	0.00	100.00
1.58	0.00	39.64	52.69	0.38	5.71	0.00	0.00	100.00
0.25	0.00	23.27	72.34	0.68	3.46	0.00	0.00	100.00
1.35	0.00	42.78	54.80	0.23	0.84	0.00	0.00	100.00
20.25	0.00	3.71	1.08	0.08	74.88	0.00	0.00	100.00
28.68	0.00	4.23	0.98	0.02	66.09	0.00	0.00	100.00
0.12	0.00	0.82	98.01	0.21	0.83	0.00	0.00	100.00

0.15	0.00	42.36	56.03	0.84	0.62	0.00	0.00	100.00
0.28	0.00	43.09	55.58	0.73	0.32	0.00	0.00	100.00
0.01	0.00	0.17	99.49	0.28	0.05	0.00	0.00	100.00
15.10	0.00	8.94	72.55	0.24	3.17	0.00	0.00	100.00
0.12	0.00	0.55	99.01	0.24	0.08	0.00	0.00	100.00
0.06	0.00	41.46	56.83	0.36	1.28	0.00	0.00	100.00
0.11	0.00	0.63	98.91	0.28	0.07	0.00	0.00	100.00
0.23	0.00	0.25	99.14	0.31	0.07	0.00	0.00	100.00
0.12	0.00	0.29	99.15	0.09	0.35	0.00	0.00	100.00
0.28	0.00	43.17	55.91	0.32	0.32	0.00	0.00	100.00
2.38	0.00	31.39	64.61	0.40	1.22	0.00	0.00	100.00
3.66	0.00	32.22	62.41	0.43	1.29	0.00	0.00	100.00
0.05	0.00	40.91	55.98	0.68	2.37	0.00	0.00	100.00
0.06	0.00	0.31	99.46	0.14	0.02	0.00	0.00	100.00
0.17	0.00	40.76	55.54	0.71	2.81	0.00	0.00	100.00
0.57	0.00	43.01	55.36	0.60	0.46	0.00	0.00	100.00
0.01	0.00	0.42	99.10	0.28	0.18	0.00	0.00	100.00
0.34	0.00	44.35	53.94	0.94	0.43	0.00	0.00	100.00
0.00	0.00	4.94	94.75	0.27	0.05	0.00	0.00	100.00
0.50	0.00	48.76	49.92	0.41	0.41	0.00	0.00	100.00
0.02	0.00	44.73	47.28	0.29	7.69	0.00	0.00	100.00
0.00	0.00	10.72	89.06	0.15	0.07	0.00	0.00	100.00
0.03	0.00	0.02	99.61	0.24	0.10	0.00	0.00	100.00
0.00	0.00	46.11	53.75	0.00	0.14	0.00	0.00	100.00
0.00	0.00	46.24	53.60	0.01	0.16	0.00	0.00	100.00
0.03	0.00	0.33	0.00	4.80	94.83	0.00	0.00	100.00
0.04	0.00	0.31	0.09	4.73	94.83	0.00	0.00	100.00

Wt% Oxide	Formula	CO2	SiO2	MgO	CaO	MnO	FeO	O=	Total	X	Y	Z	Comment	Point#
1 / 1.	43.979	0.015	0.001	55.858	0.085	0	99.938	0	99.938	-19369	-5276	39	CaCO3-01	1
2 / 1.	44.09	0.015	0	55.726	0.114	0	99.946	0	99.946	-19340	-5327	40	CaCO3-02	2
3 / 1.	43.873	0.01	0.016	55.917	0.157	0	99.973	0	99.973	-19322	-5262	40	CaCO3-03	3
4 / 1.	43.714	0	0.018	56.09	0.156	0.01	99.989	0	99.989	-19257	-5270	39	CaCO3-04	4
5 / 1.	46.764	0.011	22.258	30.859	0.01	0.099	100	100	100	-20668	-1553	50	MgCO3-01	5
6 / 1.	47.094	0.011	22.106	30.739	0.024	0.026	100	100	100	-20630	-1546	51	MgCO3-02	6
7 / 1.	46.828	0	22.125	30.942	0.007	0.096	99.997	0	99.997	-20569	-1548	50	MgCO3-03	7
8 / 1.	46.837	0.004	22.122	30.958	0.005	0.075	100	100	100	-20515	-1561	50	MgCO3-04	8
9 / 1.	38.679	0.029	0.141	0.047	2.837	58.267	100	100	100	-15595	-6752	37	FeCO3-01	9
10 / 1.	39.022	0.009	0.12	0.007	2.903	57.939	100	100	100	-15556	-6826	37	FeCO3-02	10
11 / 1.	38.59	0.014	0.128	0.005	2.811	58.453	100	100	100	-15520	-6857	36	FeCO3-03	11
12 / 1.	39.369	0.047	0.116	0.016	2.903	57.549	100	100	100	-15578	-6801	38	FeCO3-04	12
13 / 1.	42.844	0.245	0.327	56.358	0.117	0.109	100	100	100	-1690	27920	56	911-2-01	13
14 / 1.	45.696	0.455	18.99	34.729	0.097	0.034	100	100	100	-1696	27895	57	911-2-02	14
15 / 1.	42.501	0.841	1.141	55.255	0.109	0.153	100	100	100	-1705	27874	58	911-2-03	15
16 / 1.	41.425	0.134	0.304	57.94	0.123	0.074	100	100	100	-1725	27878	59	911-2-04	16
17 / 1.	45.397	0.283	16.753	37.308	0.167	0.092	100	100	100	-582	28492	58	911-2-05	17
18 / 1.	41.819	0.167	0.455	56.929	0.16	0.471	100	100	100	-607	28509	59	911-2-06	18
19 / 1.	42.46	0.793	2.475	52.884	0.087	1.302	100	100	100	-613	28509	59	911-2-07	19
20 / 1.	42.047	0.21	2.061	54.645	0.152	0.884	100	100	100	-7	28491	60	911-2-08	20
21 / 1.	46.195	0	19.855	33.549	0.205	0.16	99.965	0	99.965	25	28456	59	911-2-09	21
22 / 1.	46.351	0.156	20.225	32.811	0.246	0.21	100	100	100	-14	28452	57	911-2-010	22
23 / 1.	43.922	0.159	1.901	53.78	0.001	0.236	100	100	100	75	28426	57	911-2-011	23
24 / 1.	62.511	0.121	0.075	37.13	0.021	0.142	100	100	100	61	28427	59	911-2-012	24
25 / 1.	28.285	19.212	1.853	0.571	0.197	49.882	100	100	100	-30	28456	58	911-2-013	25
26 / 1.	21.381	6.401	0.476	0.511	0.295	70.937	100	100	100	588	28486	61	911-2-014	26
27 / 1.	44.778	1.623	19.446	30.278	0.239	3.636	100	100	100	650	28654	59	911-2-015	27
28 / 1.	44.946	0.253	11.248	40.96	0.423	2.171	100	100	100	618	28664	59	911-2-016	28
29 / 1.	46.05	1.37	20.757	31.146	0.146	0.531	100	100	100	571	28690	59	911-2-017	29
30 / 1.	25.952	21.691	1.9	0.648	0.053	49.756	100	100	100	525	28672	58	911-2-018	30
31 / 1.	26.589	29.137	2.057	0.56	0.012	41.645	100	100	100	533	28727	59	911-2-019	31
32 / 1.	42.508	0.128	0.403	56.295	0.134	0.531	100	100	100	-4286	28672	60	911-2-020	32
33 / 1.	45.802	0.153	20.832	32.283	0.532	0.397	100	100	100	-4273	-27926	-51	911-16-01	33
34 / 1.	46.565	0.286	20.904	31.585	0.457	0.204	100	100	100		-27901	-51	911-16-02	34

35 / 1 .	43.451	0.006	0.084	56.252	0.177	0.029	100	0	100	-4242	-27924	-50 911-16-03	35
36 / 1 .	35.776	15.615	4.42	42.004	0.152	2.034	100	0	100	-4326	-27945	-50 911-16-04	36
37 / 1 .	42.849	0.122	0.268	56.558	0.154	0.05	100	0	100	-9632	-28625	-27 911-16-05	37
38 / 1 .	46.983	0.064	19.929	32.002	0.225	0.798	100	0	100	-9531	-28552	-27 911-16-06	38
39 / 1 .	43.5	0.108	0.306	55.868	0.173	0.044	100	0	100	-9502	-28524	-29 911-16-07	39
40 / 1 .	43.218	0.23	0.121	56.193	0.195	0.044	100	0	100	-9488	-28641	-26 911-16-08	40
41 / 1 .	43.269	0.123	0.14	56.192	0.059	0.217	100	0	100	-5033	-27641	-44 911-16-09	41
42 / 1 .	46.636	0.287	20.93	31.749	0.198	0.2	100	0	100	-4947	-27721	-45 911-16-01	42
43 / 1 .	45.308	2.389	15.04	36.259	0.247	0.757	100	0	100	-4906	-27576	-46 911-16-01	43
44 / 1 .	44.537	3.682	15.512	35.2	0.265	0.805	100	0	100	-4906	-27576	-45 911-16-01	44
45 / 1 .	47.142	0.048	19.562	31.355	0.422	1.471	100	0	100	-4939	-27531	-46 911-16-01	45
46 / 1 .	43.695	0.062	0.15	55.989	0.089	0.015	100	0	100	-5530	-27576	-45 911-16-01	46
47 / 1 .	47.6	0.168	19.286	30.784	0.435	1.727	100	0	100	-5472	-27656	-44 911-16-01	47
48 / 1 .	47.075	0.571	20.614	31.082	0.369	0.289	100	0	100	-5397	-27625	-44 911-16-01	48
49 / 1 .	44.878	0.013	0.198	54.628	0.171	0.111	100	0	100	-5301	-27733	-47 911-16-01	49
50 / 1 .	48.173	0.336	20.893	29.763	0.573	0.262	100	0	100	-5124	-27685	-48 911-16-01	50
51 / 1 .	45.353	0	2.319	52.134	0.163	0.029	99.999	0	99.999	-5191	-27685	-48 911-16-01	51
52 / 1 .	43.546	0.539	25.172	30.19	0.275	0.277	100	0	100	-4182	-28274	-52 911-16-02	52
53 / 1 .	37.588	0.022	25.263	31.283	0.21	5.634	100	0	100	-4211	-28245	-52 911-16-02	53
54 / 1 .	39.955	0.005	5.579	54.314	0.103	0.044	100	0	100	-17661	-4315	36 CaCO3-05	54
55 / 1 .	45.355	0.032	0.007	54.4	0.147	0.059	100	0	100	-17657	-4278	34 CaCO3-06	55
56 / 1 .	47.493	0	22.158	30.258	0	0.089	99.999	0	99.999	-20720	-1529	52 MgCO3-05	56
57 / 1 .	47.874	0.001	22.064	29.96	0.005	0.096	100	0	100	-20720	-1524	50 MgCO3-06	57
58 / 1 .	40.269	0.033	0.152	0	2.856	56.687	99.997	0	99.997	-15607	-6819	36 FeCO3-05	58
59 / 1 .	39.286	0.035	0.147	0.047	2.861	57.624	100	0	100	-15607	-6849	38 FeCO3-06	59

Date	Geo Specie
2012-05-17 16:45	Carbonate (on the basis of 6 O)
2012-05-17 16:47	Carbonate (on the basis of 6 O)
2012-05-17 16:50	Carbonate (on the basis of 6 O)
2012-05-17 16:53	Carbonate (on the basis of 6 O)
2012-05-17 16:55	Carbonate (on the basis of 6 O)
2012-05-17 16:58	Carbonate (on the basis of 6 O)
2012-05-17 17:00	Carbonate (on the basis of 6 O)
2012-05-17 17:03	Carbonate (on the basis of 6 O)
2012-05-17 17:06	Carbonate (on the basis of 6 O)
2012-05-17 17:09	Carbonate (on the basis of 6 O)
2012-05-17 17:11	Carbonate (on the basis of 6 O)
2012-05-17 17:14	Carbonate (on the basis of 6 O)
2012-05-17 17:17	Carbonate (on the basis of 6 O)
2012-05-17 17:19	Carbonate (on the basis of 6 O)
2012-05-17 17:22	Carbonate (on the basis of 6 O)
2012-05-17 17:25	Carbonate (on the basis of 6 O)
2012-05-17 17:27	Carbonate (on the basis of 6 O)
2012-05-17 17:30	Carbonate (on the basis of 6 O)
2012-05-17 17:33	Carbonate (on the basis of 6 O)
2012-05-17 17:35	Carbonate (on the basis of 6 O)
2012-05-17 17:38	Carbonate (on the basis of 6 O)
2012-05-17 17:41	Carbonate (on the basis of 6 O)
2012-05-17 17:44	Carbonate (on the basis of 6 O)
2012-05-17 17:46	Carbonate (on the basis of 6 O)
2012-05-17 17:49	Carbonate (on the basis of 6 O)
2012-05-17 17:52	Carbonate (on the basis of 6 O)
2012-05-17 17:54	Carbonate (on the basis of 6 O)
2012-05-17 17:57	Carbonate (on the basis of 6 O)
2012-05-17 18:00	Carbonate (on the basis of 6 O)
2012-05-17 18:02	Carbonate (on the basis of 6 O)
2012-05-17 18:05	Carbonate (on the basis of 6 O)
2012-05-17 18:08	Carbonate (on the basis of 6 O)
2012-05-17 18:11	Carbonate (on the basis of 6 O)
2012-05-17 18:13	Carbonate (on the basis of 6 O)

2012-05-17 18:16 Carbonate (on the basis of 6 O)
2012-05-17 18:19 Carbonate (on the basis of 6 O)
2012-05-17 18:21 Carbonate (on the basis of 6 O)
2012-05-17 18:24 Carbonate (on the basis of 6 O)
2012-05-17 18:27 Carbonate (on the basis of 6 O)
2012-05-17 18:29 Carbonate (on the basis of 6 O)
2012-05-17 18:32 Carbonate (on the basis of 6 O)
2012-05-17 18:35 Carbonate (on the basis of 6 O)
2012-05-17 18:37 Carbonate (on the basis of 6 O)
2012-05-17 18:40 Carbonate (on the basis of 6 O)
2012-05-17 18:42 Carbonate (on the basis of 6 O)
2012-05-17 18:45 Carbonate (on the basis of 6 O)
2012-05-17 18:48 Carbonate (on the basis of 6 O)
2012-05-17 18:50 Carbonate (on the basis of 6 O)
2012-05-18 9:41 Carbonate (on the basis of 6 O)
2012-05-18 9:44 Carbonate (on the basis of 6 O)
2012-05-18 9:46 Carbonate (on the basis of 6 O)
2012-05-18 9:49 Carbonate (on the basis of 6 O)
2012-05-18 9:51 Carbonate (on the basis of 6 O)
2012-05-18 9:54 Carbonate (on the basis of 6 O)
2012-05-18 9:56 Carbonate (on the basis of 6 O)
2012-05-18 9:59 Carbonate (on the basis of 6 O)
2012-05-18 10:02 Carbonate (on the basis of 6 O)
2012-05-18 10:04 Carbonate (on the basis of 6 O)
2012-05-18 10:07 Carbonate (on the basis of 6 O)

Nb of Ions	Formula	C	Si	Mg	Ca	Mn	Fe	Total	X	Y	Z	Comment	Point#	Date	Geo Specie
1 / 1 .	2.00	0.00	0.00	2.00	0.00	0.00	4.00	-19369.00	-5276.00	39.00	CaCO3-01	1.00	41046.70	Carbonate (on the basis of 6 O	
2 / 1 .	2.00	0.00	0.00	1.99	0.00	0.00	4.00	-19340.00	-5327.00	40.00	CaCO3-02	2.00	41046.70	Carbonate (on the basis of 6 O	
3 / 1 .	2.00	0.00	0.00	2.00	0.00	0.00	4.00	-19322.00	-5262.00	40.00	CaCO3-03	3.00	41046.70	Carbonate (on the basis of 6 O	
4 / 1 .	1.99	0.00	0.00	2.01	0.00	0.00	4.01	-19257.00	-5270.00	39.00	CaCO3-04	4.00	41046.70	Carbonate (on the basis of 6 O	
5 / 1 .	1.97	0.00	1.03	1.02	0.00	0.00	4.03	-20668.00	-1553.00	50.00	MgCO3-01	5.00	41046.71	Carbonate (on the basis of 6 O	
6 / 1 .	1.98	0.00	1.02	1.02	0.00	0.00	4.02	-20630.00	-1546.00	51.00	MgCO3-02	6.00	41046.71	Carbonate (on the basis of 6 O	
7 / 1 .	1.98	0.00	1.02	1.03	0.00	0.00	4.02	-20569.00	-1548.00	50.00	MgCO3-03	7.00	41046.71	Carbonate (on the basis of 6 O	
8 / 1 .	1.98	0.00	1.02	1.03	0.00	0.00	4.02	-20515.00	-1561.00	50.00	MgCO3-04	8.00	41046.71	Carbonate (on the basis of 6 O	
9 / 1 .	2.02	0.00	0.01	0.01	0.00	0.09	3.98	-15595.00	-6752.00	37.00	FeCO3-01	9.00	41046.71	Carbonate (on the basis of 6 O	
10 / 1 .	2.03	0.00	0.01	0.01	0.00	0.09	3.97	-15556.00	-6826.00	37.00	FeCO3-02	10.00	41046.71	Carbonate (on the basis of 6 O	
11 / 1 .	2.02	0.00	0.01	0.01	0.00	0.09	3.98	-15520.00	-6857.00	36.00	FeCO3-03	11.00	41046.72	Carbonate (on the basis of 6 O	
12 / 1 .	2.04	0.00	0.01	0.01	0.00	0.09	3.96	-15578.00	-6801.00	38.00	FeCO3-04	12.00	41046.72	Carbonate (on the basis of 6 O	
13 / 1 .	1.97	0.01	0.02	2.03	0.00	0.00	4.03	-1690.00	27920.00	56.00	911-2-01	13.00	41046.72	Carbonate (on the basis of 6 O	
14 / 1 .	1.96	0.01	0.89	1.17	0.00	0.00	4.03	-1696.00	27895.00	57.00	911-2-02	14.00	41046.72	Carbonate (on the basis of 6 O	
15 / 1 .	1.95	0.03	0.06	1.99	0.00	0.00	4.03	-1705.00	27874.00	58.00	911-2-03	15.00	41046.72	Carbonate (on the basis of 6 O	
16 / 1 .	1.93	0.01	0.02	2.12	0.00	0.00	4.07	-1725.00	27878.00	59.00	911-2-04	16.00	41046.73	Carbonate (on the basis of 6 O	
17 / 1 .	1.96	0.01	0.79	1.26	0.00	0.00	4.03	-590.00	28492.00	58.00	911-2-05	17.00	41046.73	Carbonate (on the basis of 6 O	
18 / 1 .	1.94	0.01	0.02	2.07	0.01	0.01	4.06	-582.00	28509.00	59.00	911-2-06	18.00	41046.73	Carbonate (on the basis of 6 O	
19 / 1 .	1.94	0.03	0.12	1.90	0.00	0.00	4.03	-607.00	28509.00	59.00	911-2-07	19.00	41046.73	Carbonate (on the basis of 6 O	
20 / 1 .	1.94	0.01	0.10	1.98	0.00	0.00	4.06	-613.00	28491.00	60.00	911-2-08	20.00	41046.73	Carbonate (on the basis of 6 O	
21 / 1 .	1.97	0.00	0.93	1.12	0.01	0.00	4.03	-7.00	28456.00	59.00	911-2-09	21.00	41046.74	Carbonate (on the basis of 6 O	
22 / 1 .	1.97	0.01	0.94	1.10	0.01	0.01	4.02	25.00	28452.00	57.00	911-2-010	22.00	41046.74	Carbonate (on the basis of 6 O	
23 / 1 .	1.99	0.01	0.09	1.91	0.00	0.00	4.01	-14.00	28426.00	57.00	911-2-011	23.00	41046.74	Carbonate (on the basis of 6 O	
24 / 1 .	2.43	0.00	0.00	1.13	0.00	0.00	3.57	75.00	28427.00	59.00	911-2-012	24.00	41046.74	Carbonate (on the basis of 6 O	
25 / 1 .	1.44	0.72	0.10	0.02	0.01	1.56	3.84	61.00	28456.00	58.00	911-2-013	25.00	41046.74	Carbonate (on the basis of 6 O	
26 / 1 .	1.33	0.29	0.03	0.03	0.01	2.70	4.38	-30.00	28486.00	61.00	911-2-014	26.00	41046.74	Carbonate (on the basis of 6 O	
27 / 1 .	1.93	0.05	0.92	1.02	0.01	0.10	4.02	588.00	28654.00	59.00	911-2-015	27.00	41046.75	Carbonate (on the basis of 6 O	
28 / 1 .	1.98	0.01	0.54	1.42	0.01	0.06	4.01	650.00	28664.00	59.00	911-2-016	28.00	41046.75	Carbonate (on the basis of 6 O	
29 / 1 .	1.95	0.04	0.96	1.04	0.00	0.01	4.01	618.00	28690.00	59.00	911-2-017	29.00	41046.75	Carbonate (on the basis of 6 O	
30 / 1 .	1.33	0.82	0.11	0.03	0.00	1.57	3.85	571.00	28672.00	58.00	911-2-018	30.00	41046.75	Carbonate (on the basis of 6 O	
31 / 1 .	1.29	1.03	0.11	0.02	0.00	1.23	3.68	525.00	28727.00	59.00	911-2-019	31.00	41046.75	Carbonate (on the basis of 6 O	
32 / 1 .	1.96	0.00	0.02	2.04	0.00	0.02	4.04	533.00	28672.00	60.00	911-2-020	32.00	41046.76	Carbonate (on the basis of 6 O	
33 / 1 .	1.96	0.01	0.97	1.08	0.01	0.01	4.04	-4286.00	-27926.00	-51.00	911-16-01	33.00	41046.76	Carbonate (on the basis of 6 O	
34 / 1 .	1.97	0.01	0.97	1.05	0.01	0.01	4.02	-4273.00	-27901.00	-51.00	911-16-02	34.00	41046.76	Carbonate (on the basis of 6 O	

35 / 1 .	1.99	0.00	0.00	2.02	0.01	0.00	4.01	-4242.00	-27924.00	-50.00	911-16-03	35.00	41046.76	Carbonate (on the basis of 6 O
36 / 1 .	1.61	0.51	0.22	1.48	0.00	0.06	3.88	-4326.00	-27945.00	-50.00	911-16-04	36.00	41046.76	Carbonate (on the basis of 6 O
37 / 1 .	1.97	0.00	0.01	2.04	0.00	0.00	4.03	-9632.00	-28625.00	-27.00	911-16-05	37.00	41046.77	Carbonate (on the basis of 6 O
38 / 1 .	1.99	0.00	0.92	1.06	0.01	0.02	4.01	-9531.00	-28552.00	-27.00	911-16-06	38.00	41046.77	Carbonate (on the basis of 6 O
39 / 1 .	1.99	0.00	0.02	2.00	0.01	0.00	4.01	-9502.00	-28524.00	-29.00	911-16-07	39.00	41046.77	Carbonate (on the basis of 6 O
40 / 1 .	1.98	0.01	0.01	2.02	0.01	0.00	4.02	-9488.00	-28641.00	-26.00	911-16-08	40.00	41046.77	Carbonate (on the basis of 6 O
41 / 1 .	1.98	0.00	0.01	2.02	0.00	0.01	4.02	-5033.00	-27641.00	-44.00	911-16-09	41.00	41046.77	Carbonate (on the basis of 6 O
42 / 1 .	1.98	0.01	0.97	1.06	0.01	0.01	4.02	-4947.00	-27721.00	-45.00	911-16-01	42.00	41046.77	Carbonate (on the basis of 6 O
43 / 1 .	1.95	0.08	0.71	1.22	0.01	0.02	3.98	-4906.00	-27576.00	-46.00	911-16-01'	43.00	41046.78	Carbonate (on the basis of 6 O
44 / 1 .	1.91	0.12	0.73	1.19	0.01	0.02	3.97	-4906.00	-27576.00	-45.00	911-16-01	44.00	41046.78	Carbonate (on the basis of 6 O
45 / 1 .	2.00	0.00	0.91	1.04	0.01	0.04	4.00	-4939.00	-27531.00	-46.00	911-16-01	45.00	41046.78	Carbonate (on the basis of 6 O
46 / 1 .	1.99	0.00	0.01	2.00	0.00	0.00	4.01	-5530.00	-27576.00	-45.00	911-16-01	46.00	41046.78	Carbonate (on the basis of 6 O
47 / 1 .	2.01	0.01	0.89	1.02	0.01	0.05	3.98	-5472.00	-27656.00	-44.00	911-16-01	47.00	41046.78	Carbonate (on the basis of 6 O
48 / 1 .	1.99	0.02	0.95	1.03	0.01	0.01	4.00	-5397.00	-27625.00	-44.00	911-16-01	48.00	41046.79	Carbonate (on the basis of 6 O
49 / 1 .	2.02	0.00	0.01	1.93	0.01	0.00	3.98	-5301.00	-27733.00	-47.00	911-16-01	49.00	41047.40	Carbonate (on the basis of 6 O
50 / 1 .	2.01	0.01	0.95	0.98	0.02	0.01	3.98	-5124.00	-27685.00	-48.00	911-16-01	50.00	41047.41	Carbonate (on the basis of 6 O
51 / 1 .	2.03	0.00	0.11	1.83	0.01	0.00	3.97	-5191.00	-27685.00	-48.00	911-16-01	51.00	41047.41	Carbonate (on the basis of 6 O
52 / 1 .	1.87	0.02	1.18	1.02	0.01	0.01	4.11	-4182.00	-28274.00	-52.00	911-16-02	52.00	41047.41	Carbonate (on the basis of 6 O
53 / 1 .	1.72	0.00	1.26	1.13	0.01	0.16	4.28	-4211.00	-28245.00	-52.00	911-16-02'	53.00	41047.41	Carbonate (on the basis of 6 O
54 / 1 .	1.86	0.00	0.28	1.99	0.00	0.00	4.14	-17661.00	-4315.00	36.00	CaCO3-05	54.00	41047.41	Carbonate (on the basis of 6 O
55 / 1 .	2.04	0.00	0.00	1.92	0.00	0.00	3.96	-17657.00	-4278.00	34.00	CaCO3-06	55.00	41047.41	Carbonate (on the basis of 6 O
56 / 1 .	1.99	0.00	1.02	1.00	0.00	0.00	4.01	-20720.00	-1529.00	52.00	MgCO3-05	56.00	41047.42	Carbonate (on the basis of 6 O
57 / 1 .	2.00	0.00	1.01	0.98	0.00	0.00	4.00	-20720.00	-1524.00	50.00	MgCO3-06	57.00	41047.42	Carbonate (on the basis of 6 O
58 / 1 .	2.06	0.00	0.01	0.00	0.09	1.78	3.94	-15607.00	-6819.00	36.00	FeCO3-05	58.00	41047.42	Carbonate (on the basis of 6 O
59 / 1 .	2.03	0.00	0.01	0.00	0.09	1.83	3.97	-15607.00	-6849.00	38.00	FeCO3-06	59.00	41047.42	Carbonate (on the basis of 6 O

Results

Formula	Weight%	Norm Weig	Peak cnt	(cAtomic%	StdDev wt%	Det.Lim	pp Peak	(cts)	Beam curr	Peak Time	Ix	(c/s/nA)	Pk-Bg	(cps Pk/Bg)
1 / 1.	X = -19369.	Y = -5276.	Z = 39.	Comment : CaCO3-01										
MgO	0.001	0.001	6.85	0	0.025	300	137	9.304	20	0.005	0.05	1.007		
SiO2	0.007	0.007	16.401	0.005	0.021	243	328	9.304	20	0.14	1.3	1.086		
MnO	0.066	0.066	6.425	0.024	0.056	618	257	9.304	40	0.199	1.85	1.404		
FeO	0	0	4.2	0	0.086	1130	42	9.304	10	-0.183	-1.7	0.712		
CaO	39.921	39.971	2746.571	19.955	0.797	468	54438	9.304	20	294.375	2738.72	349.872		
CO2	12.002	12.017		20.02										
O	47.927	47.987		60.013										
Total	99.924	100.048		100.017										
Formula														
MgO	0.001													
SiO2	0.015													
MnO	0.085													
FeO	0													
CaO	55.858													
CO2	43.979													
Total	99.938													

Formula	Weight%	Norm Weig	Peak cnt	(cAtomic%	StdDev wt%	Det.Lim	pp Peak	(cts)	Beam curr	Peak Time	Ix	(c/s/nA)	Pk-Bg	(cps Pk/Bg)
2 / 1.	X = -19340.	Y = -5327.	Z = 40.	Comment : CaCO3-02										
MgO	0	0	6.25	0	0.025	307	125	9.27	20	-0.086	-0.8	0.887		
SiO2	0.007	0.007	15.051	0.005	0.02	233	301	9.27	20	0.14	1.3	1.095		
MnO	0.089	0.089	6.225	0.032	0.054	562	249	9.27	40	0.267	2.475	1.66		
FeO	0	0	4.8	0	0.089	1134	48	9.27	10	-0.119	-1.1	0.814		
CaO	39.827	39.87	2728.855	19.894	0.796	438	54090	9.27	20	293.644	2722.055	401.293		
CO2	12.033	12.046		20.056										
O	47.976	48.028		60.031										
Total	99.932	100.04		100.018										
Formula														
MgO	0													
SiO2	0.015													
MnO	0.114													
FeO	0													
CaO	55.726													
CO2	44.09													
Total	99.946													

Formula	Weight%	Norm Weig	Peak cnt	(cAtomic%	StdDev wt%	Det.Lim	pp Peak	(cts)	Beam curr	Peak Time	Ix	(c/s/nA)	Pk-Bg	(cps Pk/Bg)
3 / 1.	X = -19322.	Y = -5262.	Z = 40.	Comment : CaCO3-03										
MgO	0.01	0.01	7.45	0.008	0.023	267	149	10.161	20	0.103	1.05	1.164		
SiO2	0.005	0.005	15.951	0.003	0.019	222	319	10.161	20	0.089	0.9	1.06		
MnO	0.122	0.122	7.425	0.044	0.052	510	297	10.161	40	0.367	3.725	2.007		

Fe	FeO	0	0	5	0	0.081	1026	50	10.161	10	-0.079	-0.8	0.862
Ca	CaO	39.963	39.985	3002.661	19.983	0.783	428	59464	10.161	20	294.733	2994.811	382.495
C	CO2	11.974	11.98		19.978								
O		47.894	47.92		59.991								
Total		99.967	100.021		100.008								

Formula Oxide

MgO	0.016
SiO2	0.01
MnO	0.157
FeO	0
CaO	55.917
CO2	43.873
Total	99.973

4 / 1 . X = -19257. Y = -5270. Z = 39. Comment : CaCO3-04

Mg	MgO	0.011	0.011	8.5	0.009	0.025	285	170	10.137	20	0.118	1.2	1.164
Si	SiO2	0	0	15.001	0	0.019	230	300	10.137	20	-0.099	-1	0.937
Mn	MnO	0.121	0.121	7.675	0.044	0.053	529	307	10.137	40	0.365	3.7	1.931
Fe	FeO	0.008	0.008	6.3	0.003	0.087	1045	63	10.137	10	0.03	0.3	1.05
Ca	CaO	40.087	40.096	3004.599	20.063	0.786	411	59502	10.137	20	295.698	2997.398	417.295
C	CO2	11.93	11.933		19.924								
O		47.826	47.836		59.96								
Total		99.984	100.005		100.004								

Formula Oxide

MgO	0.018
SiO2	0
MnO	0.156
FeO	0.01
CaO	56.09
CO2	43.714
Total	99.989

5 / 1 . X = -20668. Y = -1553. Z = 50. Comment : MgCO3-01

Mg	MgO	13.422	13.422	1537.916	10.234	0.258	245	30603	10.108	20	151.564	1531.966	258.468
Si	SiO2	0.005	0.005	14.901	0.003	0.02	233	298	10.108	20	0.094	0.95	1.068
Mn	MnO	0.007	0.007	3.725	0.003	0.042	501	149	10.108	40	0.022	0.225	1.064
Fe	FeO	0.077	0.077	8.7	0.025	0.095	1040	87	10.108	10	0.287	2.9	1.5
Ca	CaO	22.055	22.055	1609.958	10.197	0.501	410	32029	10.108	20	158.613	1603.208	238.507
C	CO2	12.762	12.762		19.691								
O		51.672	51.672		59.847								
Total		100	100		100								

Formula Oxide

MgO	0.018
SiO2	0
MnO	0.156
FeO	0.01
CaO	56.09
CO2	43.714
Total	99.989

MgO 22.258
 SiO2 0.011
 MnO 0.01
 FeO 0.099
 CaO 30.859
 CO2 46.764
 Total 100

6 / 1. X = -20630. Y = -1546. Z = 51. Comment : MgCO3-02

Mg	13.33	13.33	1410.535	10.147	0.266	267	28080	9.333	20	150.499	1404.535	235.085
Si	0.005	0.005	13.451	0.004	0.02	240	269	9.333	20	0.096	0.9	1.072
Mn	0.019	0.019	3.925	0.006	0.046	535	157	9.333	40	0.056	0.525	1.154
Fe	0.02	0.02	5.6	0.007	0.088	1039	56	9.333	10	0.075	0.7	1.143
Ca	21.969	21.969	1479.387	10.141	0.511	394	29444	9.333	20	157.952	1474.087	279.125
C	12.852	12.852		19.796								
O	51.804	51.804		59.9								
Total	100	100		100								

Formula Oxide

MgO 22.106
 SiO2 0.011
 MnO 0.024
 FeO 0.026
 CaO 30.739
 CO2 47.094
 Total 100

7 / 1. X = -20569. Y = -1548. Z = 50. Comment : MgCO3-03

Mg	13.342	13.343	1408.063	10.173	0.266	272	28031	9.308	20	150.607	1401.862	227.102
Si	0	0	12.1	0	0.02	238	242	9.308	20	-0.021	-0.2	0.984
Mn	0.005	0.005	3.5	0.002	0.045	532	140	9.308	40	0.016	0.15	1.045
Fe	0.075	0.075	7.7	0.025	0.097	1061	77	9.308	10	0.279	2.6	1.51
Ca	22.114	22.115	1484.689	10.225	0.513	354	29549	9.308	20	159.048	1480.439	349.334
C	12.78	12.78		19.718								
O	51.68	51.683		59.859								
Total	99.996	100.001		100.001								

Formula Oxide

MgO 22.125
 SiO2 0
 MnO 0.007
 FeO 0.096
 CaO 30.942
 CO2 46.828

MgO 0.116
 SiO2 0.047
 MnO 2.903
 FeO 57.549
 CaO 0.016
 CO2 39.369
 Total 100

13 / 1. X = -1690. Y = 27920. Z = 56. Comment : 9111-2-01

MgO	0.197	0.197	27.002	0.164	0.039	309	540	9.333	20	2.116	19.752	3.724
SiO2	0.114	0.114	34.054	0.082	0.025	226	681	9.333	20	2.245	20.953	2.599
MnO	0.091	0.091	6.475	0.033	0.054	571	259	9.333	40	0.273	2.55	1.65
FeO	0.085	0.085	9.1	0.031	0.105	1144	91	9.333	10	0.321	3	1.492
CaO	40.279	40.279	2782.518	20.24	0.802	484	55144	9.333	20	297.248	2774.067	329.283
CO2	11.692	11.692	19.606									
O	47.541	47.541	59.844									
Total	100	100	100									

Formula Oxide

MgO 0.327
 SiO2 0.245
 MnO 0.117
 FeO 0.109
 CaO 56.358
 CO2 42.844
 Total 100

14 / 1. X = -1696. Y = 27895. Z = 57. Comment : 9111-2-02

MgO	11.451	11.451	1304.794	8.853	0.236	267	25984	10.109	20	128.383	1297.844	187.736
SiO2	0.213	0.213	52.909	0.142	0.03	227	1058	10.109	20	3.898	39.409	3.919
MnO	0.075	0.075	5.775	0.026	0.048	500	231	10.109	40	0.225	2.275	1.65
FeO	0.026	0.026	7.3	0.009	0.092	1081	73	10.109	10	0.099	1	1.159
CaO	24.82	24.82	1818.599	11.636	0.546	413	36155	10.109	20	179.213	1811.699	263.559
CO2	12.471	12.471	19.509									
O	50.943	50.943	59.826									
Total	100	100	100									

Formula Oxide

MgO 18.99
 SiO2 0.455
 MnO 0.097
 FeO 0.034
 CaO 34.729
 CO2 45.696

Total 100

15 / 1 . X = -1705. Y = 27874. Z = 58. Comment : 911-2-03

Mg	0.688	0.688	74.418	0.569	0.06	266	1488	9.333	20	7.395	69.018	13.781
Si	0.393	0.393	86.475	0.281	0.037	239	1729	9.333	20	7.696	71.824	5.902
Mn	0.084	0.084	6.7	0.031	0.056	599	268	9.333	40	0.254	2.375	1.549
Fe	0.119	0.119	10.3	0.043	0.109	1144	103	9.333	10	0.45	4.2	1.689
Ca	39.49	39.49	2725.139	19.81	0.79	478	54017	9.333	20	291.121	2716.888	330.311
C	11.599	11.599	19.416									
O	47.626	47.626	59.849									
Total	100	100	100	100								

Formula Oxide

MgO	1.141
SiO2	0.841
MnO	0.109
FeO	0.153
CaO	55.255
CO2	42.501
Total	100

16 / 1 . X = -1725. Y = 27878. Z = 59. Comment : 911-2-04

Mg	0.184	0.184	26.252	0.154	0.035	267	525	10.108	20	1.969	19.902	4.134
Si	0.063	0.063	29.153	0.045	0.023	235	583	10.108	20	1.232	12.452	1.746
Mn	0.095	0.095	6.95	0.035	0.052	535	278	10.108	40	0.287	2.9	1.716
Fe	0.057	0.057	7.6	0.021	0.089	994	76	10.108	10	0.218	2.2	1.407
Ca	41.409	41.409	3102.186	21.011	0.807	428	61415	10.108	20	306.141	3094.386	397.706
C	11.305	11.305	19.141									
O	46.887	46.887	59.593									
Total	100	100	100	100								

Formula Oxide

MgO	0.304
SiO2	0.134
MnO	0.123
FeO	0.074
CaO	57.94
CO2	41.425
Total	100

17 / 1 . X = -590. Y = 28492. Z = 58. Comment : 911-2-05

Mg	10.103	10.103	1144.859	7.876	0.22	268	22811	10.109	20	112.562	1137.909	164.724
Si	0.132	0.132	38.805	0.089	0.026	230	776	10.109	20	2.444	24.704	2.752
Mn	0.129	0.129	7.9	0.045	0.054	532	316	10.109	40	0.388	3.925	1.987

MgO 2.475
 SiO2 0.793
 MnO 0.087
 FeO 1.302
 CaO 52.884
 CO2 42.46
 Total 100

20 / 1. X = -613. Y = 28491. Z = 60. Comment : 9111-2-08

Mg	1.243	1.243	141.666	1.032	0.076	278	2832	10.108	20	13.333	134.766	20.531
Si	0.098	0.098	35.604	0.071	0.025	234	712	10.108	20	1.915	19.353	2.191
Mn	0.118	0.118	7.35	0.043	0.052	514	294	10.108	40	0.356	3.6	1.96
Fe	0.688	0.688	33.004	0.248	0.157	1104	330	10.108	10	2.602	26.303	4.926
Ca	39.054	39.054	2920.121	19.659	0.77	422	57845	10.108	20	288.154	2912.571	386.761
C	11.475	11.475		19.275								
O	47.324	47.324		59.673								
Total	100	100		100								

Formula Oxide

MgO 2.061
 SiO2 0.21
 MnO 0.152
 FeO 0.884
 CaO 54.645
 CO2 42.047
 Total 100

21 / 1. X = -7. Y = 28456. Z = 59. Comment : 9111-2-09

Mg	11.973	11.982	1364.164	9.227	0.242	259	27161	10.109	20	134.295	1357.613	208.265
Si	0	0	13.901	0	0.02	255	278	10.109	20	-0.302	-3.05	0.82
Mn	0.159	0.159	8	0.054	0.052	477	320	10.109	40	0.477	4.825	2.52
Fe	0.124	0.124	9.9	0.042	0.097	985	99	10.109	10	0.465	4.7	1.904
Ca	23.977	23.994	1755.562	11.205	0.532	409	34909	10.109	20	172.992	1748.812	260.078
C	12.607	12.616		19.659								
O	51.105	51.141		59.824								
Total	99.946	100.017		100.011								

Formula Oxide

MgO 19.855
 SiO2 0
 MnO 0.205
 FeO 0.16
 CaO 33.549
 CO2 46.195

Total 99.965

22 / 1. X = 25. Y = 28452. Z = 57. Comment : 911-2-010

Mg	12.196	12.196	1390.703	9.373	0.245	265	27687	10.109	20	136.891	1383.853	203.018
Si	0.073	0.073	30.753	0.049	0.025	258	615	10.109	20	1.331	13.452	1.778
Mn	0.19	0.19	9.325	0.065	0.056	504	373	10.109	40	0.571	5.775	2.627
Fe	0.164	0.164	12.2	0.055	0.107	1056	122	10.109	10	0.613	6.2	2.033
Ca	23.45	23.45	1715.355	10.928	0.524	387	34114	10.109	20	169.084	1709.305	283.524
C	12.65	12.65		19.671								
O	51.277	51.277		59.86								
Total	100	100		100								

Formula Oxide

MgO	20.225
SiO2	0.156
MnO	0.246
FeO	0.21
CaO	32.811
CO2	46.351
Total	100

23 / 1. X = -14. Y = 28426. Z = 57. Comment : 911-2-011

Mg	1.147	1.147	132.658	0.94	0.074	299	2652	10.109	20	12.326	124.608	16.479
Si	0.074	0.074	32.153	0.053	0.024	242	643	10.109	20	1.449	14.652	1.837
Mn	0.001	0.001	4.075	0	0.044	536	163	10.109	40	0.002	0.025	1.006
Fe	0.183	0.183	13.201	0.065	0.11	1066	132	10.109	10	0.692	7	2.129
Ca	38.437	38.437	2867.938	19.1	0.761	441	56821	10.109	20	282.885	2859.738	349.739
C	11.987	11.987		19.877								
O	48.172	48.172		59.965								
Total	100	100		100								

Formula Oxide

MgO	1.901
SiO2	0.159
MnO	0.001
FeO	0.236
CaO	53.78
CO2	43.922
Total	100

24 / 1. X = 75. Y = 28427. Z = 59. Comment : 911-2-012

Mg	0.045	0.045	10.7	0.033	0.028	291	214	9.272	20	0.48	4.45	1.712
Si	0.057	0.057	25.852	0.036	0.024	252	517	9.272	20	1.095	10.151	1.647
Mn	0.016	0.016	3.925	0.005	0.047	549	157	9.272	40	0.049	0.45	1.129

MgO 0.476
 SiO2 6.401
 MnO 0.295
 FeO 70.937
 CaO 0.511
 CO2 21.381
 Total 100

27 / 1 . X = 588. Y = 28654. Z = 59. Comment : 911-2-015

Mg	MgO	11.727	11.727	1318.361	9.127	0.241	281	26253	10.109	20	129.67	1310.861	175.777
Si	SiO2	0.759	0.759	153.077	0.511	0.047	229	3060	10.109	20	13.802	139.527	11.297
Mn	MnO	0.185	0.185	8.95	0.064	0.054	483	358	10.109	40	0.559	5.65	2.712
Fe	FeO	2.826	2.826	113.643	0.957	0.277	1051	1136	10.109	10	10.648	107.643	18.94
Ca	CaO	21.639	21.639	1587.271	10.214	0.493	355	31580	10.109	20	156.508	1582.171	311.224
C	CO2	12.22	12.22		19.247								
O		50.644	50.644		59.879								
Total		100	100		100								

Formula Oxide

MgO 19.446
 SiO2 1.623
 MnO 0.239
 FeO 3.636
 CaO 30.278
 CO2 44.778
 Total 100

28 / 1 . X = 650. Y = 28664. Z = 59. Comment : 911-2-016

Mg	MgO	6.783	6.783	689.867	5.4	0.185	265	13766	9.273	20	73.813	684.467	127.751
Si	SiO2	0.118	0.118	32.854	0.082	0.026	230	657	9.273	20	2.222	20.603	2.682
Mn	MnO	0.327	0.327	12.501	0.115	0.068	531	500	9.273	40	0.987	9.15	3.731
Fe	FeO	1.687	1.687	64.614	0.585	0.229	1107	646	9.273	10	6.364	59.014	11.538
Ca	CaO	29.274	29.274	1987.146	14.134	0.629	444	39484	9.273	20	213.555	1980.296	290.088
C	CO2	12.266	12.266		19.762								
O		49.545	49.545		59.922								
Total		100	100		100								

Formula Oxide

MgO 11.248
 SiO2 0.253
 MnO 0.423
 FeO 2.171
 CaO 40.96
 CO2 44.946

Total 100

29 / 1 . X = 618. Y = 28690. Z = 59. Comment : 9111-2-017

Mg	12.517	12.517	1416.642	9.596	0.249	247	28201	10.021	20	140.783	1410.742	240.104
Si	0.64	0.64	129.005	0.425	0.044	219	2579	10.021	20	11.656	116.804	10.574
Mn	0.113	0.113	6.55	0.038	0.049	479	262	10.021	40	0.339	3.4	2.079
Fe	0.413	0.413	20.501	0.138	0.128	975	205	10.021	10	1.547	15.501	4.1
Ca	22.26	22.26	1612.536	10.348	0.506	407	32080	10.021	20	160.267	1605.985	246.183
C	12.567	12.567	19.495									
O	51.489	51.489	59.96									
Total	100	100	100									

Formula Oxide

MgO	20.757
SiO2	1.37
MnO	0.146
FeO	0.531
CaO	31.146
CO2	46.05
Total	100

Total 100

30 / 1 . X = 571. Y = 28672. Z = 58. Comment : 9111-2-018

Mg	1.146	1.146	104.036	1.082	0.084	350	2080	9.301	20	10.466	97.336	15.527
Si	10.139	10.139	1719.148	8.288	0.175	301	34189	9.301	20	182.753	1699.697	88.382
Mn	0.041	0.041	6.35	0.017	0.052	590	254	9.301	40	0.137	1.275	1.251
Fe	38.676	38.676	1465.958	15.899	1.192	1593	14589	9.301	10	156.159	1452.357	107.786
Ca	0.463	0.463	39.355	0.265	0.065	419	787	9.301	20	3.516	32.705	5.918
C	7.082	7.082	13.537									
O	42.453	42.453	60.912									
Total	100	100	100									

Formula Oxide

MgO	1.9
SiO2	21.691
MnO	0.053
FeO	49.756
CaO	0.648
CO2	25.952
Total	100

Total 100

31 / 1 . X = 525. Y = 28727. Z = 59. Comment : 9111-2-019

Mg	1.24	1.24	124.851	1.122	0.082	323	2496	9.99	20	11.782	117.701	17.461
Si	13.619	13.619	2510.223	10.66	0.197	263	49792	9.99	20	249.492	2492.472	141.412
Mn	0.009	0.009	5.55	0.004	0.048	569	222	9.99	40	0.03	0.3	1.057

Fe	FeO	32.371	32.371	1300.76	12.742	1.039	1436	12952	9.99	10	128.962	1288.359	104.896
Ca	CaO	0.4	0.4	36.804	0.22	0.06	403	736	9.99	20	2.993	29.904	5.334
C	CO2	7.256	7.256		13.281								
O		45.104	45.104		61.971								
Total		100	100		100								

Formula Oxide

MgO	2.057
SiO2	29.137
MnO	0.012
FeO	41.645
CaO	0.56
CO2	26.589
Total	100

32 / 1. X = 533. Y = 28672. Z = 60. Comment : 911-2-020

Mg	MgO	0.243	0.243	33.404	0.202	0.04	282	668	10.109	20	2.602	26.304	4.705
Si	SiO2	0.06	0.06	25.352	0.043	0.021	212	507	10.109	20	1.172	11.852	1.878
Mn	MnO	0.104	0.104	7.1	0.038	0.052	526	284	10.109	40	0.314	3.175	1.809
Fe	FeO	0.413	0.413	21.402	0.149	0.129	1012	214	10.109	10	1.563	15.801	3.822
Ca	CaO	40.234	40.234	3011.483	20.279	0.788	426	59637	10.109	20	297.134	3003.783	391.092
C	CO2	11.601	11.601		19.511								
O		47.345	47.345		59.777								
Total		100	100		100								

Formula Oxide

MgO	0.403
SiO2	0.128
MnO	0.134
FeO	0.531
CaO	56.295
CO2	42.508
Total	100

33 / 1. X = -4286. Y = -27926. Z = -51. Comment : 911-16-01

Mg	MgO	12.562	12.562	1307.719	9.677	0.258	271	26042	9.233	20	140.981	1301.719	217.949
Si	SiO2	0.072	0.072	22.652	0.048	0.023	222	453	9.233	20	1.305	12.051	2.137
Mn	MnO	0.412	0.412	14.351	0.14	0.071	501	574	9.233	40	1.237	11.426	4.906
Fe	FeO	0.309	0.309	15.801	0.104	0.125	1068	158	9.233	10	1.159	10.701	3.098
Ca	CaO	23.073	23.073	1541.805	10.779	0.53	388	30680	9.233	20	166.436	1536.755	305.303
C	CO2	12.5	12.5		19.486								
O		51.073	51.073		59.767								
Total		100	100		100								

Formula Oxide

MgO	0.403
SiO2	0.128
MnO	0.134
FeO	0.531
CaO	56.295
CO2	42.508
Total	100

MgO 20.832
 SiO2 0.153
 MnO 0.532
 FeO 0.397
 CaO 32.283
 CO2 45.802
 Total 100

34 / 1. X = -4273. Y = -27901. Z = -51. Comment : 911-16-02

MgO	12.606	12.606	1438.698	9.657	0.249	262	28638	10.109	20	141.648	1431.948	213.136
SiO2	0.134	0.134	36.204	0.089	0.025	212	724	10.109	20	2.429	24.554	3.108
MnO	0.354	0.354	14.051	0.12	0.065	488	562	10.109	40	1.061	10.726	4.226
FeO	0.158	0.158	10.2	0.053	0.095	889	102	10.109	10	0.594	6	2.429
CaO	22.574	22.574	1650.289	10.487	0.509	395	32827	10.109	20	162.623	1643.989	261.945
CO2	12.708	12.708		19.7								
O	51.467	51.467		59.894								
Total	100	100		100								

Formula Oxide

MgO 20.904
 SiO2 0.286
 MnO 0.457
 FeO 0.204
 CaO 31.585
 CO2 46.565
 Total 100

35 / 1. X = -4242. Y = -27924. Z = -50. Comment : 911-16-03

MgO	0.05	0.05	11.2	0.042	0.028	288	224	9.272	20	0.539	5	1.806
SiO2	0.003	0.003	13.751	0.002	0.019	228	275	9.272	20	0.059	0.55	1.042
MnO	0.137	0.137	7.55	0.05	0.057	560	302	9.272	40	0.413	3.825	2.027
FeO	0.023	0.023	6.7	0.008	0.096	1133	67	9.272	10	0.086	0.8	1.136
CaO	40.203	40.203	2757.007	20.149	0.802	436	54643	9.272	20	296.636	2750.257	408.436
CO2	11.858	11.858		19.832								
O	47.725	47.725		59.917								
Total	100	100		100								

Formula Oxide

MgO 0.084
 SiO2 0.006
 MnO 0.177
 FeO 0.029
 CaO 56.252
 CO2 43.451

MgO 0.121
 SiO2 0.23
 MnO 0.195
 FeO 0.044
 CaO 56.193
 CO2 43.218
 Total 100

41 / 1 . X = -5033. Y = -27641. Z = -44. Comment : 911-16-09

Mg	0.085	0.085	14.051	0.07	0.03	275	281	9.27	20	0.906	8.401	2.487
Si	0.057	0.057	24.052	0.041	0.023	232	481	9.27	20	1.127	10.451	1.768
Mn	0.046	0.046	5.775	0.017	0.054	615	231	9.27	40	0.138	1.275	1.283
Fe	0.168	0.168	12	0.061	0.115	1152	120	9.27	10	0.637	5.9	1.967
Ca	40.16	40.16	2754.309	20.144	0.801	456	54590	9.27	20	296.326	2746.909	372.195
C	11.809	11.809	19.765									
O	47.675	47.675	59.903									
Total	100	100	100									

Formula Oxide

MgO 0.14
 SiO2 0.123
 MnO 0.059
 FeO 0.217
 CaO 56.192
 CO2 43.269
 Total 100

42 / 1 . X = -4947. Y = -27721. Z = -45. Comment : 911-16-010

Mg	12.621	12.621	1442.181	9.661	0.249	261	28707	10.112	20	141.954	1435.481	215.246
Si	0.134	0.134	36.204	0.089	0.025	211	724	10.112	20	2.438	24.654	3.134
Mn	0.153	0.153	8.45	0.052	0.055	521	338	10.112	40	0.46	4.65	2.224
Fe	0.156	0.156	10.7	0.052	0.099	948	107	10.112	10	0.583	5.9	2.229
Ca	22.691	22.691	1658.73	10.532	0.511	396	32994	10.112	20	163.408	1652.43	263.285
C	12.727	12.727	19.713									
O	51.517	51.517	59.901									
Total	100	100	100									

Formula Oxide

MgO 20.93
 SiO2 0.287
 MnO 0.198
 FeO 0.2
 CaO 31.749
 CO2 46.636

Total 100

43 / 1. X = -4906. Y = -27576. Z = -46. Comment : 9111-16-011

Mg	9.07	9.07	939.755	7.074	0.215	292	18737	9.273	20	100.605	932.905	137.187
Si	1.117	1.117	205.289	0.754	0.058	238	4103	9.273	20	20.753	192.438	15.975
Mn	0.191	0.191	8.825	0.066	0.06	544	353	9.273	40	0.574	5.325	2.521
Fe	0.588	0.588	24.902	0.2	0.148	989	249	9.273	10	2.211	20.502	5.659
Ca	25.914	25.914	1746.306	12.257	0.576	441	34726	9.273	20	187.604	1739.656	262.597
C	12.365	12.365		19.515								
O	50.755	50.755		60.135								
Total	100	100		100								

Formula Oxide

MgO	15.04
SiO2	2.389
MnO	0.247
FeO	0.757
CaO	36.259
CO2	45.308
Total	100

44 / 1. X = -4906. Y = -27576. Z = -45. Comment : 9111-16-012

Mg	9.354	9.354	972.411	7.296	0.219	297	19386	9.275	20	104.077	965.26	135.998
Si	1.721	1.721	310.768	1.162	0.071	252	6209	9.275	20	31.95	296.318	21.505
Mn	0.205	0.205	9.1	0.071	0.06	535	364	9.275	40	0.617	5.725	2.696
Fe	0.626	0.626	26.402	0.212	0.152	1010	264	9.275	10	2.351	21.802	5.74
Ca	25.157	25.157	1693.411	11.9	0.564	419	33680	9.275	20	181.941	1687.411	282.23
C	12.155	12.155		19.185								
O	50.782	50.782		60.173								
Total	100	100		100								

Formula Oxide

MgO	15.512
SiO2	3.682
MnO	0.265
FeO	0.805
CaO	35.2
CO2	44.537
Total	100

45 / 1. X = -4939. Y = -27531. Z = -46. Comment : 9111-16-013

Mg	11.796	11.796	1223.218	9.059	0.249	269	24366	9.273	20	131.281	1217.368	209.093
Si	0.022	0.022	14.401	0.015	0.02	221	288	9.273	20	0.41	3.8	1.359
Mn	0.327	0.327	12.901	0.111	0.07	567	516	9.273	40	0.981	9.101	3.395

MgO 19.286
 SiO2 0.168
 MnO 0.435
 FeO 1.727
 CaO 30.784
 CO2 47.6
 Total 100

48 / 1 . X = -5397. Y = -27625. Z = -44. Comment : 911-16-016

Mg	12.431	12.431	1300.255	9.494	0.256	274	25894	9.27	20	139.598	1294.055	209.714
Si	0.267	0.267	56.511	0.176	0.033	230	1130	9.27	20	4.856	45.01	4.914
Mn	0.286	0.286	11.45	0.097	0.066	546	458	9.27	40	0.858	7.95	3.272
Fe	0.225	0.225	12.801	0.075	0.115	1055	128	9.27	10	0.841	7.8	2.56
Ca	22.214	22.214	1488.425	10.288	0.516	420	29623	9.27	20	159.924	1482.475	250.151
C	12.847	12.847		19.855								
O	51.731	51.731		60.016								
Total	100	100		100								

Formula Oxide

MgO 20.614
 SiO2 0.571
 MnO 0.369
 FeO 0.289
 CaO 31.082
 CO2 47.075
 Total 100

49 / 1 . X = -5301. Y = -27733. Z = -47. Comment : 911-16-017

Mg	0.12	0.12	18.751	0.098	0.031	256	375	10.111	20	1.281	12.951	3.233
Si	0.006	0.006	15.701	0.004	0.019	219	314	10.111	20	0.124	1.25	1.087
Mn	0.132	0.132	8.125	0.048	0.055	539	325	10.111	40	0.398	4.025	1.982
Fe	0.086	0.086	8.7	0.031	0.093	997	87	10.111	10	0.326	3.3	1.611
Ca	39.042	39.042	2916.349	19.382	0.77	458	57771	10.111	20	287.567	2907.499	329.521
C	12.248	12.248		20.29								
O	48.365	48.365		60.147								
Total	100	100		100								

Formula Oxide

MgO 0.198
 SiO2 0.013
 MnO 0.171
 FeO 0.111
 CaO 54.628
 CO2 44.878

Total 100

50 / 1. X = -5124. Y = -27685. Z = -48. Comment : 9111-16-018

Mg	12.599	12.599	1323.707	9.56	0.258	263	26359	9.32	20	141.407	1317.957	230.205
Si	0.157	0.157	40.205	0.103	0.029	249	804	9.32	20	2.854	26.605	2.956
Mn	0.444	0.444	16.001	0.149	0.075	551	640	9.32	40	1.331	12.401	4.445
Fe	0.203	0.203	12.2	0.067	0.113	1060	122	9.32	10	0.762	7.1	2.392
Ca	21.271	21.271	1432.49	9.788	0.5	446	28515	9.32	20	152.966	1425.69	210.656
C	13.147	13.147		20.187								
O	52.178	52.178		60.145								
Total	100	100		100								

Formula Oxide

MgO	20.893
SiO2	0.336
MnO	0.573
FeO	0.262
CaO	29.763
CO2	48.173
Total	100

51 / 1. X = -5191. Y = -27685. Z = -48. Comment : 9111-16-019

Mg	1.399	1.399	146.171	1.135	0.084	287	2922	9.301	20	15.044	139.92	23.387
Si	0	0	13.851	0	0.02	236	277	9.301	20	-0.011	-0.1	0.993
Mn	0.126	0.126	6.925	0.045	0.054	535	277	9.301	40	0.379	3.525	2.037
Fe	0.023	0.023	5.8	0.008	0.089	1045	58	9.301	10	0.086	0.8	1.16
Ca	37.26	37.261	2554.352	18.332	0.756	495	50660	9.301	20	273.711	2545.651	293.595
C	12.377	12.378		20.321								
O	48.813	48.815		60.16								
Total	99.998	100.001		100								

Formula Oxide

MgO	2.319
SiO2	0
MnO	0.163
FeO	0.029
CaO	52.134
CO2	45.353
Total	99.999

52 / 1. X = -4182. Y = -28274. Z = -52. Comment : 9111-16-020

Mg	15.18	15.18	1606.876	11.703	0.287	275	31968	9.267	20	172.709	1600.476	251.069
Si	0.252	0.252	53.459	0.168	0.033	234	1069	9.267	20	4.522	41.909	4.628
Mn	0.213	0.213	9.075	0.073	0.06	517	363	9.267	40	0.639	5.925	2.881

MgO 5.579
 SiO2 0.005
 MnO 0.103
 FeO 0.044
 CaO 54.314
 CO2 39.955
 Total 100

55 / 1. X = -17657. Y = -4278. Z = 34. Comment : CaCO3-06
 MgO 0.005 0.005 7.1 0.004 0.025 297 142 9.322 20 0.048 0.45 1.068
 SiO2 0.015 0.015 15.801 0.01 0.02 226 316 9.322 20 0.29 2.7 1.206
 MnO 0.114 0.114 6.55 0.041 0.053 529 262 9.322 40 0.343 3.2 1.955
 FeO 0.046 0.046 6.3 0.016 0.089 1011 63 9.322 10 0.172 1.6 1.34
 CaO 38.879 38.879 2675.261 19.249 0.78 442 53037 9.322 20 286.239 2668.261 382.171
 CO2 12.378 12.378 20.45
 O 48.564 48.564 60.23
 Total 100 100

Formula Oxide
 MgO 0.007
 SiO2 0.032
 MnO 0.147
 FeO 0.059
 CaO 54.4
 CO2 45.355
 Total 100

56 / 1. X = -20720. Y = -1529. Z = 52. Comment : MgCO3-05
 MgO 13.362 13.363 1411.04 10.146 0.266 257 28090 9.319 20 150.823 1405.49 254.237
 SiO2 0 0 11.05 0 0.019 227 221 9.319 20 -0.011 -0.1 0.991
 MnO 0 0 3.425 0 0.056 672 137 9.319 40 0 0 1
 FeO 0.069 0.069 6.7 0.023 0.09 977 67 9.319 10 0.258 2.4 1.558
 CaO 21.626 21.626 1454.347 9.958 0.506 425 28948 9.319 20 155.406 1448.196 236.474
 CO2 12.961 12.962 19.916
 O 51.98 51.981 59.958
 Total 99.998 100.001 100

Formula Oxide
 MgO 22.158
 SiO2 0
 MnO 0
 FeO 0.089
 CaO 30.258
 CO2 47.493

Total 99.999

57 / 1 . X = -20720. Y = -1524. Z = 50. Comment : MgCO3-06

MgO	13.305	13.305	1403.874	10.082	0.265	255	27948	9.316	20	150.115	1398.424	257.587
SiO2	0.001	0.001	11.8	0	0.019	232	236	9.316	20	0.011	0.1	1.009
MnO	0.004	0.004	3.325	0.001	0.044	522	133	9.316	40	0.011	0.1	1.031
FeO	0.075	0.075	7.7	0.025	0.097	1062	77	9.316	10	0.279	2.6	1.51
CaO	21.412	21.412	1439.203	9.84	0.502	429	28648	9.316	20	153.821	1432.953	230.267
CO2	13.065	13.065		20.035								
O	52.138	52.138		60.017								
Total	100	100		100								

Formula Oxide

MgO	22.064
SiO2	0.001
MnO	0.005
FeO	0.096
CaO	29.96
CO2	47.874
Total	100

58 / 1 . X = -15607. Y = -6819. Z = 36. Comment : FeCO3-05

MgO	0.092	0.092	12.751	0.085	0.036	341	255	9.262	20	0.783	7.25	2.318
SiO2	0.015	0.015	16.751	0.012	0.023	266	335	9.262	20	0.27	2.5	1.175
MnO	2.212	2.212	74.268	0.913	0.136	596	2970	9.262	40	7.449	68.993	14.079
FeO	44.063	44.066	1677.232	17.881	1.302	1815	16680	9.262	10	179.16	1659.431	94.221
CaO	0	0	6.5	0	0.034	411	130	9.262	20	-0.016	-0.15	0.977
CO2	10.99	10.99		20.736								
O	42.624	42.627		60.374								
Total	99.996	100.002		100.001								

Formula Oxide

MgO	0.152
SiO2	0.033
MnO	2.856
FeO	56.687
CaO	0
CO2	40.269
Total	99.997

59 / 1 . X = -15607. Y = -6849. Z = 38. Comment : FeCO3-06

MgO	0.089	0.089	13.001	0.084	0.037	357	260	9.243	20	0.757	7	2.167
SiO2	0.016	0.016	16.101	0.013	0.023	259	322	9.243	20	0.287	2.65	1.197
MnO	2.216	2.216	73.293	0.922	0.134	531	2931	9.243	40	7.478	69.118	17.555

Bg cnt (cps)	Bg1 cnt (ct)	Bg2 cnt (ct)	lx/lstd	lx/lpure	Z	A	F
6.8	8.6	5	0	0	0.201	1.961	1.001
15.101	17.201	13.001	0	0	0.389	1.346	1.005
4.575	5.6	3.55	0.001	0.001	0.341	1.042	1
5.9	5	6.8	-0.001	0	0.321	1.032	1
7.85	7	8.7	0.996	0.363	0.486	1.034	1
7.05	9	5.1	-0.001	0	0.201	1.961	1.001
13.751	17.401	10.1	0	0	0.389	1.346	1.005
3.75	3.45	4.05	0.001	0.001	0.341	1.042	1
5.9	6	5.8	-0.001	0	0.321	1.032	1
6.8	7.6	6	0.994	0.362	0.486	1.034	1
6.4	6.4	6.4	0.001	0	0.201	1.961	1.001
15.051	17.401	12.701	0	0	0.389	1.346	1.005
3.7	4.15	3.25	0.001	0.001	0.341	1.042	1

5.8	5.6	6	0	0.321	1.032	1
7.85	7.6	8.1	0.364	0.486	1.034	1

7.3	9.2	5.4	0.001	0.201	1.962	1.001
16.001	17.701	14.301	0	0.389	1.346	1.005
3.975	4.15	3.8	0.001	0.341	1.042	1
6	6.8	5.2	0	0.321	1.032	1
7.2	7.2	7.2	1	0.365	1.034	1

5.95	7	4.9	1.007	0.082	1.831	1.001
13.951	15.601	12.301	0	0.337	1.434	1.003
3.5	3.35	3.65	0	0.344	1.029	1
5.8	6.2	5.4	0.002	0.321	1.022	1
6.75	5.8	7.7	0.537	0.196	1.043	1

6	6.3	5.7	1	0.081	0.227	1.83	1.001
12.551	15.001	10.1	0	0	0.338	1.433	1.003
3.4	3.35	3.45	0	0	0.344	1.029	1
4.9	4.6	5.2	0	0	0.321	1.022	1
5.3	5.5	5.1	0.534	0.195	0.47	1.042	1

6.2	6.3	6.1	1.001	0.081	0.227	1.831	1.001
12.301	14.201	10.4	0	0	0.338	1.433	1.003
3.35	4.15	2.55	0	0	0.344	1.029	1
5.1	4.4	5.8	0.001	0.001	0.321	1.022	1
4.25	3.8	4.7	0.538	0.196	0.47	1.042	1

6.75	8	5.5	1.001	0.081	0.227	1.831	1.001
12.601	14.401	10.8	0	0	0.338	1.433	1.003
3.875	4	3.75	0	0	0.344	1.029	1
5.6	5.4	5.8	0.001	0	0.321	1.022	1
5.55	5.1	6	0.538	0.196	0.47	1.042	1

7.05	7.9	6.2	0.005	0	0.121	2.589	1
14.551	14.701	14.401	0	0	0.297	1.578	1.001
6.2	7	5.4	0.026	0.019	0.381	1.013	1.034
23.102	27.202	19.001	0.984	0.387	0.354	1.01	1
6.1	7.4	4.8	0.001	0	0.488	1.058	1.029

6.6	7.4	5.8	0.004	0	0.121	2.586	1
15.651	15.801	15.501	0	0	0.297	1.576	1.001
5.1	6	4.2	0.027	0.019	0.381	1.013	1.034

20.201	22.402	18.001	0.978	0.384	0.354	1.01	1
6.05	6.4	5.7	0	0	0.488	1.058	1.029

5.7	6.8	4.6	0.004	0	0.121	2.591	1
15.101	17.401	12.801	0	0	0.297	1.578	1.001
5.15	5.5	4.8	0.026	0.019	0.381	1.013	1.034
17.201	20.801	13.601	0.988	0.388	0.354	1.01	1
7.2	7.1	7.3	0	0	0.488	1.058	1.029

5.9	6.5	5.3	0.004	0	0.122	2.581	1
13.901	14.601	13.201	0.001	0	0.298	1.575	1.001
4.875	5.65	4.1	0.027	0.019	0.381	1.013	1.033
19.401	20.401	18.401	0.971	0.381	0.353	1.01	1
4.9	5	4.8	0	0	0.487	1.058	1.029

7.25	7.4	7.1	0.014	0.001	0.201	1.961	1.001
13.101	14.401	11.8	0.004	0.001	0.388	1.348	1.005
3.925	4.65	3.2	0.001	0.001	0.342	1.043	1
6.1	8.2	4	0.002	0.001	0.321	1.033	1
8.45	9.2	7.7	1.006	0.367	0.486	1.034	1

6.95	8.2	5.7	0.853	0.069	0.223	1.849	1.001
13.501	13.801	13.201	0.007	0.002	0.345	1.42	1.003
3.5	3.75	3.25	0.001	0.001	0.344	1.031	1
6.3	6.2	6.4	0.001	0	0.321	1.023	1
6.9	7.2	6.6	0.606	0.221	0.472	1.042	1

5.4	5.9	4.9	0.049	0.004	0.202	1.955	1.001
14.651	17.501	11.8	0.013	0.003	0.386	1.351	1.005
4.325	4.45	4.2	0.001	0.001	0.342	1.042	1
6.1	6.2	6	0.002	0.001	0.321	1.032	1
8.25	7.7	8.8	0.985	0.359	0.485	1.035	1

6.35	7	5.7	0.013	0.001	0.201	1.963	1.001
16.701	17.301	16.101	0.002	0	0.388	1.349	1.005
4.05	4.45	3.65	0.001	0.001	0.342	1.044	1
5.4	4.4	6.4	0.001	0	0.321	1.033	1
7.8	7.8	7.8	1.036	0.378	0.487	1.034	1

6.95	8.3	5.6	0.748	0.061	0.22	1.864	1.001
14.101	15.501	12.701	0.004	0.001	0.35	1.412	1.003
3.975	4.4	3.55	0.001	0.001	0.344	1.032	1

5.9	6.6	5.2	0.001	0.001	0.321	1.025	1
6.5	6	7	0.653	0.238	0.474	1.041	1

7.75	9.5	6	0.02	0.002	0.2	1.966	1.001
14.851	14.901	14.801	0.003	0.001	0.387	1.351	1.005
4.025	4.2	3.85	0.001	0.001	0.342	1.043	1
6.4	6.2	6.6	0.007	0.003	0.321	1.033	1
7.7	7.7	7.7	1.017	0.371	0.487	1.034	1

6.4	7.6	5.2	0.106	0.009	0.202	1.959	1.001
15.751	17.701	13.801	0.012	0.003	0.381	1.36	1.005
4.175	4.3	4.05	0.001	0.001	0.343	1.041	1
4.8	4.8	4.8	0.02	0.008	0.321	1.031	1
7.35	7.1	7.6	0.942	0.344	0.484	1.036	1

6.9	9.4	4.4	0.089	0.007	0.201	1.96	1.001
16.251	18.501	14.001	0.003	0.001	0.383	1.358	1.005
3.75	4.15	3.35	0.001	0.001	0.342	1.042	1
6.7	8	5.4	0.014	0.005	0.321	1.032	1
7.55	7.5	7.6	0.975	0.356	0.485	1.035	1

6.55	6.9	6.2	0.892	0.072	0.224	1.847	1.001
16.951	23.002	10.9	-0.001	0	0.342	1.425	1.003
3.175	3.65	2.7	0.002	0.001	0.344	1.03	1
5.2	6.4	4	0.002	0.001	0.321	1.023	1
6.75	7	6.5	0.585	0.214	0.472	1.042	1

6.85	8.1	5.6	0.909	0.074	0.224	1.845	1.001
17.301	23.402	11.2	0.002	0.001	0.342	1.427	1.003
3.55	4.15	2.95	0.002	0.001	0.344	1.03	1
6	6.6	5.4	0.003	0.001	0.321	1.023	1
6.05	6.3	5.8	0.572	0.209	0.471	1.042	1

8.05	8.3	7.8	0.082	0.007	0.203	1.951	1.001
17.501	19.801	15.201	0.002	0.001	0.384	1.354	1.005
4.05	4.5	3.6	0	0	0.342	1.041	1
6.2	5.6	6.8	0.004	0.001	0.321	1.031	1
8.2	8	8.4	0.957	0.349	0.485	1.035	1

6.25	7.9	4.6	0.003	0	0.202	1.933	1.001
15.701	20.301	11.1	0.002	0	0.387	1.334	1.004
3.475	3.8	3.15	0	0	0.341	1.03	1

4.6	5	4.2	0.002	0.001	0.318	1.023	1
6	5.8	6.2	0.648	0.236	0.476	1.032	1

7.6	7.2	8	0.067	0.005	0.139	2.404	1.001
19.251	20.401	18.101	0.272	0.065	0.316	1.523	1
5.55	6	5.1	0.002	0.001	0.376	1.016	1.028
18.601	20.601	16.601	0.833	0.327	0.349	1.012	1
6.3	6.7	5.9	0.011	0.004	0.476	1.067	1.02

7.5	8.8	6.2	0.016	0.001	0.114	2.7	1
26.003	35.004	17.001	0.088	0.021	0.288	1.622	1.001
6.65	6.7	6.6	0.003	0.002	0.391	1.016	1.038
22.202	20.001	24.402	1.232	0.484	0.363	1.012	1
8.2	8.3	8.1	0.01	0.004	0.492	1.068	1.028

7.5	10.1	4.9	0.861	0.07	0.217	1.88	1.001
13.551	16.801	10.3	0.023	0.006	0.339	1.435	1.002
3.3	4	2.6	0.002	0.001	0.346	1.029	1.001
6	6.4	5.6	0.057	0.022	0.323	1.022	1
5.1	5.3	4.9	0.53	0.193	0.471	1.044	1.001

5.4	6.3	4.5	0.49	0.04	0.209	1.918	1.001
12.251	14.101	10.4	0.004	0.001	0.358	1.398	1.004
3.35	3.4	3.3	0.004	0.003	0.344	1.034	1.001
5.6	6.2	5	0.034	0.013	0.322	1.026	1
6.85	6.1	7.6	0.723	0.264	0.478	1.039	1.001

5.9	6.6	5.2	0.935	0.076	0.225	1.84	1.001
12.2	12.901	11.5	0.02	0.005	0.341	1.428	1.003
3.15	3.15	3.15	0.001	0.001	0.344	1.029	1
5	6.8	3.2	0.008	0.003	0.321	1.022	1
6.55	6.4	6.7	0.542	0.198	0.47	1.043	1

6.7	7.3	6.1	0.07	0.006	0.14	2.395	1.002
19.451	24.302	14.601	0.308	0.074	0.317	1.521	1
5.075	5.45	4.7	0	0	0.376	1.016	1.027
13.601	15.401	11.8	0.832	0.327	0.349	1.012	1
6.65	6.6	6.7	0.012	0.004	0.475	1.068	1.02

7.15	8	6.3	0.078	0.006	0.153	2.28	1.002
17.751	22.002	13.501	0.42	0.101	0.332	1.48	1
5.25	5.55	4.95	0	0	0.371	1.016	1.023

12.401	13.001	11.8	0.687	0.27	0.345	1.012	1
6.9	7.5	6.3	0.01	0.004	0.468	1.069	1.016

7.1	7.5	6.7	0.017	0.001	0.2	1.966	1.001
13.501	14.301	12.701	0.002	0	0.387	1.35	1.005
3.925	4	3.85	0.001	0.001	0.342	1.043	1
5.6	6.6	4.6	0.008	0.003	0.321	1.033	1
7.7	7.9	7.5	1.005	0.367	0.486	1.034	1

6	6.4	5.6	0.937	0.076	0.224	1.846	1.001
10.6	12.701	8.5	0.002	0.001	0.34	1.431	1.003
2.925	3.15	2.7	0.004	0.003	0.345	1.03	1
5.1	6.4	3.8	0.006	0.002	0.322	1.022	1
5.05	5.2	4.9	0.563	0.205	0.471	1.042	1

6.75	6.9	6.6	0.941	0.076	0.225	1.842	1.001
11.65	13.501	9.8	0.004	0.001	0.34	1.43	1.003
3.325	3.7	2.95	0.004	0.003	0.344	1.029	1
4.2	5	3.4	0.003	0.001	0.321	1.022	1
6.3	6	6.6	0.55	0.201	0.471	1.042	1

6.2	6.5	5.9	0.004	0	0.201	1.962	1.001
13.201	14.201	12.2	0	0	0.389	1.347	1.005
3.725	4.1	3.35	0.001	0.001	0.342	1.043	1
5.9	4.6	7.2	0	0	0.321	1.032	1
6.75	6.8	6.7	1.004	0.366	0.486	1.034	1

7.5	8.6	6.4	0.195	0.016	0.212	1.91	1.002
17.101	21.702	12.501	0.239	0.057	0.383	1.355	1.004
4.1	4.15	4.05	0.001	0.001	0.345	1.037	1.001
5.4	5.4	5.4	0.032	0.013	0.323	1.028	1
6.65	7	6.3	0.74	0.27	0.474	1.046	1.001

7.9	9.8	6	0.011	0.001	0.201	1.961	1.001
16.401	19.701	13.101	0.002	0	0.388	1.348	1.005
4.15	4.75	3.55	0.001	0.001	0.342	1.043	1
5.4	5.2	5.6	0.001	0	0.321	1.033	1
8.35	8	8.7	1.009	0.368	0.486	1.034	1

8.2	10.2	6.2	0.893	0.072	0.222	1.852	1.001
13.401	15.901	10.9	0.001	0	0.341	1.427	1.003
3.875	3.95	3.8	0.002	0.001	0.344	1.029	1

6.4	7	5.8	0.012	0.005	0.321	1.022	1
4.95	4.3	5.6	0.558	0.204	0.471	1.042	1

6.7	7.4	6	0.013	0.001	0.201	1.96	1.001
13.701	15.701	11.7	0.002	0	0.388	1.348	1.005
3.725	3.8	3.65	0.001	0.001	0.342	1.042	1
5.4	5.4	5.4	0.001	0	0.321	1.032	1
7.35	6.8	7.9	0.996	0.364	0.486	1.034	1

6.5	7.6	5.4	0.005	0	0.201	1.961	1.001
13.151	15.001	11.3	0.004	0.001	0.389	1.347	1.005
3.85	3.65	4.05	0.002	0.001	0.342	1.043	1
5.9	6.4	5.4	0.001	0	0.321	1.032	1
8.15	7.7	8.6	1.003	0.366	0.486	1.034	1

5.65	5.8	0.006	0	0.201	1.962	1.001
13.601	15.701	0.002	0	0.388	1.347	1.005
4.5	4.85	0	0	0.342	1.043	1
6.1	4.6	0.003	0.001	0.321	1.032	1
7.4	6.9	1.003	0.366	0.486	1.034	1

6.7	7.3	0.943	0.077	0.225	1.84	1.001
11.55	13.001	0.004	0.001	0.34	1.429	1.003
3.8	3.7	0.002	0.001	0.344	1.029	1
4.8	6.2	0.003	0.001	0.321	1.022	1
6.3	6	0.553	0.202	0.471	1.042	1

6.85	7.8	5.9	0.668	0.054	0.218	1.873	1.001
12.851	15.101	10.6	0.035	0.008	0.353	1.405	1.003
3.5	3.7	3.3	0.002	0.001	0.344	1.032	1
4.4	5.4	3.4	0.012	0.005	0.321	1.024	1
6.65	7.5	5.8	0.635	0.232	0.473	1.041	1

7.15	7.9	6.4	0.691	0.056	0.219	1.867	1.001
14.451	16.801	12.1	0.054	0.013	0.353	1.406	1.003
3.375	4	2.75	0.002	0.002	0.344	1.031	1
4.6	5.2	4	0.013	0.005	0.322	1.024	1
6	6.1	5.9	0.616	0.225	0.472	1.042	1

5.85	6.7	5	0.872	0.071	0.22	1.862	1.001
10.6	11.2	10	0.001	0	0.341	1.429	1.003
3.8	4.45	3.15	0.003	0.003	0.345	1.029	1

5.1	5.8	4.4	0.023	0.009	0.322	1.022	1
6.45	6.6	6.3	0.547	0.2	0.471	1.042	1.001

6.95	8.1	5.8	0.006	0.001	0.201	1.96	1.001
13.501	14.301	12.701	0.001	0	0.389	1.347	1.005
3.675	4.55	2.8	0.001	0.001	0.341	1.042	1
6.1	7	5.2	0	0	0.321	1.032	1
8.3	8.6	8	0.998	0.364	0.486	1.034	1

6.75	7.2	6.3	0.858	0.07	0.219	1.865	1.001
10.5	11.4	9.6	0.002	0.001	0.341	1.428	1.003
3.7	4.25	3.15	0.004	0.003	0.345	1.029	1.001
6.3	7.8	4.8	0.027	0.011	0.322	1.022	1
5.7	6	5.4	0.537	0.196	0.471	1.042	1.001

6.2	7.4	5	0.927	0.075	0.225	1.842	1.001
11.5	11.9	11.1	0.008	0.002	0.34	1.428	1.003
3.5	3.7	3.3	0.003	0.002	0.344	1.029	1
5	5.8	4.2	0.004	0.002	0.321	1.022	1
5.95	5.6	6.3	0.541	0.197	0.47	1.042	1

5.8	6.9	4.7	0.009	0.001	0.201	1.96	1.001
14.451	15.001	13.901	0	0	0.388	1.347	1.005
4.1	3.85	4.35	0.001	0.001	0.341	1.042	1
5.4	4.4	6.4	0.002	0.001	0.321	1.032	1
8.85	9.6	8.1	0.973	0.355	0.485	1.034	1

5.75	7	4.5	0.939	0.076	0.225	1.841	1.001
13.601	16.501	10.7	0.005	0.001	0.339	1.429	1.002
3.6	4.05	3.15	0.005	0.003	0.344	1.028	1
5.1	4.8	5.4	0.004	0.002	0.321	1.021	1
6.8	6.8	6.8	0.518	0.189	0.47	1.042	1

6.25	6.6	5.9	0.1	0.008	0.203	1.946	1.001
13.951	14.601	13.301	0	0	0.383	1.354	1.005
3.4	3.7	3.1	0.001	0.001	0.342	1.04	1
5	5.6	4.4	0	0	0.32	1.031	1
8.7	7.2	10.2	0.926	0.338	0.484	1.034	1

6.4	7.9	4.9	1.147	0.093	0.23	1.821	1.001
11.55	14.601	8.5	0.008	0.002	0.331	1.449	1.002
3.15	3.3	3	0.002	0.002	0.345	1.029	1

4.4	5.2	3.6	0.004	0.002	0.322	1.022	1
5.1	5.7	4.5	0.525	0.192	0.469	1.045	1

7.75	8.5	7	1.126	0.091	0.218	1.882	1.001
11.95	14.501	9.4	0	0	0.324	1.473	1.002
3.75	3.75	3.75	0.002	0.001	0.348	1.03	1.002
5.3	4.6	6	0.089	0.035	0.325	1.023	1
5.55	5.4	5.7	0.55	0.201	0.472	1.047	1.002

6.9	7.3	6.5	0.243	0.02	0.207	1.936	1.001
12.751	13.401	12.1	0	0	0.376	1.37	1.005
3.675	4.3	3.05	0.001	0.001	0.342	1.042	1
4.6	4.4	4.8	0.001	0	0.321	1.032	1
7.65	8.1	7.2	0.968	0.353	0.484	1.036	1

6.65	8.3	5	0	0	0.201	1.959	1.001
13.101	14.601	11.6	0	0	0.389	1.345	1.005
3.35	3.85	2.85	0.001	0.001	0.341	1.041	1
4.7	5	4.4	0.001	0	0.32	1.032	1
7	6.6	7.4	0.968	0.353	0.485	1.034	1

5.55	6.4	4.7	1.002	0.081	0.227	1.83	1.001
11.15	13.601	8.7	0	0	0.338	1.433	1.002
3.425	3.8	3.05	0	0	0.344	1.028	1
4.3	3.8	4.8	0.001	0.001	0.321	1.021	1
6.15	6.6	5.7	0.526	0.192	0.47	1.042	1

5.45	6.6	4.3	0.997	0.081	0.227	1.83	1.001
11.7	13.601	9.8	0	0	0.338	1.432	1.002
3.225	4.25	2.2	0	0	0.344	1.028	1
5.1	5.6	4.6	0.001	0.001	0.321	1.021	1
6.25	7.8	4.7	0.52	0.19	0.469	1.042	1

5.5	6.6	4.4	0.005	0	0.122	2.57	1
14.251	14.301	14.201	0	0	0.299	1.571	1.001
5.275	6.25	4.3	0.027	0.019	0.38	1.013	1.033
17.801	19.601	16.001	0.954	0.375	0.353	1.01	1
6.65	7.2	6.1	0	0	0.487	1.057	1.028

6	7.2	4.8	0.005	0	0.122	2.582	1
13.451	13.701	13.201	0	0	0.298	1.575	1.001
4.175	4.45	3.9	0.027	0.019	0.381	1.013	1.033

17.601	18.601	16.601	0.972	0.382	0.353	1.01	1
5.5	5.4	5.6	0.001	0	0.487	1.058	1.028

Wt% Oxide	Formula	CO2	SiO2	MgO	CaO	MnO	FeO	Total	O=	Total	X	Y	Z	Comment
1 / 1 .	44.342	0.033	0.019	55.473	0.106	0.027	100	0	100	100	-19376	-5309	34	CaCO3-01
2 / 1 .	43.737	0.016	0.046	56.028	0.128	0.046	100	0	100	100	-19399	-5306	35	CaCO3-02
3 / 1 .	43.583	0.014	0.002	56.254	0.144	0	99.997	0	99.997	100	-19417	-5310	36	CaCO3-03
4 / 1 .	44.314	0.021	0.012	55.497	0.133	0	99.977	0	99.977	100	-19423	-5287	33	CaCO3-04
5 / 1 .	47.551	0.029	21.477	30.863	0.039	0.042	100	0	100	-20703	-1581	45	MgCO3-01	
6 / 1 .	47.677	0	21.585	30.664	0.007	0.038	99.972	0	99.972	-20724	-1603	45	MgCO3-02	
7 / 1 .	47.293	0	21.814	30.855	0.001	0.031	99.995	0	99.995	-20728	-1637	45	MgCO3-03	
8 / 1 .	47.446	0.006	21.571	30.865	0.02	0.092	100	0	100	-20759	-1640	45	MgCO3-04	
9 / 1 .	38.244	0.029	0.146	0.018	2.695	58.868	100	0	100	-15565	-6756	32	FeCO3-01	
10 / 1 .	37.993	0.009	0.11	0.005	2.869	59.015	100	0	100	-15544	-6752	32	FeCO3-02	
11 / 1 .	37.451	0.041	0.128	0.023	2.857	59.5	100	0	100	-15511	-6769	32	FeCO3-03	
12 / 1 .	38.57	0.022	0.162	0.009	2.802	58.436	100	0	100	-15497	-6791	30	FeCO3-04	
13 / 1 .	47.817	0.253	19.782	30.638	0.556	0.954	100	0	100	266	37776	37776	43	911-4-cher
14 / 1 .	48.272	0	20.397	28.463	0.106	2.76	99.998	0	99.998	310	37807	37807	40	911-4-cher
15 / 1 .	47.077	5.269	16.361	28.007	0.167	3.119	100	0	100	298	37794	37794	40	911-4-cher
16 / 1 .	47.306	0.104	17.55	31.622	0.063	3.356	100	0	100	-3599	33872	33872	48	911-4-cher
17 / 1 .	48.45	0.035	17.612	30.671	0.165	3.067	100	0	100	-3605	33898	33898	52	911-4-cher
18 / 1 .	47.957	0.957	19.816	30.066	0.554	0.649	100	0	100	-3681	33867	33867	51	911-4-cher
19 / 1 .	50.044	0.753	17.099	29.022	0.106	2.976	100	0	100	8366	37420	37420	50	911-4-cher
20 / 1 .	47.975	0.111	17.399	31.251	0.182	3.082	100	0	100	8434	37499	37499	54	911-4-cher
21 / 1 .	47.995	0.056	17.482	31.378	0.126	2.963	100	0	100	-2021	36612	36612	47	911-4-cher
22 / 1 .	48.003	0.137	20.169	30.784	0.466	0.44	100	0	100	-2022	36573	36573	46	911-4-cher
23 / 1 .	47.527	0.096	17.812	31.486	0.104	2.976	100	0	100	-2244	36654	36654	44	911-4-cher
24 / 1 .	47.396	0.05	18.033	31.665	0.138	2.717	100	0	100	-2148	36662	36662	44	911-4-cher
25 / 1 .	48.064	0.201	17.777	30.958	0.213	2.787	100	0	100	-2194	36664	36664	46	911-4-cher
26 / 1 .	39.311	1.925	19.914	35.127	0.162	3.561	100	0	100	-1347	36477	36477	47	911-4-cher
27 / 1 .	47.594	0.128	19.814	31.457	0.405	0.602	100	0	100	-1352	36430	36430	46	911-4-cher
28 / 1 .	47.284	1.478	19.656	30.427	0.526	0.63	100	0	100	-1341	36366	36366	46	911-4-cher
29 / 1 .	47.33	1.514	19.553	30.413	0.481	0.71	100	0	100	-1341	36366	36366	46	911-4-cher
30 / 1 .	47.999	0.214	17.686	32.139	0.264	1.697	100	0	100	-1375	36377	36377	46	911-4-cher
31 / 1 .	48.377	0.262	17.373	30.959	0.156	2.874	100	0	100	273	37601	37601	47	911-4-cher
32 / 1 .	47.541	0.064	19.047	31.994	0.332	1.022	100	0	100	268	37555	37555	46	911-4-cher
33 / 1 .	48.518	0.351	17.793	30.052	0.348	2.937	100	0	100	303	37558	37558	49	911-4-cher
34 / 1 .	43.125	0.13	0.11	56.345	0.197	0.093	100	0	100	-3481	-28562	-28562	-35	911-13-che

35 / 1 .	43.099	2.173	0.202	54.07	0.142	0.315	100	0	100	-3539	-28636	-36 911-13-che
36 / 1 .	45.337	5.344	17.219	28.994	0.332	2.774	100	0	100	-3491	-28602	-34 911-13-che
37 / 1 .	46.985	0.323	20.228	31.49	0.377	0.597	100	0	100	-3457	-28604	-36 911-13-che
38 / 1 .	42.012	9.093	1.275	47.406	0	0.213	99.998	0	99.998	-4088	-28477	-33 911-13-che
39 / 1 .	42.961	3.496	1.107	52.41	0	0.024	99.998	0	99.998	-4066	-28494	-33 911-13-che
40 / 1 .	45.36	1.788	13.779	34.49	0.338	4.244	100	0	100	-4091	-28494	-33 911-13-che
41 / 1 .	45.827	0.311	14.333	34.667	0.367	4.494	100	0	100	-4072	-28511	-34 911-13-che
42 / 1 .	42.356	2.149	3.481	51.566	0.174	0.274	100	0	100	-4099	-28529	-32 911-13-che
43 / 1 .	47.456	0.176	19.514	31.1	0.369	1.384	100	0	100	-4210	-28261	-33 911-13-che
44 / 1 .	47.379	0.38	19.604	31.05	0.63	0.957	100	0	100	-4189	-28248	-32 911-13-che
45 / 1 .	45.169	7.935	14.588	27.325	0.377	4.606	100	0	100	-4222	-28305	-33 911-13-che
46 / 1 .	46.747	0.348	20.086	31.954	0.384	0.482	100	0	100	-4147	-28317	-32 911-13-che
47 / 1 .	47.246	0.108	19.463	31.768	0.336	1.079	100	0	100	-4176	-28324	-33 911-13-che
48 / 1 .	43.364	0.186	0.097	56.103	0.197	0.053	100	0	100	-4188	-26725	-32 911-13-che
49 / 1 .	43.062	0.052	0.079	56.632	0.122	0.053	100	0	100	-4197	-26660	-31 911-13-che
50 / 1 .	43.165	5.88	0.295	50.223	0.155	0.281	100	0	100	-4176	-26792	-32 911-13-che
51 / 1 .	43.142	0.023	0.139	56.328	0.188	0.18	100	0	100	-3503	-27338	-36 911-13-che
52 / 1 .	47.341	0.251	19.622	31.371	0.791	0.624	100	0	100	-3438	-27283	-35 911-13-che
53 / 1 .	43.24	0.018	0.138	56.127	0.129	0.348	100	0	100	-3523	-27391	-36 911-13-che
54 / 1 .	47.293	0.353	19.629	31.327	0.611	0.788	100	0	100	-3629	-27319	-34 911-13-che
55 / 1 .	44.247	0.034	0.004	55.518	0.125	0.072	100	0	100	-19424	-5257	39 CaCO3-05
56 / 1 .	43.885	0.008	0.018	55.923	0.14	0.027	100	0	100	-19391	-5255	39 CaCO3-06
57 / 1 .	44.118	0.016	0.01	55.702	0.134	0	99.981	0	99.981	-19366	-5245	39 CaCO3-07
58 / 1 .	44.08	0.019	0	55.663	0.169	0	99.93	0	99.93	-19343	-5237	39 CaCO3-08
59 / 1 .	47.763	0.013	21.429	30.709	0.009	0.077	100	0	100	-20808	-1622	49 MgCO3-05
60 / 1 .	47.644	0.008	21.493	30.73	0.013	0.111	100	0	100	-20801	-1587	48 MgCO3-06
61 / 1 .	38.306	0.037	0.087	0.015	2.694	58.861	100	0	100	-15527	-6830	34 FeCO3-05
62 / 1 .	38.503	0.023	0.129	0.011	2.723	58.611	100	0	100	-15519	-6868	34 FeCO3-06

Point#	Date	Geo Specie
1	2012-05-18 14:33	Carbonate (on the basis of 6 O)
2	2012-05-18 14:35	Carbonate (on the basis of 6 O)
3	2012-05-18 14:38	Carbonate (on the basis of 6 O)
4	2012-05-18 14:40	Carbonate (on the basis of 6 O)
5	2012-05-18 14:43	Carbonate (on the basis of 6 O)
6	2012-05-18 14:45	Carbonate (on the basis of 6 O)
7	2012-05-18 14:48	Carbonate (on the basis of 6 O)
8	2012-05-18 14:51	Carbonate (on the basis of 6 O)
9	2012-05-18 14:53	Carbonate (on the basis of 6 O)
10	2012-05-18 14:56	Carbonate (on the basis of 6 O)
11	2012-05-18 14:58	Carbonate (on the basis of 6 O)
12	2012-05-18 15:01	Carbonate (on the basis of 6 O)
13	2012-05-18 15:04	Carbonate (on the basis of 6 O)
14	2012-05-18 15:06	Carbonate (on the basis of 6 O)
15	2012-05-18 15:09	Carbonate (on the basis of 6 O)
16	2012-05-18 15:12	Carbonate (on the basis of 6 O)
17	2012-05-18 15:14	Carbonate (on the basis of 6 O)
18	2012-05-18 15:17	Carbonate (on the basis of 6 O)
19	2012-05-18 15:19	Carbonate (on the basis of 6 O)
20	2012-05-18 15:22	Carbonate (on the basis of 6 O)
21	2012-05-18 15:25	Carbonate (on the basis of 6 O)
22	2012-05-18 15:27	Carbonate (on the basis of 6 O)
23	2012-05-18 15:30	Carbonate (on the basis of 6 O)
24	2012-05-18 15:32	Carbonate (on the basis of 6 O)
25	2012-05-18 15:35	Carbonate (on the basis of 6 O)
26	2012-05-18 15:37	Carbonate (on the basis of 6 O)
27	2012-05-18 15:40	Carbonate (on the basis of 6 O)
28	2012-05-18 15:43	Carbonate (on the basis of 6 O)
29	2012-05-18 15:45	Carbonate (on the basis of 6 O)
30	2012-05-18 15:48	Carbonate (on the basis of 6 O)
31	2012-05-18 15:50	Carbonate (on the basis of 6 O)
32	2012-05-18 15:53	Carbonate (on the basis of 6 O)
33	2012-05-18 15:55	Carbonate (on the basis of 6 O)
34	2012-05-18 15:58	Carbonate (on the basis of 6 O)

35 2012-05-18 16:01 Carbonate (on the basis of 6 O)
36 2012-05-18 16:03 Carbonate (on the basis of 6 O)
37 2012-05-18 16:06 Carbonate (on the basis of 6 O)
38 2012-05-18 16:08 Carbonate (on the basis of 6 O)
39 2012-05-18 16:11 Carbonate (on the basis of 6 O)
40 2012-05-18 16:14 Carbonate (on the basis of 6 O)
41 2012-05-18 16:16 Carbonate (on the basis of 6 O)
42 2012-05-18 16:19 Carbonate (on the basis of 6 O)
43 2012-05-18 16:21 Carbonate (on the basis of 6 O)
44 2012-05-18 16:24 Carbonate (on the basis of 6 O)
45 2012-05-18 16:26 Carbonate (on the basis of 6 O)
46 2012-05-18 16:29 Carbonate (on the basis of 6 O)
47 2012-05-18 16:32 Carbonate (on the basis of 6 O)
48 2012-05-18 16:34 Carbonate (on the basis of 6 O)
49 2012-05-18 16:37 Carbonate (on the basis of 6 O)
50 2012-05-18 16:39 Carbonate (on the basis of 6 O)
51 2012-05-18 16:42 Carbonate (on the basis of 6 O)
52 2012-05-18 16:45 Carbonate (on the basis of 6 O)
53 2012-05-18 16:47 Carbonate (on the basis of 6 O)
54 2012-05-18 16:50 Carbonate (on the basis of 6 O)
55 2012-05-18 16:52 Carbonate (on the basis of 6 O)
56 2012-05-18 16:55 Carbonate (on the basis of 6 O)
57 2012-05-18 16:57 Carbonate (on the basis of 6 O)
58 2012-05-18 17:00 Carbonate (on the basis of 6 O)
59 2012-05-18 17:02 Carbonate (on the basis of 6 O)
60 2012-05-18 17:05 Carbonate (on the basis of 6 O)
61 2012-05-18 17:08 Carbonate (on the basis of 6 O)
62 2012-05-18 17:10 Carbonate (on the basis of 6 O)

When carbonate is analyzed, the elements Si, S, Mg, Ca, Mn, Fe, Sr, and Ba are analyzed directly, and O is determined stoichiometrically for each element. Then, CO2 is assigned to make up the difference between the analytical total of above oxides and a total of 100%. This is done in order to have an appropriate ZAF correction

To get back to a true analytical total, recalculate MgO, CaO, MnO, FeO, SrO (and BaO if appropriate) as carbonate. (see "recalculated as carbonate" area of worksheet)
 To do this, paste your data (and comments) into the "raw data" area. The recalculations will happen automatically

Raw data, normalized to 100%, CO2 by difference

Wt% Oxide	CO2	SiO2	SO2	MgO	CaO	MnO	FeO	SrO	BaO	Total
Comment										
CaCO3-01	44.34	0.03		0.02	55.47	0.11	0.03			100.00
CaCO3-02	43.74	0.02		0.05	56.03	0.13	0.05			100.00
CaCO3-03	43.58	0.01		0.00	56.25	0.14	0.00			100.00
CaCO3-04	44.31	0.02		0.01	55.50	0.13	0.00			99.98
MgCO3-01	47.55	0.03		21.48	30.86	0.04	0.04			100.00
MgCO3-02	47.68	0.00		21.59	30.66	0.01	0.04			99.97
MgCO3-03	47.29	0.00		21.81	30.86	0.00	0.03			100.00
MgCO3-04	47.45	0.01		21.57	30.87	0.02	0.09			100.00
FeCO3-01	38.24	0.03		0.15	0.02	2.70	58.87			100.00
FeCO3-02	37.99	0.01		0.11	0.01	2.87	59.02			100.00
FeCO3-03	37.45	0.04		0.13	0.02	2.86	59.50			100.00
FeCO3-04	38.57	0.02		0.16	0.01	2.80	58.44			100.00
911-4-chem-1	47.82	0.25		19.78	30.64	0.56	0.95			100.00
911-4-chem-2	48.27	0.00		20.40	28.46	0.11	2.76			100.00
911-4-chem-3	47.08	5.27		16.36	28.01	0.17	3.12			100.00
911-4-chem-4	47.31	0.10		17.55	31.62	0.06	3.36			100.00
911-4-chem-5	48.45	0.04		17.61	30.67	0.17	3.07			100.00
911-4-chem-6	47.96	0.96		19.82	30.07	0.55	0.65			100.00
911-4-chem-7	50.04	0.75		17.10	29.02	0.11	2.98			100.00
911-4-chem-8	47.98	0.11		17.40	31.25	0.18	3.08			100.00
911-4-chem-9	48.00	0.06		17.48	31.38	0.13	2.96			100.00
911-4-chem-10	48.00	0.14		20.17	30.78	0.47	0.44			100.00
911-4-chem-11	47.53	0.10		17.81	31.49	0.10	2.98			100.00
911-4-chem-12	47.40	0.05		18.03	31.67	0.14	2.72			100.00
911-4-chem-13	48.06	0.20		17.78	30.96	0.21	2.79			100.00
911-4-chem-14	39.31	1.93		19.91	35.13	0.16	3.56			100.00
911-4-chem-15	47.59	0.13		19.81	31.46	0.41	0.60			100.00
911-4-chem-16	47.28	1.48		19.66	30.43	0.53	0.63			100.00
911-4-chem-17	47.33	1.51		19.55	30.41	0.48	0.71			100.00
911-4-chem-18	48.00	0.21		17.69	32.14	0.26	1.70			100.00
911-4-chem-19	48.38	0.26		17.37	30.96	0.16	2.87			100.00
911-4-chem-20	47.54	0.06		19.05	31.99	0.33	1.02			100.00
911-4-chem-21	48.52	0.35		17.79	30.05	0.35	2.94			100.00

911-13-chem-1	43.13	0.13	0.11	56.35	0.20	0.09	100.00
911-13-chem-2	43.10	2.17	0.20	54.07	0.14	0.32	100.00
911-13-chem-3	45.34	5.34	17.22	28.99	0.33	2.77	100.00
911-13-chem-4	46.99	0.32	20.23	31.49	0.38	0.60	100.00
911-13-chem-5	42.01	9.09	1.28	47.41	0.00	0.21	100.00
911-13-chem-6	42.96	3.50	1.11	52.41	0.00	0.02	100.00
911-13-chem-7	45.36	1.79	13.78	34.49	0.34	4.24	100.00
911-13-chem-8	45.83	0.31	14.33	34.67	0.37	4.49	100.00
911-13-chem-9	42.36	2.15	3.48	51.57	0.17	0.27	100.00
911-13-chem-10	47.46	0.18	19.51	31.10	0.37	1.38	100.00
911-13-chem-11	47.38	0.38	19.60	31.05	0.63	0.96	100.00
911-13-chem-12	45.17	7.94	14.59	27.33	0.38	4.61	100.00
911-13-chem-13	46.75	0.35	20.09	31.95	0.38	0.48	100.00
911-13-chem-14	47.25	0.11	19.46	31.77	0.34	1.08	100.00
911-13-chem-15	43.36	0.19	0.10	56.10	0.20	0.05	100.00
911-13-chem-16	43.06	0.05	0.08	56.63	0.12	0.05	100.00
911-13-chem-17	43.17	5.88	0.30	50.22	0.16	0.28	100.00
911-13-chem-18	43.14	0.02	0.14	56.33	0.19	0.18	100.00
911-13-chem-19	47.34	0.25	19.62	31.37	0.79	0.62	100.00
911-13-chem-20	43.24	0.02	0.14	56.13	0.13	0.35	100.00
911-13-chem-21	47.29	0.35	19.63	31.33	0.61	0.79	100.00
CaCO3-05	44.25	0.03	0.00	55.52	0.13	0.07	100.00
CaCO3-06	43.89	0.01	0.02	55.92	0.14	0.03	100.00
CaCO3-07	44.12	0.02	0.01	55.70	0.13	0.00	99.98
CaCO3-08	44.08	0.02	0.00	55.66	0.17	0.00	99.93
MgCO3-05	47.76	0.01	21.43	30.71	0.01	0.08	100.00
MgCO3-06	47.64	0.01	21.49	30.73	0.01	0.11	100.00
FeCO3-05	38.31	0.04	0.09	0.02	2.69	58.86	100.00
FeCO3-06	38.50	0.02	0.13	0.01	2.72	58.61	100.00

Recalculated as carbonate (non-normalized)

Comment	SiO2	SO2	MgCO3	CaCO3	MnCO3	FeCO3	SrCO3	BaCO3	Total	Comment
CaCO3-01	0.03		0.04	99.06	0.17	0.04			99.35	CaCO3-01
CaCO3-02	0.02		0.10	100.05	0.21	0.07			100.44	CaCO3-02
CaCO3-03	0.01		0.00	100.45	0.23	0.00			100.71	CaCO3-03
CaCO3-04	0.02		0.03	99.10	0.22	0.00			99.36	CaCO3-04
MgCO3-01	0.03		44.93	55.11	0.06	0.07			100.20	MgCO3-01
MgCO3-02	0.00		45.15	54.76	0.01	0.06			99.98	MgCO3-02
MgCO3-03	0.00		45.63	55.10	0.00	0.05			100.78	MgCO3-03
MgCO3-04	0.01		45.12	55.12	0.03	0.15			100.43	MgCO3-04
FeCO3-01	0.03		0.31	0.03	4.37	94.92			99.65	FeCO3-01
FeCO3-02	0.01		0.23	0.01	4.65	95.16			100.05	FeCO3-02
FeCO3-03	0.04		0.27	0.04	4.63	95.94			100.92	FeCO3-03
FeCO3-04	0.02		0.34	0.02	4.54	94.22			99.14	FeCO3-04
911-4-chem-1	0.25		41.38	54.71	0.90	1.54			98.78	911-4-chem-1
911-4-chem-2	0.00		42.67	50.83	0.17	4.45			98.12	911-4-chem-2
911-4-chem-3	5.27		34.22	50.01	0.27	5.03			94.81	911-4-chem-3
911-4-chem-4	0.10		36.71	56.47	0.10	5.41			98.80	911-4-chem-4
911-4-chem-5	0.04		36.84	54.77	0.27	4.95			96.86	911-4-chem-5
911-4-chem-6	0.96		41.45	53.69	0.90	1.05			98.04	911-4-chem-6
911-4-chem-7	0.75		35.77	51.83	0.17	4.80			93.32	911-4-chem-7
911-4-chem-8	0.11		36.40	55.81	0.29	4.97			97.58	911-4-chem-8
911-4-chem-9	0.06		36.57	56.03	0.20	4.78			97.64	911-4-chem-9
911-4-chem-10	0.14		42.19	54.97	0.76	0.71			98.76	911-4-chem-10
911-4-chem-11	0.10		37.26	56.23	0.17	4.80			98.55	911-4-chem-11
911-4-chem-12	0.05		37.72	56.54	0.22	4.38			98.92	911-4-chem-12
911-4-chem-13	0.20		37.19	55.28	0.35	4.49			97.51	911-4-chem-13
911-4-chem-14	1.93		41.66	62.73	0.26	5.74			112.31	911-4-chem-14
911-4-chem-15	0.13		41.45	56.17	0.66	0.97			99.38	911-4-chem-15
911-4-chem-16	1.48		41.12	54.33	0.85	1.02			98.80	911-4-chem-16
911-4-chem-17	1.51		40.90	54.31	0.78	1.14			98.65	911-4-chem-17
911-4-chem-18	0.21		37.00	57.39	0.43	2.74			97.76	911-4-chem-18
911-4-chem-19	0.26		36.34	55.28	0.25	4.63			96.77	911-4-chem-19
911-4-chem-20	0.06		39.84	57.13	0.54	1.65			99.22	911-4-chem-20
911-4-chem-21	0.35		37.22	53.66	0.56	4.74			96.53	911-4-chem-21

911-13-chem-1	0.13	0.23	100.62	0.32	0.15	101.45	911-13-chem-1
911-13-chem-2	2.17	0.42	96.55	0.23	0.51	99.89	911-13-chem-2
911-13-chem-3	5.34	36.02	51.78	0.54	4.47	98.15	911-13-chem-3
911-13-chem-4	0.32	42.31	56.23	0.61	0.96	100.44	911-13-chem-4
911-13-chem-5	9.09	2.67	84.65	0.00	0.34	96.76	911-13-chem-5
911-13-chem-6	3.50	2.32	93.59	0.00	0.04	99.44	911-13-chem-6
911-13-chem-7	1.79	28.82	61.59	0.55	6.84	99.59	911-13-chem-7
911-13-chem-8	0.31	29.98	61.91	0.59	7.25	100.04	911-13-chem-8
911-13-chem-9	2.15	7.28	92.08	0.28	0.44	102.24	911-13-chem-9
911-13-chem-10	0.18	40.82	55.54	0.60	2.23	99.36	911-13-chem-10
911-13-chem-11	0.38	41.01	55.45	1.02	1.54	99.40	911-13-chem-11
911-13-chem-12	7.94	30.52	48.79	0.61	7.43	95.28	911-13-chem-12
911-13-chem-13	0.35	42.02	57.06	0.62	0.78	100.82	911-13-chem-13
911-13-chem-14	0.11	40.71	56.73	0.54	1.74	99.83	911-13-chem-14
911-13-chem-15	0.19	0.20	100.18	0.32	0.09	100.98	911-13-chem-15
911-13-chem-16	0.05	0.17	101.13	0.20	0.09	101.63	911-13-chem-16
911-13-chem-17	5.88	0.62	89.68	0.25	0.45	96.89	911-13-chem-17
911-13-chem-18	0.02	0.29	100.59	0.30	0.29	101.49	911-13-chem-18
911-13-chem-19	0.25	41.05	56.02	1.28	1.01	99.60	911-13-chem-19
911-13-chem-20	0.02	0.29	100.23	0.21	0.56	101.30	911-13-chem-20
911-13-chem-21	0.35	41.06	55.94	0.99	1.27	99.61	911-13-chem-21
CaCO3-05	0.03	0.01	99.14	0.20	0.12	99.50	CaCO3-05
CaCO3-06	0.01	0.04	99.86	0.23	0.04	100.18	CaCO3-06
CaCO3-07	0.02	0.02	99.47	0.22	0.00	99.72	CaCO3-07
CaCO3-08	0.02	0.00	99.40	0.27	0.00	99.69	CaCO3-08
MgCO3-05	0.01	44.83	54.84	0.01	0.12	99.81	MgCO3-05
MgCO3-06	0.01	44.96	54.88	0.02	0.18	100.04	MgCO3-06
FeCO3-05	0.04	0.18	0.03	4.36	94.91	99.52	FeCO3-05
FeCO3-06	0.02	0.27	0.02	4.41	94.50	99.23	FeCO3-06

Recalculated as carbonate (normalized to 100%)

SiO2	SO2	MgCO3	CaCO3	MnCO3	FeCO3	SrCO3	BaCO3	Total
0.03	0.00	0.04	99.71	0.17	0.04	0.00	0.00	100.00
0.02	0.00	0.10	99.61	0.21	0.07	0.00	0.00	100.00
0.01	0.00	0.00	99.75	0.23	0.00	0.00	0.00	100.00
0.02	0.00	0.03	99.74	0.22	0.00	0.00	0.00	100.00
0.03	0.00	44.84	55.00	0.06	0.07	0.00	0.00	100.00
0.00	0.00	45.16	54.77	0.01	0.06	0.00	0.00	100.00
0.00	0.00	45.28	54.67	0.00	0.05	0.00	0.00	100.00
0.01	0.00	44.93	54.88	0.03	0.15	0.00	0.00	100.00
0.03	0.00	0.31	0.03	4.38	95.25	0.00	0.00	100.00
0.01	0.00	0.23	0.01	4.65	95.11	0.00	0.00	100.00
0.04	0.00	0.27	0.04	4.59	95.07	0.00	0.00	100.00
0.02	0.00	0.34	0.02	4.58	95.04	0.00	0.00	100.00
0.26	0.00	41.89	55.38	0.91	1.56	0.00	0.00	100.00
0.00	0.00	43.49	51.80	0.18	4.54	0.00	0.00	100.00
5.56	0.00	36.10	52.75	0.29	5.30	0.00	0.00	100.00
0.11	0.00	37.16	57.16	0.10	5.48	0.00	0.00	100.00
0.04	0.00	38.04	56.55	0.28	5.11	0.00	0.00	100.00
0.98	0.00	42.28	54.76	0.92	1.07	0.00	0.00	100.00
0.81	0.00	38.33	55.54	0.18	5.14	0.00	0.00	100.00
0.11	0.00	37.30	57.19	0.30	5.09	0.00	0.00	100.00
0.06	0.00	37.45	57.39	0.21	4.89	0.00	0.00	100.00
0.14	0.00	42.72	55.66	0.76	0.72	0.00	0.00	100.00
0.10	0.00	37.81	57.05	0.17	4.87	0.00	0.00	100.00
0.05	0.00	38.13	57.16	0.23	4.43	0.00	0.00	100.00
0.21	0.00	38.14	56.69	0.35	4.61	0.00	0.00	100.00
1.71	0.00	37.09	55.85	0.23	5.11	0.00	0.00	100.00
0.13	0.00	41.71	56.53	0.66	0.98	0.00	0.00	100.00
1.50	0.00	41.62	55.00	0.86	1.03	0.00	0.00	100.00
1.53	0.00	41.46	55.05	0.79	1.16	0.00	0.00	100.00
0.22	0.00	37.84	58.70	0.44	2.80	0.00	0.00	100.00
0.27	0.00	37.55	57.13	0.26	4.79	0.00	0.00	100.00
0.06	0.00	40.15	57.58	0.54	1.66	0.00	0.00	100.00
0.36	0.00	38.56	55.59	0.58	4.91	0.00	0.00	100.00

0.13	0.00	0.23	99.18	0.31	0.15	0.00	0.00	100.00
2.18	0.00	0.42	96.66	0.23	0.51	0.00	0.00	100.00
5.44	0.00	36.70	52.75	0.55	4.56	0.00	0.00	100.00
0.32	0.00	42.13	55.98	0.61	0.96	0.00	0.00	100.00
9.40	0.00	2.76	87.49	0.00	0.35	0.00	0.00	100.00
3.52	0.00	2.33	94.12	0.00	0.04	0.00	0.00	100.00
1.80	0.00	28.94	61.84	0.55	6.87	0.00	0.00	100.00
0.31	0.00	29.97	61.88	0.59	7.24	0.00	0.00	100.00
2.10	0.00	7.12	90.07	0.28	0.43	0.00	0.00	100.00
0.18	0.00	41.08	55.89	0.60	2.25	0.00	0.00	100.00
0.38	0.00	41.26	55.78	1.03	1.55	0.00	0.00	100.00
8.33	0.00	32.03	51.21	0.64	7.79	0.00	0.00	100.00
0.35	0.00	41.67	56.59	0.62	0.77	0.00	0.00	100.00
0.11	0.00	40.78	56.82	0.55	1.74	0.00	0.00	100.00
0.18	0.00	0.20	99.21	0.32	0.08	0.00	0.00	100.00
0.05	0.00	0.16	99.51	0.19	0.08	0.00	0.00	100.00
6.07	0.00	0.64	92.57	0.26	0.47	0.00	0.00	100.00
0.02	0.00	0.29	99.10	0.30	0.29	0.00	0.00	100.00
0.25	0.00	41.21	56.24	1.29	1.01	0.00	0.00	100.00
0.02	0.00	0.28	98.94	0.21	0.55	0.00	0.00	100.00
0.35	0.00	41.22	56.16	0.99	1.28	0.00	0.00	100.00
0.03	0.00	0.01	99.64	0.20	0.12	0.00	0.00	100.00
0.01	0.00	0.04	99.68	0.23	0.04	0.00	0.00	100.00
0.02	0.00	0.02	99.75	0.22	0.00	0.00	0.00	100.00
0.02	0.00	0.00	99.71	0.27	0.00	0.00	0.00	100.00
0.01	0.00	44.91	54.94	0.01	0.12	0.00	0.00	100.00
0.01	0.00	44.94	54.85	0.02	0.18	0.00	0.00	100.00
0.04	0.00	0.18	0.03	4.39	95.37	0.00	0.00	100.00
0.02	0.00	0.27	0.02	4.45	95.24	0.00	0.00	100.00

Formula	CO2	SiO2	MgO	CaO	MnO	FeO	O=	Total	X	Y	Z	Comment	Point#
1 / 1 .	43.979	0.015	0.001	55.858	0.085	0	99.938	0	99.938	-19369	-5276	39	CaCO3-01
2 / 1 .	44.09	0.015	0	55.726	0.114	0	99.946	0	99.946	-19340	-5327	40	CaCO3-02
3 / 1 .	43.873	0.01	0.016	55.917	0.157	0	99.973	0	99.973	-19322	-5262	40	CaCO3-03
4 / 1 .	43.714	0	0.018	56.09	0.156	0.01	99.989	0	99.989	-19257	-5270	39	CaCO3-04
5 / 1 .	46.764	0.011	22.258	30.859	0.01	0.099	100	0	100	-20668	-1553	50	MgCO3-01
6 / 1 .	47.094	0.011	22.106	30.739	0.024	0.026	100	0	100	-20630	-1546	51	MgCO3-02
7 / 1 .	46.828	0	22.125	30.942	0.007	0.096	99.997	0	99.997	-20569	-1548	50	MgCO3-03
8 / 1 .	46.837	0.004	22.122	30.958	0.005	0.075	100	0	100	-20515	-1561	50	MgCO3-04
9 / 1 .	38.679	0.029	0.141	0.047	2.837	58.267	100	0	100	-15595	-6752	37	FeCO3-01
10 / 1 .	39.022	0.009	0.12	0.007	2.903	57.939	100	0	100	-15556	-6826	37	FeCO3-02
11 / 1 .	38.59	0.014	0.128	0.005	2.811	58.453	100	0	100	-15520	-6857	36	FeCO3-03
12 / 1 .	39.369	0.047	0.116	0.016	2.903	57.549	100	0	100	-15578	-6801	38	FeCO3-04
13 / 1 .	42.844	0.245	0.327	56.358	0.117	0.109	100	0	100	-1690	27920	56	911-2-01
14 / 1 .	45.696	0.455	18.99	34.729	0.097	0.034	100	0	100	-1696	27895	57	911-2-02
15 / 1 .	42.501	0.841	1.141	55.255	0.109	0.153	100	0	100	-1705	27874	58	911-2-03
16 / 1 .	41.425	0.134	0.304	57.94	0.123	0.074	100	0	100	-1725	27878	59	911-2-04
17 / 1 .	45.397	0.283	16.753	37.308	0.167	0.092	100	0	100	-590	28492	58	911-2-05
18 / 1 .	41.819	0.167	0.455	56.929	0.16	0.471	100	0	100	-582	28509	59	911-2-06
19 / 1 .	42.46	0.793	2.475	52.884	0.087	1.302	100	0	100	-607	28509	59	911-2-07
20 / 1 .	42.047	0.21	2.061	54.645	0.152	0.884	100	0	100	-613	28491	60	911-2-08
21 / 1 .	46.195	0	19.855	33.549	0.205	0.16	99.965	0	99.965	-7	28456	59	911-2-09
22 / 1 .	46.351	0.156	20.225	32.811	0.246	0.21	100	0	100	25	28452	57	911-2-010
23 / 1 .	43.922	0.159	1.901	53.78	0.001	0.236	100	0	100	-14	28426	57	911-2-011
24 / 1 .	62.511	0.121	0.075	37.13	0.021	0.142	100	0	100	75	28427	59	911-2-012
25 / 1 .	28.285	19.212	1.853	0.571	0.197	49.882	100	0	100	61	28456	58	911-2-013
26 / 1 .	21.381	6.401	0.476	0.511	0.295	70.937	100	0	100	-30	28486	61	911-2-014
27 / 1 .	44.778	1.623	19.446	30.278	0.239	3.636	100	0	100	588	28654	59	911-2-015
28 / 1 .	44.946	0.253	11.248	40.96	0.423	2.171	100	0	100	650	28664	59	911-2-016
29 / 1 .	46.05	1.37	20.757	31.146	0.146	0.531	100	0	100	618	28690	59	911-2-017
30 / 1 .	25.952	21.691	1.9	0.648	0.053	49.756	100	0	100	571	28672	58	911-2-018
31 / 1 .	26.589	29.137	2.057	0.56	0.012	41.645	100	0	100	525	28727	59	911-2-019
32 / 1 .	42.508	0.128	0.403	56.295	0.134	0.531	100	0	100	533	28672	60	911-2-020
33 / 1 .	45.802	0.153	20.832	32.283	0.532	0.397	100	0	100	-4286	-27926	-51	911-16-01
34 / 1 .	46.565	0.286	20.904	31.585	0.457	0.204	100	0	100	-4273	-27901	-51	911-16-02

35 / 1 .	43.451	0.006	0.084	56.252	0.177	0.029	100	0	100	-4242	-27924	-50 911-16-03
36 / 1 .	35.776	15.615	4.42	42.004	0.152	2.034	100	0	100	-4326	-27945	-50 911-16-04
37 / 1 .	42.849	0.122	0.268	56.558	0.154	0.05	100	0	100	-9632	-28625	-27 911-16-05
38 / 1 .	46.983	0.064	19.929	32.002	0.225	0.798	100	0	100	-9531	-28552	-27 911-16-06
39 / 1 .	43.5	0.108	0.306	55.868	0.173	0.044	100	0	100	-9502	-28524	-29 911-16-07
40 / 1 .	43.218	0.23	0.121	56.193	0.195	0.044	100	0	100	-9488	-28641	-26 911-16-08
41 / 1 .	43.269	0.123	0.14	56.192	0.059	0.217	100	0	100	-5033	-27641	-44 911-16-09
42 / 1 .	46.636	0.287	20.93	31.749	0.198	0.2	100	0	100	-4947	-27721	-45 911-16-010
43 / 1 .	45.308	2.389	15.04	36.259	0.247	0.757	100	0	100	-4906	-27576	-46 911-16-011
44 / 1 .	44.537	3.682	15.512	35.2	0.265	0.805	100	0	100	-4906	-27576	-45 911-16-012
45 / 1 .	47.142	0.048	19.562	31.355	0.422	1.471	100	0	100	-4939	-27531	-46 911-16-013
46 / 1 .	43.695	0.062	0.15	55.989	0.089	0.015	100	0	100	-5530	-27576	-45 911-16-014
47 / 1 .	47.6	0.168	19.286	30.784	0.435	1.727	100	0	100	-5472	-27656	-44 911-16-015
48 / 1 .	47.075	0.571	20.614	31.082	0.369	0.289	100	0	100	-5397	-27625	-44 911-16-016
49 / 1 .	44.878	0.013	0.198	54.628	0.171	0.111	100	0	100	-5301	-27733	-47 911-16-017
50 / 1 .	48.173	0.336	20.893	29.763	0.573	0.262	100	0	100	-5124	-27685	-48 911-16-018
51 / 1 .	45.353	0	2.319	52.134	0.163	0.029	99.999	0	99.999	-5191	-27685	-48 911-16-019
52 / 1 .	43.546	0.539	25.172	30.19	0.275	0.277	100	0	100	-4182	-28274	-52 911-16-020
53 / 1 .	37.588	0.022	25.263	31.283	0.21	5.634	100	0	100	-4211	-28245	-52 911-16-021
54 / 1 .	39.955	0.005	5.579	54.314	0.103	0.044	100	0	100	-17661	-4315	36 CaCO3-05
55 / 1 .	45.355	0.032	0.007	54.4	0.147	0.059	100	0	100	-17657	-4278	34 CaCO3-06
56 / 1 .	47.493	0	22.158	30.258	0	0.089	99.999	0	99.999	-20720	-1529	52 MgCO3-05
57 / 1 .	47.874	0.001	22.064	29.96	0.005	0.096	100	0	100	-20720	-1524	50 MgCO3-06
58 / 1 .	40.269	0.033	0.152	0	2.856	56.687	99.997	0	99.997	-15607	-6819	36 FeCO3-05
59 / 1 .	39.286	0.035	0.147	0.047	2.861	57.624	100	0	100	-15607	-6849	38 FeCO3-06

Date	Geo Specie
2012-05-17 16:45	Carbonate (on the basis of 6 O)
2012-05-17 16:47	Carbonate (on the basis of 6 O)
2012-05-17 16:50	Carbonate (on the basis of 6 O)
2012-05-17 16:53	Carbonate (on the basis of 6 O)
2012-05-17 16:55	Carbonate (on the basis of 6 O)
2012-05-17 16:58	Carbonate (on the basis of 6 O)
2012-05-17 17:00	Carbonate (on the basis of 6 O)
2012-05-17 17:03	Carbonate (on the basis of 6 O)
2012-05-17 17:06	Carbonate (on the basis of 6 O)
2012-05-17 17:09	Carbonate (on the basis of 6 O)
2012-05-17 17:11	Carbonate (on the basis of 6 O)
2012-05-17 17:14	Carbonate (on the basis of 6 O)
2012-05-17 17:17	Carbonate (on the basis of 6 O)
2012-05-17 17:19	Carbonate (on the basis of 6 O)
2012-05-17 17:22	Carbonate (on the basis of 6 O)
2012-05-17 17:25	Carbonate (on the basis of 6 O)
2012-05-17 17:27	Carbonate (on the basis of 6 O)
2012-05-17 17:30	Carbonate (on the basis of 6 O)
2012-05-17 17:33	Carbonate (on the basis of 6 O)
2012-05-17 17:35	Carbonate (on the basis of 6 O)
2012-05-17 17:38	Carbonate (on the basis of 6 O)
2012-05-17 17:41	Carbonate (on the basis of 6 O)
2012-05-17 17:44	Carbonate (on the basis of 6 O)
2012-05-17 17:46	Carbonate (on the basis of 6 O)
2012-05-17 17:49	Carbonate (on the basis of 6 O)
2012-05-17 17:52	Carbonate (on the basis of 6 O)
2012-05-17 17:54	Carbonate (on the basis of 6 O)
2012-05-17 17:57	Carbonate (on the basis of 6 O)
2012-05-17 18:00	Carbonate (on the basis of 6 O)
2012-05-17 18:02	Carbonate (on the basis of 6 O)
2012-05-17 18:05	Carbonate (on the basis of 6 O)
2012-05-17 18:08	Carbonate (on the basis of 6 O)
2012-05-17 18:11	Carbonate (on the basis of 6 O)
2012-05-17 18:13	Carbonate (on the basis of 6 O)

2012-05-17 18:16 Carbonate (on the basis of 6 O)
2012-05-17 18:19 Carbonate (on the basis of 6 O)
2012-05-17 18:21 Carbonate (on the basis of 6 O)
2012-05-17 18:24 Carbonate (on the basis of 6 O)
2012-05-17 18:27 Carbonate (on the basis of 6 O)
2012-05-17 18:29 Carbonate (on the basis of 6 O)
2012-05-17 18:32 Carbonate (on the basis of 6 O)
2012-05-17 18:35 Carbonate (on the basis of 6 O)
2012-05-17 18:37 Carbonate (on the basis of 6 O)
2012-05-17 18:40 Carbonate (on the basis of 6 O)
2012-05-17 18:42 Carbonate (on the basis of 6 O)
2012-05-17 18:45 Carbonate (on the basis of 6 O)
2012-05-17 18:48 Carbonate (on the basis of 6 O)
2012-05-17 18:50 Carbonate (on the basis of 6 O)
2012-05-18 9:41 Carbonate (on the basis of 6 O)
2012-05-18 9:44 Carbonate (on the basis of 6 O)
2012-05-18 9:46 Carbonate (on the basis of 6 O)
2012-05-18 9:49 Carbonate (on the basis of 6 O)
2012-05-18 9:51 Carbonate (on the basis of 6 O)
2012-05-18 9:54 Carbonate (on the basis of 6 O)
2012-05-18 9:56 Carbonate (on the basis of 6 O)
2012-05-18 9:59 Carbonate (on the basis of 6 O)
2012-05-18 10:02 Carbonate (on the basis of 6 O)
2012-05-18 10:04 Carbonate (on the basis of 6 O)
2012-05-18 10:07 Carbonate (on the basis of 6 O)

Nb of Ions	Formula C	Si	Mg	Ca	Mn	Fe	Total	X	Y	Z	Comment	Point#	Date	Geo Specie
1 / 1.	2.01	0.00	0.00	1.97	0.00	0.00	3.99	-19376.00	-5309.00	34.00	CaCO3-01	1.00		41047.61 Carbonate (on the basis of 6 O)
2 / 1.	1.99	0.00	0.00	2.00	0.00	0.00	4.01	-19399.00	-5306.00	35.00	CaCO3-02	2.00		41047.61 Carbonate (on the basis of 6 O)
3 / 1.	1.99	0.00	0.00	2.02	0.00	0.00	4.01	-19417.00	-5310.00	36.00	CaCO3-03	3.00		41047.61 Carbonate (on the basis of 6 O)
4 / 1.	2.01	0.00	0.00	1.98	0.00	0.00	3.99	-19423.00	-5287.00	33.00	CaCO3-04	4.00		41047.61 Carbonate (on the basis of 6 O)
5 / 1.	2.00	0.00	0.99	1.02	0.00	0.00	4.00	-20703.00	-1581.00	45.00	MgCO3-01	5.00		41047.61 Carbonate (on the basis of 6 O)
6 / 1.	2.00	0.00	0.99	1.01	0.00	0.00	4.00	-20724.00	-1603.00	45.00	MgCO3-02	6.00		41047.62 Carbonate (on the basis of 6 O)
7 / 1.	1.99	0.00	1.00	1.02	0.00	0.00	4.01	-20728.00	-1637.00	45.00	MgCO3-03	7.00		41047.62 Carbonate (on the basis of 6 O)
8 / 1.	1.99	0.00	0.99	1.02	0.00	0.00	4.01	-20759.00	-1640.00	45.00	MgCO3-04	8.00		41047.62 Carbonate (on the basis of 6 O)
9 / 1.	2.01	0.00	0.01	0.00	0.09	1.89	3.99	-15565.00	-6756.00	32.00	FeCO3-01	9.00		41047.62 Carbonate (on the basis of 6 O)
10 / 1.	2.00	0.00	0.01	0.00	0.09	1.90	4.00	-15544.00	-6752.00	32.00	FeCO3-02	10.00		41047.62 Carbonate (on the basis of 6 O)
11 / 1.	1.98	0.00	0.01	0.00	0.09	1.93	4.02	-15511.00	-6769.00	32.00	FeCO3-03	11.00		41047.62 Carbonate (on the basis of 6 O)
12 / 1.	2.01	0.00	0.01	0.00	0.09	1.87	3.99	-15497.00	-6791.00	30.00	FeCO3-04	12.00		41047.63 Carbonate (on the basis of 6 O)
13 / 1.	2.01	0.01	0.91	1.01	0.02	0.03	3.98	266.00	37776.00	43.00	911-4-cher	13.00		41047.63 Carbonate (on the basis of 6 O)
14 / 1.	2.03	0.00	0.94	0.94	0.00	0.07	3.97	310.00	37807.00	40.00	911-4-cher	14.00		41047.63 Carbonate (on the basis of 6 O)
15 / 1.	1.97	0.16	0.75	0.92	0.00	0.08	3.87	298.00	37794.00	40.00	911-4-cher	15.00		41047.63 Carbonate (on the basis of 6 O)
16 / 1.	2.02	0.00	0.82	1.06	0.00	0.09	3.98	-3599.00	33872.00	48.00	911-4-cher	16.00		41047.63 Carbonate (on the basis of 6 O)
17 / 1.	2.04	0.00	0.81	1.02	0.00	0.08	3.96	-3605.00	33898.00	52.00	911-4-cher	17.00		41047.64 Carbonate (on the basis of 6 O)
18 / 1.	2.01	0.03	0.91	0.99	0.01	0.02	3.96	-3681.00	33867.00	51.00	911-4-cher	18.00		41047.64 Carbonate (on the basis of 6 O)
19 / 1.	2.08	0.02	0.78	0.95	0.00	0.08	3.90	8366.00	37420.00	50.00	911-4-cher	19.00		41047.64 Carbonate (on the basis of 6 O)
20 / 1.	2.03	0.00	0.81	1.04	0.01	0.08	3.96	8434.00	37499.00	54.00	911-4-cher	20.00		41047.64 Carbonate (on the basis of 6 O)
21 / 1.	2.03	0.00	0.81	1.04	0.00	0.08	3.97	-2021.00	36612.00	47.00	911-4-cher	21.00		41047.64 Carbonate (on the basis of 6 O)
22 / 1.	2.02	0.00	0.92	1.01	0.01	0.01	3.98	-2022.00	36573.00	46.00	911-4-cher	22.00		41047.64 Carbonate (on the basis of 6 O)
23 / 1.	2.02	0.00	0.83	1.05	0.00	0.08	3.98	-2244.00	36654.00	44.00	911-4-cher	23.00		41047.65 Carbonate (on the basis of 6 O)
24 / 1.	2.02	0.00	0.84	1.06	0.00	0.07	3.98	-2148.00	36662.00	44.00	911-4-cher	24.00		41047.65 Carbonate (on the basis of 6 O)
25 / 1.	2.03	0.01	0.82	1.03	0.01	0.07	3.96	-2194.00	36664.00	46.00	911-4-cher	25.00		41047.65 Carbonate (on the basis of 6 O)
26 / 1.	1.77	0.06	0.98	1.24	0.01	0.10	4.16	-1347.00	36477.00	47.00	911-4-cher	26.00		41047.65 Carbonate (on the basis of 6 O)
27 / 1.	2.01	0.00	0.91	1.04	0.01	0.02	3.99	-1352.00	36430.00	46.00	911-4-cher	27.00		41047.65 Carbonate (on the basis of 6 O)
28 / 1.	1.99	0.05	0.90	1.00	0.01	0.02	3.97	-1341.00	36366.00	46.00	911-4-cher	28.00		41047.65 Carbonate (on the basis of 6 O)
29 / 1.	1.99	0.05	0.90	1.00	0.01	0.02	3.97	-1341.00	36366.00	46.00	911-4-cher	29.00		41047.66 Carbonate (on the basis of 6 O)
30 / 1.	2.03	0.01	0.82	1.07	0.01	0.04	3.97	-1375.00	36377.00	46.00	911-4-cher	30.00		41047.66 Carbonate (on the basis of 6 O)
31 / 1.	2.04	0.01	0.80	1.03	0.00	0.07	3.95	273.00	37601.00	47.00	911-4-cher	31.00		41047.66 Carbonate (on the basis of 6 O)
32 / 1.	2.01	0.00	0.88	1.06	0.01	0.03	3.99	268.00	37555.00	46.00	911-4-cher	32.00		41047.66 Carbonate (on the basis of 6 O)
33 / 1.	2.04	0.01	0.82	0.99	0.01	0.08	3.95	303.00	37558.00	49.00	911-4-cher	33.00		41047.66 Carbonate (on the basis of 6 O)
34 / 1.	1.98	0.00	0.01	2.03	0.01	0.00	4.02	-3481.00	-28562.00	-35.00	911-13-cher	34.00		41047.67 Carbonate (on the basis of 6 O)

35 / 1 .	1.95	0.07	0.01	1.92	0.00	0.01	3.97	-3539.00	-28636.00	-36.00	911-13-che	35.00	41047.67	Carbonate (on the basis of 6 O)
36 / 1 .	1.92	0.17	0.80	0.96	0.01	0.07	3.92	-3491.00	-28602.00	-34.00	911-13-che	36.00	41047.67	Carbonate (on the basis of 6 O)
37 / 1 .	1.99	0.01	0.93	1.05	0.01	0.02	4.00	-3457.00	-28604.00	-36.00	911-13-che	37.00	41047.67	Carbonate (on the basis of 6 O)
38 / 1 .	1.85	0.29	0.06	1.64	0.00	0.01	3.85	-4088.00	-28477.00	-33.00	911-13-che	38.00	41047.67	Carbonate (on the basis of 6 O)
39 / 1 .	1.93	0.12	0.05	1.85	0.00	0.00	3.95	-4066.00	-28494.00	-33.00	911-13-che	39.00	41047.67	Carbonate (on the basis of 6 O)
40 / 1 .	1.97	0.06	0.65	1.18	0.01	0.11	3.98	-4091.00	-28494.00	-33.00	911-13-che	40.00	41047.68	Carbonate (on the basis of 6 O)
41 / 1 .	1.99	0.01	0.68	1.18	0.01	0.12	4.00	-4072.00	-28511.00	-34.00	911-13-che	41.00	41047.68	Carbonate (on the basis of 6 O)
42 / 1 .	1.92	0.07	0.17	1.83	0.01	0.01	4.01	-4099.00	-28529.00	-32.00	911-13-che	42.00	41047.68	Carbonate (on the basis of 6 O)
43 / 1 .	2.01	0.01	0.90	1.03	0.01	0.04	3.99	-4210.00	-28261.00	-33.00	911-13-che	43.00	41047.68	Carbonate (on the basis of 6 O)
44 / 1 .	2.00	0.01	0.90	1.03	0.02	0.03	3.99	-4189.00	-28248.00	-32.00	911-13-che	44.00	41047.68	Carbonate (on the basis of 6 O)
45 / 1 .	1.90	0.25	0.67	0.90	0.01	0.12	3.85	-4222.00	-28305.00	-33.00	911-13-che	45.00	41047.69	Carbonate (on the basis of 6 O)
46 / 1 .	1.98	0.01	0.93	1.06	0.01	0.01	4.01	-4147.00	-28317.00	-32.00	911-13-che	46.00	41047.69	Carbonate (on the basis of 6 O)
47 / 1 .	2.00	0.00	0.90	1.06	0.01	0.03	4.00	-4176.00	-28324.00	-33.00	911-13-che	47.00	41047.69	Carbonate (on the basis of 6 O)
48 / 1 .	1.98	0.01	0.90	2.01	0.01	0.00	4.01	-4188.00	-26725.00	-32.00	911-13-che	48.00	41047.69	Carbonate (on the basis of 6 O)
49 / 1 .	1.98	0.00	0.00	2.04	0.00	0.00	4.02	-4197.00	-26660.00	-31.00	911-13-che	49.00	41047.69	Carbonate (on the basis of 6 O)
50 / 1 .	1.92	0.19	0.01	1.75	0.00	0.01	3.89	-4176.00	-26792.00	-32.00	911-13-che	50.00	41047.69	Carbonate (on the basis of 6 O)
51 / 1 .	1.98	0.00	0.01	2.03	0.01	0.01	4.02	-3503.00	-27338.00	-36.00	911-13-che	51.00	41047.70	Carbonate (on the basis of 6 O)
52 / 1 .	2.00	0.01	0.91	1.04	0.02	0.02	3.99	-3438.00	-27283.00	-35.00	911-13-che	52.00	41047.70	Carbonate (on the basis of 6 O)
53 / 1 .	1.98	0.00	0.01	2.02	0.00	0.01	4.02	-3523.00	-27391.00	-36.00	911-13-che	53.00	41047.70	Carbonate (on the basis of 6 O)
54 / 1 .	2.00	0.01	0.91	1.04	0.02	0.02	3.99	-3629.00	-27319.00	-34.00	911-13-che	54.00	41047.70	Carbonate (on the basis of 6 O)
55 / 1 .	2.01	0.00	0.00	1.98	0.00	0.00	3.99	-19424.00	-5257.00	39.00	CaCO3-05	55.00	41047.70	Carbonate (on the basis of 6 O)
56 / 1 .	2.00	0.00	0.00	2.00	0.00	0.00	4.00	-19391.00	-5255.00	39.00	CaCO3-06	56.00	41047.71	Carbonate (on the basis of 6 O)
57 / 1 .	2.00	0.00	0.00	1.99	0.00	0.00	4.00	-19366.00	-5245.00	39.00	CaCO3-07	57.00	41047.71	Carbonate (on the basis of 6 O)
58 / 1 .	2.00	0.00	0.00	1.99	0.01	0.00	4.00	-19343.00	-5237.00	39.00	CaCO3-08	58.00	41047.71	Carbonate (on the basis of 6 O)
59 / 1 .	2.00	0.00	0.98	1.01	0.00	0.00	4.00	-20808.00	-1622.00	49.00	MgCO3-05	59.00	41047.71	Carbonate (on the basis of 6 O)
60 / 1 .	2	0	0.985	1.012	0	0.003	4	-20801	-1587	48	MgCO3-06	60	2012-05-18	17:05 Carbonate (on the basis of 6 O)
61 / 1 .	2.007	0.001	0.005	0.001	0.088	1.889	3.991	-15527	-6830	34	FeCO3-05	61	2012-05-18	17:08 Carbonate (on the basis of 6 O)
62 / 1 .	2.013	0.001	0.007	0	0.088	1.877	3.986	-15519	-6868	34	FeCO3-06	62	2012-05-18	17:10 Carbonate (on the basis of 6 O)

Ca	40.204	40.207	3030.966	20.135	0.957	461	60019	10.202	20	296.19	3021.816	331.243
C	11.894	11.895		19.878								
O	47.778	47.782		59.941								
Total	99.996	100.003		100.001								

Formula Oxide

MgO	0.002
SiO2	0.014
MnO	0.144
FeO	0
CaO	56.254
CO2	43.583
Total	99.997

4 / 1 . X = -19423. Y = -5287. Z = 33. Comment : CaCO3-04

Mg	0.007	0.007	7.2	0.006	0.025	295	144	9.276	20	0.075	0.7	1.108
Si	0.01	0.01	15.851	0.007	0.02	235	317	9.276	20	0.194	1.8	1.128
Mn	0.103	0.103	6.4	0.037	0.054	545	256	9.276	40	0.31	2.875	1.816
Fe	0	0	5.3	0	0.093	1168	53	9.276	10	-0.065	-0.6	0.898
Ca	39.664	39.682	2715.365	19.774	0.959	451	53825	9.276	20	291.951	2708.165	377.125
C	12.094	12.099		20.119								
O	48.095	48.117		60.063								
Total	99.972	100.018		100.006								

Formula Oxide

MgO	0.012
SiO2	0.021
MnO	0.133
FeO	0
CaO	55.497
CO2	44.314
Total	99.977

5 / 1 . X = -20703. Y = -1581. Z = 45. Comment : MgCO3-01

Mg	12.951	12.951	1354.629	9.847	0.262	279	26972	9.238	20	145.945	1348.229	211.656
Si	0.014	0.014	12.2	0.009	0.019	215	244	9.238	20	0.249	2.3	1.232
Mn	0.03	0.03	3.775	0.01	0.044	504	151	9.238	40	0.089	0.825	1.28
Fe	0.033	0.033	6.2	0.011	0.095	1103	62	9.238	10	0.119	1.1	1.216
Ca	22.057	22.057	1468.835	10.17	0.595	415	29235	9.238	20	158.379	1463.085	255.445
C	12.977	12.977		19.966								
O	51.938	51.938		59.987								
Total	100	100		100								

Formula Oxide

MgO	21.477
SiO2	0.029

MnO 0.039
 FeO 0.042
 CaO 30.863
 CO2 47.551
 Total 100

6 / 1. X = -20724. Y = -1603. Z = 45. Comment : MgCO3-02

Mg	13.016	13.024	1493.626	9.891	0.253	237	29726	10.141	20	146.734	1488.076	269.117
Si	0	0	13.901	0	0.02	251	278	10.141	20	-0.237	-2.4	0.853
Mn	0.006	0.006	3.6	0.002	0.041	494	144	10.141	40	0.017	0.175	1.051
Fe	0.03	0.03	6.5	0.01	0.089	1033	65	10.141	10	0.108	1.1	1.204
Ca	21.915	21.928	1601.418	10.099	0.58	388	31860	10.141	20	157.314	1595.368	264.692
C	13.012	13.019		20.008								
O	51.978	52.007		59.999								
Total	99.957	100.013		100.009								

Formula Oxide

MgO 21.585
 SiO2 0
 MnO 0.007
 FeO 0.038
 CaO 30.664
 CO2 47.677
 Total 99.972

7 / 1. X = -20728. Y = -1637. Z = 45. Comment : MgCO3-03

Mg	13.155	13.156	1378.694	10.009	0.264	264	27449	9.252	20	148.401	1372.944	239.768
Si	0	0	10.7	0	0.019	227	214	9.252	20	-0.043	-0.4	0.964
Mn	0.001	0.001	3.2	0	0.043	522	128	9.252	40	0.003	0.025	1.008
Fe	0.024	0.024	5.5	0.008	0.09	1058	55	9.252	10	0.086	0.8	1.17
Ca	22.052	22.054	1469.845	10.175	0.594	387	29255	9.252	20	158.334	1464.845	293.964
C	12.907	12.908		19.873								
O	51.854	51.859		59.936								
Total	99.992	100.002		100.002								

Formula Oxide

MgO 21.814
 SiO2 0
 MnO 0.001
 FeO 0.031
 CaO 30.855
 CO2 47.293
 Total 99.995

8 / 1. X = -20759. Y = -1640. Z = 45. Comment : MgCO3-04

Mg	MgO	13.008	13.008	1360.632	9.895	0.263	293	27091	9.233	20	146.598	1353.582	192.993
Si	SiO2	0.003	0.003	12.351	0.002	0.02	236	247	9.233	20	0.049	0.45	1.038
Mn	MnO	0.015	0.015	3.6	0.005	0.045	523	144	9.233	40	0.046	0.425	1.134
Fe	FeO	0.072	0.072	6.8	0.024	0.095	1027	68	9.233	10	0.26	2.4	1.545
Ca	CaO	22.059	22.059	1468.129	10.176	0.595	408	29221	9.233	20	158.403	1462.578	264.523
C	CO2	12.948	12.948		19.932								
O		51.895	51.895		59.967								
Total		100	100		100								
Formula	Oxide												
MgO		21.571											
SiO2		0.006											
MnO		0.02											
FeO		0.092											
CaO		30.865											
CO2		47.446											
Total		100											

9 / 1 . X = -15565. Y = -6756. Z = 32. Comment : FeCO3-01

Mg	MgO	0.088	0.088	13.251	0.084	0.034	319	265	10.111	20	0.747	7.55	2.325
Si	SiO2	0.014	0.014	17.401	0.011	0.022	250	348	10.111	20	0.237	2.4	1.16
Mn	MnO	2.087	2.087	76.744	0.877	0.126	544	3069	10.111	40	7.066	71.444	14.48
Fe	FeO	45.758	45.758	1852.152	18.918	1.121	1734	18409	10.111	10	181.367	1833.751	100.654
Ca	CaO	0.013	0.013	7.9	0.007	0.033	382	158	10.111	20	0.099	1	1.145
C	CO2	10.437	10.437		20.064								
O		41.603	41.603		60.038								
Total		100	100		100								
Formula	Oxide												
MgO		0.146											
SiO2		0.029											
MnO		2.695											
FeO		58.868											
CaO		0.018											
CO2		38.244											
Total		100											

10 / 1 . X = -15544. Y = -6752. Z = 32. Comment : FeCO3-02

Mg	MgO	0.066	0.066	10.9	0.063	0.035	349	218	9.272	20	0.561	5.2	1.912
Si	SiO2	0.004	0.004	16.151	0.004	0.023	277	323	9.272	20	0.076	0.7	1.045
Mn	MnO	2.222	2.222	74.768	0.936	0.135	576	2990	9.272	40	7.525	69.768	14.953
Fe	FeO	45.872	45.872	1705.444	19.016	1.164	1894	16959	9.272	10	181.949	1686.943	92.181
Ca	CaO	0.003	0.003	6.4	0.002	0.033	394	128	9.272	20	0.027	0.25	1.041
C	CO2	10.369	10.369		19.985								
O		41.463	41.463		59.994								

Total Formula Oxide 100 100 100

MgO 0.11
 SiO2 0.009
 MnO 2.869
 FeO 59.015
 CaO 0.005
 CO2 37.993
 Total 100

11 / 1 . X = -15511. Y = -6769. Z = 32. Comment : FeCO3-03

Mg	0.077	0.077	13.151	0.074	0.035	343	263	10.112	20	0.653	6.6	2.008
Si	0.019	0.019	18.901	0.016	0.022	255	378	10.112	20	0.331	3.35	1.215
Mn	2.213	2.213	81.147	0.937	0.129	544	3245	10.112	40	7.5	75.847	15.31
Fe	46.25	46.25	1875.638	19.264	1.127	1749	18641	10.112	10	183.622	1856.837	99.762
Ca	0.016	0.016	8.25	0.01	0.033	383	165	10.112	20	0.129	1.3	1.187
C	10.221	10.221	19.795									
O	41.204	41.204	59.905									
Total	100	100	100									

Total Formula Oxide 100 100 100

MgO 0.128
 SiO2 0.041
 MnO 2.857
 FeO 59.5
 CaO 0.023
 CO2 37.451
 Total 100

12 / 1 . X = -15497. Y = -6791. Z = 30. Comment : FeCO3-04

Mg	0.097	0.097	13.151	0.092	0.037	339	263	9.302	20	0.828	7.7	2.413
Si	0.01	0.01	16.301	0.008	0.023	269	326	9.302	20	0.177	1.65	1.113
Mn	2.17	2.17	73.068	0.909	0.134	564	2922	9.302	40	7.339	68.268	15.222
Fe	45.423	45.423	1692.703	18.722	1.157	1926	16833	9.302	10	179.908	1673.501	88.156
Ca	0.006	0.006	6.2	0.004	0.032	380	124	9.302	20	0.048	0.45	1.078
C	10.526	10.526	20.173									
O	41.767	41.767	60.091									
Total	100	100	100									

Total Formula Oxide 100 100 100

MgO 0.162
 SiO2 0.022
 MnO 2.802
 FeO 58.436
 CaO 0.009

CO2 38.57
Total 100

13 / 1. X = 266. Y = 37776. Z = 43. Comment : 911-4-chem-1

MgO	11.929	11.929	1234.66	9.108	0.251	272	24593	9.232	20	133.095	1228.71	207.502
SiO2	0.118	0.118	30.603	0.078	0.026	223	612	9.232	20	2.15	19.853	2.847
MnO	0.43	0.43	14.951	0.145	0.073	510	598	9.232	40	1.292	11.926	4.942
FeO	0.742	0.742	29.203	0.246	0.164	1014	292	9.232	10	2.697	24.903	6.791
CaO	21.897	21.897	1460.606	10.139	0.591	423	29072	9.232	20	157.565	1454.606	243.43
C	13.05	13.05		20.163								
O	51.834	51.834		60.12								
Total	100	100		100								

Formula Oxide

MgO 19.782
SiO2 0.253
MnO 0.556
FeO 0.954
CaO 30.638
CO2 47.817
Total 100

14 / 1. X = 310. Y = 37807. Z = 40. Comment : 911-4-chem-2

MgO	12.3	12.3	1385.607	9.376	0.247	274	27586	10.103	20	136.439	1378.457	193.787
SiO2	0	0	14.451	0	0.02	239	289	10.103	20	-0.015	-0.15	0.99
MnO	0.082	0.082	5.7	0.028	0.047	478	228	10.103	40	0.247	2.5	1.781
FeO	2.145	2.145	83.723	0.712	0.244	976	837	10.103	10	7.812	78.923	17.442
CaO	20.343	20.343	1484.083	9.404	0.547	366	29537	10.103	20	146.364	1478.733	277.394
C	13.174	13.174		20.321								
O	51.953	51.953		60.16								
Total	99.997	100.001		100.001								

Formula Oxide

MgO 20.397
SiO2 0
MnO 0.106
FeO 2.76
CaO 28.463
CO2 48.272
Total 99.998

15 / 1. X = 298. Y = 37794. Z = 40. Comment : 911-4-chem-3

MgO	9.866	9.866	1015.643	7.553	0.226	298	20245	9.25	20	109.036	1008.593	144.059
SiO2	2.463	2.463	432.366	1.632	0.084	246	8635	9.25	20	45.298	419.015	32.386
MnO	0.129	0.129	6.75	0.044	0.054	517	270	9.25	40	0.389	3.6	2.143

Formula Oxide

Mg 9.866
Si 2.463
Mn 0.129

SiO2 0.035
MnO 0.165
FeO 3.067
CaO 30.671
CO2 48.45
Total 100

18 / 1. X = -3681. Y = 33867. Z = 51. Comment : 911-4-chem-6

Mg	11.949	11.949	1244.036	9.094	0.251	269	24779	9.264	20	133.653	1238.136	210.849
Si	0.448	0.448	88.326	0.295	0.04	242	1766	9.264	20	8.153	75.525	6.9
Mn	0.429	0.429	15.426	0.145	0.074	546	617	9.264	40	1.287	11.926	4.407
Fe	0.505	0.505	21.502	0.167	0.144	1034	215	9.264	10	1.835	17.001	4.778
Ca	21.488	21.488	1437.689	9.917	0.582	457	28618	9.264	20	154.433	1430.639	203.923
C	13.088	13.088	20.156									
O	52.093	52.093	60.226									
Total	100	100	100									

Formula

MgO 19.816
SiO2 0.957
MnO 0.554
FeO 0.649
CaO 30.066
CO2 47.957
Total 100

19 / 1. X = 8366. Y = 37420. Z = 50. Comment : 911-4-chem-7

Mg	10.311	10.311	1056.068	7.83	0.232	285	21048	9.258	20	113.383	1049.667	165.007
Si	0.352	0.352	71.817	0.231	0.036	237	1436	9.258	20	6.434	59.567	5.862
Mn	0.082	0.082	5.775	0.027	0.052	546	231	9.258	40	0.246	2.275	1.65
Fe	2.313	2.313	82.823	0.765	0.265	1077	828	9.258	10	8.417	77.923	16.902
Ca	20.742	20.742	1388.13	9.552	0.566	420	27636	9.258	20	149.301	1382.18	233.294
C	13.658	13.658	20.987									
O	52.542	52.542	60.609									
Total	100	100	100									

Formula

MgO 17.099
SiO2 0.753
MnO 0.106
FeO 2.976
CaO 29.022
CO2 50.044
Total 100

O 51.968 51.968 60.115
 Total 100 100 100

Formula Oxide
 MgO 20.169
 SiO2 0.137
 MnO 0.466
 FeO 0.44
 CaO 30.784
 CO2 48.003
 Total 100

23 / 1 . X = -2244. Y = 36654. Z = 44. Comment : 911-4-chem-11

Mg	10.741	10.741	1206.081	8.28	0.229	266	24026	10.137	20	118.321	1199.381	180.008
Si	0.045	0.045	22.252	0.03	0.022	231	445	10.137	20	0.819	8.301	1.595
Mn	0.08	0.08	6.525	0.027	0.051	536	261	10.137	40	0.242	2.45	1.601
Fe	2.314	2.314	91.127	0.776	0.253	1047	911	10.137	10	8.437	85.527	16.272
Ca	22.503	22.503	1652.513	10.52	0.592	375	32871	10.137	20	162.46	1646.813	289.909
C	12.97	12.97		20.234								
O	51.347	51.347	60.132									
Total	100	100										

Formula Oxide
 MgO 17.812
 SiO2 0.096
 MnO 0.104
 FeO 2.976
 CaO 31.486
 CO2 47.527
 Total 100

24 / 1 . X = -2148. Y = 36662. Z = 44. Comment : 911-4-chem-12

Mg	10.875	10.875	1116.599	8.384	0.239	262	22250	9.261	20	119.984	1111.149	204.877
Si	0.023	0.023	16.451	0.016	0.021	239	329	9.261	20	0.427	3.95	1.316
Mn	0.107	0.107	6.625	0.036	0.055	556	265	9.261	40	0.321	2.975	1.815
Fe	2.112	2.112	76.219	0.709	0.254	1074	762	9.261	10	7.701	71.319	15.555
Ca	22.631	22.631	1518.673	10.58	0.606	414	30222	9.261	20	163.363	1512.873	261.835
C	12.935	12.935		20.179								
O	51.317	51.317	60.097									
Total	100	100										

Formula Oxide
 MgO 18.033
 SiO2 0.05
 MnO 0.138
 FeO 2.717

CaO 31.665
 CO2 47.396
 Total 100

25 / 1. X = -2194. Y = 36664. Z = 46. Comment : 911-4-chem-13

Mg	10.72	10.72	1102.094	8.235	0.237	289	21962	9.273	20	118.133	1095.444	165.725
Si	0.094	0.094	28.853	0.062	0.026	243	577	9.273	20	1.715	15.902	2.228
Mn	0.165	0.165	7.45	0.056	0.055	491	298	9.273	40	0.496	4.6	2.614
Fe	2.166	2.166	78.52	0.724	0.258	1115	785	9.273	10	7.896	73.22	14.815
Ca	22.125	22.125	1485.749	10.307	0.595	406	29570	9.273	20	159.619	1480.149	265.307
C	13.117	13.117		20.39								
O	51.612	51.612	60.226									
Total	100	100		100								

Formula
 Oxide
 MgO 17.777
 SiO2 0.201
 MnO 0.213
 FeO 2.787
 CaO 30.958
 CO2 48.064
 Total 100

26 / 1. X = -1347. Y = 36477. Z = 47. Comment : 911-4-chem-14

Mg	12.009	12.009	1346.91	9.649	0.244	303	26819	10.036	20	133.341	1338.21	154.813
Si	0.9	0.9	181.359	0.626	0.052	254	3625	10.036	20	16.422	164.808	10.958
Mn	0.126	0.126	8.225	0.045	0.055	559	329	10.036	40	0.381	3.825	1.869
Fe	2.768	2.768	109.84	0.968	0.28	1234	1098	10.036	10	10.167	102.04	14.082
Ca	25.105	25.105	1837.778	12.233	0.648	447	36534	10.036	20	182.312	1829.678	226.88
C	10.728	10.728		17.444								
O	48.364	48.364	59.035									
Total	100	100		100								

Formula
 Oxide
 MgO 19.914
 SiO2 1.925
 MnO 0.162
 FeO 3.561
 CaO 35.127
 CO2 39.311
 Total 100

27 / 1. X = -1352. Y = 36430. Z = 46. Comment : 911-4-chem-15

Mg	11.948	11.948	1240.003	9.131	0.251	288	24699	9.232	20	133.593	1233.303	185.071
Si	0.06	0.06	22.202	0.04	0.023	237	444	9.232	20	1.094	10.101	1.835

Mn	MnO	0.313	0.313	11.65	0.106	0.066	506	466	9.232	40	0.94	8.675	3.916
Fe	FeO	0.468	0.468	20.001	0.156	0.139	1015	200	9.232	10	1.701	15.701	4.651
Ca	CaO	22.482	22.482	1499.433	10.419	0.604	422	29841	9.232	20	161.776	1493.483	252.001
C	CO2	12.989	12.989		20.086								
O		51.739	51.739		60.063								
Total	Oxide	100	100		100								

28 / 1 . X = -1341. Y = 36366. Z = 46. Comment : 911-4-chem-16

Mg	MgO	11.853	11.853	1243.482	9.048	0.249	275	24768	9.325	20	132.68	1237.232	198.953
Si	SiO2	0.691	0.691	129.005	0.456	0.047	228	2579	9.325	20	12.601	117.505	11.217
Mn	MnO	0.408	0.408	14.301	0.138	0.07	494	572	9.325	40	1.223	11.401	4.931
Fe	FeO	0.49	0.49	22.402	0.163	0.149	1161	224	9.325	10	1.78	16.602	3.862
Ca	CaO	21.746	21.746	1463.13	10.067	0.587	396	29122	9.325	20	156.332	1457.78	273.478
C	CO2	12.904	12.904		19.934								
O		51.909	51.909		60.195								
Total	Oxide	100	100		100								

29 / 1 . X = -1341. Y = 36366. Z = 46. Comment : 911-4-chem-17

Mg	MgO	11.791	11.791	1228.813	9	0.249	268	24477	9.27	20	131.928	1222.963	210.049
Si	SiO2	0.708	0.708	131.307	0.468	0.048	230	2625	9.27	20	12.913	119.706	11.319
Mn	MnO	0.372	0.372	14.101	0.126	0.072	564	564	9.27	40	1.117	10.351	3.76
Fe	FeO	0.552	0.552	23.902	0.183	0.152	1118	239	9.27	10	2.007	18.602	4.51
Ca	CaO	21.736	21.736	1454.094	10.061	0.587	406	28943	9.27	20	156.263	1448.544	261.994
C	CO2	12.917	12.917		19.952								
O		51.925	51.925		60.21								
Total	Oxide	100	100		100								

MgO 19.553
 SiO2 1.514
 MnO 0.481
 FeO 0.71
 CaO 30.413
 CO2 47.33
 Total 100

30 / 1 . X = -1375. Y = 36377. Z = 46. Comment : 911-4-chem-18

Mg	10.665	10.665	1097.108	8.185	0.236	267	21863	9.244	20	118.072	1091.458	194.175
Si	0.1	0.1	28.503	0.066	0.025	230	570	9.244	20	1.834	16.952	2.468
Mn	0.204	0.204	8.875	0.069	0.059	523	355	9.244	40	0.614	5.675	2.773
Fe	1.319	1.319	51.109	0.441	0.215	1255	511	9.244	10	4.804	44.408	7.628
Ca	22.97	22.97	1536.855	10.69	0.613	415	30582	9.244	20	165.627	1531.055	264.97
C	13.099	13.099		20.343								
O	51.642	51.642		60.205								
Total	100	100		100								

Formula

MgO 17.686
 SiO2 0.214
 MnO 0.264
 FeO 1.697
 CaO 32.139
 CO2 47.999
 Total 100

31 / 1 . X = 273. Y = 37601. Z = 47. Comment : 911-4-chem-19

Mg	10.476	10.476	1071.324	8.04	0.235	303	21351	9.229	20	115.306	1064.124	148.792
Si	0.122	0.122	32.203	0.081	0.026	230	644	9.229	20	2.238	20.653	2.788
Mn	0.121	0.121	6.525	0.041	0.053	521	261	9.229	40	0.363	3.35	2.055
Fe	2.234	2.234	79.521	0.746	0.259	1024	795	9.229	10	8.14	75.121	18.073
Ca	22.126	22.126	1478.478	10.297	0.596	401	29426	9.229	20	159.619	1473.078	273.787
C	13.202	13.202		20.503								
O	51.718	51.718		60.292								
Total	100	100		100								

Formula

MgO 17.373
 SiO2 0.262
 MnO 0.156
 FeO 2.874
 CaO 30.959
 CO2 48.377
 Total 100

32 / 1 . X = 268. Y = 37555. Z = 46. Comment : 911-4-chem-20

Mg	11.486	11.486	1302.626	8.804	0.236	246	25941	10.135	20	127.949	1296.776	222.667
Si	0.03	0.03	18.301	0.02	0.02	221	366	10.135	20	0.543	5.501	1.43
Mn	0.257	0.257	12.075	0.087	0.063	549	483	10.135	40	0.772	7.825	2.841
Fe	0.795	0.795	36.304	0.265	0.169	1170	363	10.135	10	2.891	29.304	5.186
Ca	22.866	22.866	1675.21	10.628	0.6	379	33320	10.135	20	164.716	1669.41	288.824
C	12.974	12.974		20.124								
O	51.592	51.592		60.072								
Total	100	100		100								
Formula												
MgO	19.047											
SiO2	0.064											
MnO	0.332											
FeO	1.022											
CaO	31.994											
CO2	47.541											
Total	100											

33 / 1 . X = 303. Y = 37558. Z = 49. Comment : 911-4-chem-21

Mg	10.73	10.73	1099.021	8.219	0.238	297	21901	9.246	20	118.119	1092.071	158.129
Si	0.164	0.164	39.605	0.109	0.029	234	792	9.246	20	2.997	27.705	3.328
Mn	0.27	0.27	10.6	0.091	0.063	514	424	9.246	40	0.811	7.5	3.419
Fe	2.283	2.283	82.122	0.761	0.264	1108	821	9.246	10	8.32	76.922	15.792
Ca	21.478	21.478	1437.083	9.977	0.582	393	28606	9.246	20	154.874	1431.883	276.357
C	13.241	13.241		20.525								
O	51.834	51.834		60.317								
Total	100	100		100								
Formula												
MgO	17.793											
SiO2	0.351											
MnO	0.348											
FeO	2.937											
CaO	30.052											
CO2	48.518											
Total	100											

34 / 1 . X = -3481. Y = -28562. Z = -35. Comment : 911-13-chem-1

Mg	0.066	0.066	13.601	0.055	0.028	267	272	10.135	20	0.71	7.2	2.125
Si	0.061	0.061	28.253	0.044	0.022	231	565	10.135	20	1.194	12.102	1.749
Mn	0.152	0.152	8.775	0.056	0.056	539	351	10.135	40	0.459	4.65	2.127
Fe	0.073	0.073	7.6	0.026	0.09	976	76	10.135	10	0.266	2.7	1.551
Ca	40.27	40.27	3015.971	20.219	0.959	434	59725	10.135	20	296.788	3007.971	376.986

C 11.769 11.769 19.719
 O 47.609 47.609 59.881
 Total 100 100 100

Formula Oxide
 MgO 0.11
 SiO2 0.13
 MnO 0.197
 FeO 0.093
 CaO 56.345
 CO2 43.125
 Total 100

35 / 1 . X = -3539. Y = -28636. Z = -36. Comment : 911-13-chem-2

Mg	0.122	0.122	19.651	0.1	0.031	267	393	10.14	20	1.307	13.251	3.07
Si	1.016	1.016	218.558	0.724	0.052	232	4368	10.14	20	19.947	202.257	13.408
Mn	0.11	0.11	7.35	0.04	0.052	530	294	10.14	40	0.33	3.35	1.838
Fe	0.245	0.245	13.701	0.088	0.109	947	137	10.14	10	0.898	9.101	2.978
Ca	38.643	38.643	2889.849	19.293	0.926	456	57251	10.14	20	284.136	2881.048	328.382
C	11.762	11.762	19.596	19.596								
O	48.103	48.103	60.16	60.16								
Total	100	100	100	100								

Formula Oxide
 MgO 0.202
 SiO2 2.173
 MnO 0.142
 FeO 0.315
 CaO 54.07
 CO2 43.099
 Total 100

36 / 1 . X = -3491. Y = -28602. Z = -34. Comment : 911-13-chem-3

Mg	10.383	10.383	1074.95	8.012	0.232	300	21423	9.268	20	115.198	1067.7	148.265
Si	2.498	2.498	437.08	1.668	0.084	230	8729	9.268	20	45.896	425.379	37.356
Mn	0.257	0.257	11.15	0.088	0.066	579	446	9.268	40	0.774	7.175	2.805
Fe	2.156	2.156	77.82	0.724	0.256	1073	778	9.268	10	7.868	72.92	15.881
Ca	20.722	20.722	1387.978	9.696	0.566	400	27633	9.268	20	149.171	1382.578	257.028
C	12.373	12.373	19.319	19.319								
O	51.61	51.61	60.493	60.493								
Total	100	100	100	100								

Formula Oxide
 MgO 17.219
 SiO2 5.344
 MnO 0.332

FeO 2.774
 CaO 28.994
 CO2 45.337
 Total 100

37 / 1 . X = -3457. Y = -28604. Z = -36. Comment : 911-13-chem-4

Mg	12.198	12.198	1269.042	9.341	0.254	272	25275	9.246	20	136.612	1263.042	211.503
Si	0.151	0.151	36.804	0.1	0.028	229	736	9.246	20	2.753	25.454	3.243
Mn	0.292	0.292	11.65	0.099	0.067	551	466	9.246	40	0.876	8.1	3.282
Fe	0.464	0.464	19.701	0.155	0.138	990	197	9.246	10	1.687	15.601	4.805
Ca	22.505	22.505	1504.079	10.451	0.604	448	29933	9.246	20	161.952	1497.328	222.822
C	12.823	12.823		19.87								
O	51.567	51.567		59.985								
Total	100	100		100								

Formula Oxide
 MgO 20.228
 SiO2 0.323
 MnO 0.377
 FeO 0.597
 CaO 31.49
 CO2 46.985
 Total 100

38 / 1 . X = -4088. Y = -28477. Z = -33. Comment : 911-13-chem-5

Mg	0.769	0.769	84.574	0.623	0.064	307	1691	9.246	20	8.363	77.323	11.665
Si	4.25	4.25	786.436	2.98	0.107	244	15688	9.246	20	83.444	771.485	52.602
Mn	0	0	3.825	0	0.047	573	153	9.246	40	-0.005	-0.05	0.987
Fe	0.166	0.166	10.3	0.058	0.109	1051	103	9.246	10	0.606	5.6	2.192
Ca	33.881	33.882	2291.244	16.649	0.84	430	45481	9.246	20	247.13	2284.844	357.999
C	11.465	11.466		18.8								
O	49.467	49.469		60.89								
Total	99.997	100.002		100.001								

Formula Oxide
 MgO 1.275
 SiO2 9.093
 MnO 0
 FeO 0.213
 CaO 47.406
 CO2 42.012
 Total 99.998

39 / 1 . X = -4066. Y = -28494. Z = -33. Comment : 911-13-chem-6

Mg	0.667	0.667	79.171	0.546	0.057	260	1583	10.135	20	7.205	73.021	12.873
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Si	SiO2	1.634	1.634	339.781	1.157	0.064	223	6788	10.135	20	32.04	324.73	22.576
Mn	MnO	0	0	3.925	0	0.044	529	157	10.135	40	-0.005	-0.05	0.987
Fe	FeO	0.019	0.019	7.5	0.007	0.097	1146	75	10.135	10	0.069	0.7	1.103
Ca	CaO	37.457	37.459	2792.499	18.588	0.902	444	55340	10.135	20	274.709	2784.198	336.436
C	CO2	11.724	11.725		19.415								
O		48.495	48.498		60.286								
Total		99.997	100.002		100.001								

Formula Oxide

MgO	1.107
SiO2	3.496
MnO	0
FeO	0.024
CaO	52.41
CO2	42.961
Total	99.998

40 / 1 . X = -4091. Y = -28494. Z = -33. Comment : 9111-13-chem-7

Mg	MgO	8.309	8.309	923.305	6.546	0.199	274	18410	10.143	20	90.345	916.355	132.847
Si	SiO2	0.836	0.836	171.697	0.57	0.049	233	3432	10.143	20	15.479	156.997	11.68
Mn	MnO	0.262	0.262	11.875	0.091	0.061	519	475	10.143	40	0.791	8.025	3.084
Fe	FeO	3.299	3.299	128.655	1.131	0.298	1086	1286	10.143	10	12.083	122.555	21.09
Ca	CaO	24.65	24.65	1821.736	11.776	0.637	403	36217	10.143	20	178.948	1815.036	271.895
C	CO2	12.379	12.379		19.734								
O		50.265	50.265		60.152								
Total		100	100		100								

Formula Oxide

MgO	13.779
SiO2	1.788
MnO	0.338
FeO	4.244
CaO	34.49
CO2	45.36
Total	100

41 / 1 . X = -4072. Y = -28511. Z = -34. Comment : 9111-13-chem-8

Mg	MgO	8.643	8.643	876.679	6.81	0.212	306	17483	9.272	20	93.78	869.479	121.758
Si	SiO2	0.145	0.145	37.955	0.099	0.028	242	759	9.272	20	2.681	24.854	2.897
Mn	MnO	0.285	0.285	11.6	0.099	0.066	551	464	9.272	40	0.86	7.975	3.2
Fe	FeO	3.493	3.493	123.851	1.198	0.319	1099	1238	9.272	10	12.797	118.651	23.817
Ca	CaO	24.776	24.776	1674.199	11.837	0.65	389	33300	9.272	20	180.014	1668.999	321.956
C	CO2	12.507	12.507		19.939								
O		50.15	50.15		60.019								
Total		100	100		100								

Total

Formula	Oxide
MgO	14.333
SiO2	0.311
MnO	0.367
FeO	4.494
CaO	34.667
CO2	45.827
Total	100

42 / 1 . X = -4099. Y = -28529. Z = -32. Comment : 9111-13-chem-9

Mg	2.099	2.099	216.054	1.721	0.102	292	4318	9.227	20	22.716	209.604	33.496
Si	1.005	1.005	195.076	0.713	0.054	247	3899	9.227	20	19.516	180.075	13.004
Mn	0.135	0.135	7.625	0.049	0.058	574	305	9.227	40	0.406	3.75	1.968
Fe	0.213	0.213	13.101	0.076	0.122	1174	131	9.227	10	0.78	7.2	2.22
Ca	36.854	36.854	2501.226	18.321	0.902	435	49615	9.227	20	270.356	2494.626	378.965
C	11.559	11.559		19.176								
O	48.135	48.135		59.944								
Total	100	100		100								

Formula	Oxide
MgO	3.481
SiO2	2.149
MnO	0.174
FeO	0.274
CaO	51.566
CO2	42.356
Total	100

43 / 1 . X = -4210. Y = -28261. Z = -33. Comment : 9111-13-chem-10

Mg	11.768	11.768	1221.353	9.016	0.249	288	24329	9.27	20	131.032	1214.653	182.287
Si	0.082	0.082	24.752	0.055	0.024	223	495	9.27	20	1.5	13.902	2.281
Mn	0.286	0.286	11.275	0.097	0.065	531	451	9.27	40	0.858	7.95	3.391
Fe	1.076	1.076	41.506	0.359	0.192	1107	415	9.27	10	3.917	36.306	7.982
Ca	22.227	22.227	1488.93	10.327	0.597	385	29633	9.27	20	160.081	1483.93	297.781
C	12.951	12.951		20.08								
O	51.61	51.61		60.067								
Total	100	100		100								

Formula	Oxide
MgO	19.514
SiO2	0.176
MnO	0.369
FeO	1.384
CaO	31.1
CO2	47.456

Total 100

44 / 1 . X = -4189. Y = -28248. Z = -32. Comment : 9111-13-chem-11

MgO	11.822	11.822	1228.158	9.052	0.25	274	24464	9.268	20	131.852	1222.057	201.333
SiO2	0.178	0.178	42.956	0.118	0.03	244	859	9.268	20	3.237	30.006	3.317
MnO	0.488	0.488	17.276	0.165	0.078	560	691	9.268	40	1.465	13.576	4.669
FeO	0.744	0.744	30.303	0.248	0.168	1107	303	9.268	10	2.708	25.103	5.827
CaO	22.191	22.191	1487.971	10.304	0.597	458	29614	9.268	20	159.776	1480.87	209.568
CO2	12.93	12.93		20.036								
O	51.647	51.647		60.077								
Total	100	100		100								

Formula Oxide

MgO	19.604
SiO2	0.38
MnO	0.63
FeO	0.957
CaO	31.05
CO2	47.379
Total	100

45 / 1 . X = -4222. Y = -28305. Z = -33. Comment : 9111-13-chem-12

MgO	8.797	8.797	984.438	6.813	0.204	257	19625	10.135	20	96.52	978.238	158.777
SiO2	3.709	3.709	709.608	2.486	0.098	233	14159	10.135	20	68.579	695.057	48.768
MnO	0.292	0.292	13.026	0.1	0.064	536	521	10.135	40	0.881	8.926	3.177
FeO	3.58	3.58	139.865	1.207	0.313	1181	1398	10.135	10	13.09	132.664	19.425
CaO	19.529	19.529	1433.045	9.172	0.53	411	28526	10.135	20	140.718	1426.195	209.199
CO2	12.327	12.327		19.319								
O	51.766	51.766		60.903								
Total	100	100		100								

Formula Oxide

MgO	14.588
SiO2	7.935
MnO	0.377
FeO	4.606
CaO	27.325
CO2	45.169
Total	100

46 / 1 . X = -4147. Y = -28317. Z = -32. Comment : 9111-13-chem-13

MgO	12.113	12.113	1261.076	9.29	0.253	279	25117	9.247	20	135.689	1254.726	198.59
SiO2	0.163	0.163	39.105	0.108	0.028	232	782	9.247	20	2.964	27.405	3.342
MnO	0.297	0.297	11.475	0.101	0.066	525	459	9.247	40	0.892	8.25	3.558
FeO	0.375	0.375	18.401	0.125	0.139	1170	184	9.247	10	1.363	12.601	3.173

MnO 0.197
 FeO 0.053
 CaO 56.103
 CO2 43.364
 Total 100

49 / 1 . X = -4197. Y = -26660. Z = -31. Comment : 911-13-chem-16

Mg	0.048	0.048	12.451	0.039	0.03	323	249	9.23	20	0.509	4.7	1.606
Si	0.024	0.024	19.301	0.017	0.022	243	386	9.23	20	0.477	4.4	1.295
Mn	0.094	0.094	6.575	0.035	0.055	579	263	9.23	40	0.284	2.625	1.665
Fe	0.041	0.041	6.6	0.015	0.096	1103	66	9.23	10	0.152	1.4	1.269
Ca	40.475	40.475	2761.742	20.334	0.976	478	54736	9.23	20	298.332	2753.692	343.065
C	11.752	11.752		19.701								
O	47.566	47.566		59.859								
Total	100	100		100								

Formula Oxide
 MgO 0.079
 SiO2 0.052
 MnO 0.122
 FeO 0.053
 CaO 56.632
 CO2 43.062
 Total 100

50 / 1 . X = -4176. Y = -26792. Z = -32. Comment : 911-13-chem-17

Mg	0.178	0.178	24.052	0.145	0.037	289	481	9.246	20	1.92	17.752	3.818
Si	2.749	2.749	513.469	1.936	0.086	235	10252	9.246	20	54.028	499.518	36.806
Mn	0.12	0.12	7.225	0.043	0.057	573	289	9.246	40	0.362	3.35	1.865
Fe	0.219	0.219	14.201	0.077	0.128	1257	142	9.246	10	0.8	7.401	2.088
Ca	35.894	35.894	2435.366	17.72	0.882	422	48319	9.246	20	262.74	2429.166	392.793
C	11.78	11.78		19.406								
O	49.06	49.06		60.671								
Total	100	100		100								

Formula Oxide
 MgO 0.295
 SiO2 5.88
 MnO 0.155
 FeO 0.281
 CaO 50.223
 CO2 43.165
 Total 100

51 / 1 . X = -3503. Y = -27338. Z = -36. Comment : 911-13-chem-18

Total	100	100	100
Formula			
Oxide			
MgO	0.138		
SiO2	0.018		
MnO	0.129		
FeO	0.348		
CaO	56.127		
CO2	43.24		
Total	100		

54 / 1 . X = -3629. Y = -27319. Z = -34. Comment : 911-13-chem-21

Mg	11.837	11.837	1228.51	9.066	0.25	287	24471	9.247	20	132.134	1221.86	184.734
Si	0.165	0.165	39.105	0.11	0.028	228	782	9.247	20	3.012	27.855	3.476
Mn	0.473	0.473	16.626	0.16	0.077	547	665	9.247	40	1.419	13.126	4.75
Fe	0.612	0.612	27.102	0.204	0.164	1237	271	9.247	10	2.228	20.602	4.17
Ca	22.389	22.389	1496.1	10.399	0.601	403	29775	9.247	20	161.202	1490.65	274.509
C	12.907	12.907		20.004								
O	51.617	51.617		60.057								
Total	100	100		100								

Formula			
Oxide			
MgO	19.629		
SiO2	0.353		
MnO	0.611		
FeO	0.788		
CaO	31.327		
CO2	47.293		
Total	100		

55 / 1 . X = -19424. Y = -5257. Z = 39. Comment : CaCO3-05

Mg	0.003	0.003	6.95	0.002	0.025	299	139	9.268	20	0.027	0.25	1.037
Si	0.016	0.016	17.201	0.011	0.021	238	344	9.268	20	0.308	2.85	1.199
Mn	0.097	0.097	7.1	0.035	0.058	609	284	9.268	40	0.291	2.7	1.614
Fe	0.056	0.056	7	0.02	0.097	1089	70	9.268	10	0.205	1.9	1.373
Ca	39.679	39.679	2714.042	19.786	0.959	440	53799	9.268	20	292.088	2707.192	396.202
C	12.075	12.075		20.093								
O	48.075	48.075		60.052								
Total	100	100		100								

Formula			
Oxide			
MgO	0.004		
SiO2	0.034		
MnO	0.125		
FeO	0.072		
CaO	55.518		

CO2 44.247
Total 100

56 / 1 . X = -19391. Y = -5255. Z = 39. Comment : CaCO3-06

MgO	0.011	0.011	7.4	0.009	0.025	291	148	9.259	20	0.119	1.1	1.175
SiO2	0.004	0.004	14.301	0.003	0.02	232	286	9.259	20	0.07	0.65	1.048
MnO	0.108	0.108	6.9	0.04	0.056	572	276	9.259	40	0.327	3.025	1.781
FeO	0.021	0.021	5.4	0.007	0.089	1048	54	9.259	10	0.076	0.7	1.149
CaO	39.968	39.968	2733.945	19.977	0.965	491	54190	9.259	20	294.341	2725.395	319.751
CO2	11.977	11.977		19.976								
O	47.912	47.912		59.989								
Total	100	100		100								

Formula Oxide

MgO 0.018
SiO2 0.008
MnO 0.14
FeO 0.027
CaO 55.923
CO2 43.885
Total 100

57 / 1 . X = -19366. Y = -5245. Z = 39. Comment : CaCO3-07

MgO	0.006	0.006	7.05	0.005	0.025	293	141	9.276	20	0.065	0.6	1.093
SiO2	0.008	0.008	15.151	0.005	0.02	233	303	9.276	20	0.151	1.4	1.102
MnO	0.104	0.104	7.05	0.038	0.057	591	282	9.276	40	0.313	2.9	1.699
FeO	0	0	5.9	0	0.098	1215	59	9.276	10	-0.054	-0.5	0.922
CaO	39.81	39.825	2726.564	19.872	0.962	467	54045	9.276	20	293.099	2718.814	351.806
CO2	12.04	12.045		20.055								
O	48.009	48.027		60.03								
Total	99.977	100.015		100.005								

Formula Oxide

MgO 0.01
SiO2 0.016
MnO 0.134
FeO 0
CaO 55.702
CO2 44.118
Total 99.981

58 / 1 . X = -19343. Y = -5237. Z = 39. Comment : CaCO3-08

MgO	0	0	5.35	0	0.024	320	107	9.276	20	-0.253	-2.35	0.695
SiO2	0.009	0.009	16.801	0.006	0.021	245	336	9.276	20	0.173	1.6	1.105
MnO	0.131	0.131	7.175	0.048	0.056	545	287	9.276	40	0.393	3.65	2.035

Fe	0	0	5.7	0	0.097	1224	57	9.276	10	-0.086	-0.8	0.877
Ca	39.782	39.837	2724.07	19.88	0.961	446	53996	9.276	20	292.905	2717.02	386.384
C	12.03	12.047		20.061								
O	47.957	48.024		60.033								
Total	99.908	100.047		100.028								

Formula Oxide

MgO	0
SiO2	0.019
MnO	0.169
FeO	0
CaO	55.663
CO2	44.08
Total	99.93

59 / 1 . X = -20808. Y = -1622. Z = 49. Comment : MgCO3-05

Mg	12.923	12.923	1351.299	9.814	0.262	254	26906	9.246	20	145.584	1345.999	254.958
Si	0.006	0.006	11.55	0.004	0.019	222	231	9.246	20	0.108	1	1.095
Mn	0.007	0.007	3.725	0.002	0.046	550	149	9.246	40	0.022	0.2	1.057
Fe	0.06	0.06	6.1	0.02	0.09	992	61	9.246	10	0.216	2	1.488
Ca	21.948	21.948	1462.676	10.108	0.592	422	29113	9.246	20	157.561	1456.726	245.823
C	13.035	13.035		20.033								
O	52.022	52.022		60.018								
Total	100	100		100								

Formula Oxide

MgO	21.429
SiO2	0.013
MnO	0.009
FeO	0.077
CaO	30.709
CO2	47.763
Total	100

60 / 1 . X = -20801. Y = -1587. Z = 48. Comment : MgCO3-06

Mg	12.961	12.961	1356.394	9.85	0.263	278	27007	9.246	20	146.022	1350.044	213.601
Si	0.004	0.004	12.401	0.003	0.02	234	248	9.246	20	0.07	0.65	1.055
Mn	0.01	0.01	3.1	0.003	0.042	493	124	9.246	40	0.03	0.275	1.097
Fe	0.086	0.086	7	0.029	0.094	992	70	9.246	10	0.314	2.9	1.707
Ca	21.963	21.963	1462.727	10.121	0.593	381	29114	9.246	20	157.685	1457.877	301.588
C	13.003	13.003		19.995								
O	51.973	51.973		59.999								
Total	100	100		100								

Formula Oxide

MgO	21.493
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SiO2 0.008
MnO 0.013
FeO 0.111
CaO 30.73
CO2 47.644
Total 100

61 / 1 . X = -15527. Y = -6830. Z = 34. Comment : FeCO3-05

Mg	0.053	0.053	10.65	0.05	0.035	372	213	9.27	20	0.448	4.15	1.638
Si	0.017	0.017	16.951	0.014	0.023	265	339	9.27	20	0.302	2.8	1.198
Mn	2.086	2.086	70.842	0.877	0.132	598	2833	9.27	40	7.062	65.466	13.18
Fe	45.753	45.753	1698.871	18.91	1.163	1865	16894	9.27	10	181.336	1680.97	94.903
Ca	0.01	0.01	7.4	0.006	0.035	410	148	9.27	20	0.081	0.75	1.113
C	10.454	10.454		20.09								
O	41.626	41.626		60.052								
Total	100	100		100								

Formula Oxide

MgO 0.087
SiO2 0.037
MnO 2.694
FeO 58.861
CaO 0.015
CO2 38.306
Total 100

62 / 1 . X = -15519. Y = -6868. Z = 34. Comment : FeCO3-06

Mg	0.078	0.078	11.9	0.074	0.033	315	238	9.928	20	0.66	6.55	2.224
Si	0.011	0.011	17.101	0.009	0.022	257	342	9.928	20	0.191	1.9	1.125
Mn	2.109	2.109	77.045	0.884	0.129	601	3081	9.928	40	7.134	70.819	12.376
Fe	45.559	45.559	1809.44	18.793	1.126	1733	17987	9.928	10	180.481	1791.739	102.222
Ca	0.008	0.008	6.95	0.004	0.032	374	139	9.928	20	0.06	0.6	1.094
C	10.508	10.508		20.154								
O	41.728	41.728		60.081								
Total	100	100		100								

Formula Oxide

MgO 0.129
SiO2 0.023
MnO 2.723
FeO 58.611
CaO 0.011
CO2 38.503
Total 100

Bg cnt (cps Bg1 cnt (cř Bg2 cnt (cř lx/lstd	lx/lpure	Z	A	F			
5.75	6.6	4.9	0.001	0	0.201	1.96	1.001
14.101	16.101	12.1	0.001	0	0.389	1.346	1.005
3.9	3.8	4	0.001	0.001	0.341	1.042	1
4.5	5	4	0	0	0.32	1.032	1
7.9	7	8.8	0.989	0.361	0.486	1.034	1
5.35	5.9	4.8	0.002	0	0.201	1.961	1.001
14.851	16.001	13.701	0	0	0.389	1.346	1.005
3.875	4.3	3.45	0.001	0.001	0.341	1.042	1
5.1	3.8	6.4	0.001	0	0.321	1.032	1
7.85	8.3	7.4	0.999	0.365	0.486	1.034	1
6.6	7.2	6	0	0	0.201	1.962	1.001
15.751	18.601	12.901	0	0	0.389	1.346	1.005
3.85	4.25	3.45	0.001	0.001	0.341	1.043	1
6.8	6.8	6.8	0	0	0.321	1.032	1

9.15 8.8 9.5 1.004 0.366 0.486 1.034 1

6.5 7.4 5.6 0.001 0 0.201 1.961 1.001
14.051 15.501 12.601 0 0 0.389 1.346 1.005
3.525 3.5 3.55 0.001 0.001 0.341 1.042 1
5.9 5.8 6 0 0.321 1.032 1
7.2 6.5 7.9 0.989 0.361 0.486 1.034 1

6.4 6.5 6.3 0.97 0.079 0.226 1.833 1.001
9.9 12.401 7.4 0 0 0.339 1.43 1.003
2.95 2.8 3.1 0 0 0.344 1.029 1
5.1 5 5.2 0.001 0 0.321 1.022 1
5.75 5.5 6 0.537 0.196 0.47 1.042 1

5.55	6.5	4.6	0.975	0.079	0.227	1.832	1.001
16.301	17.901	14.701	0	0	0.339	1.43	1.003
3.425	3.7	3.15	0	0	0.344	1.028	1
5.4	4.8	6	0.001	0	0.321	1.022	1
6.05	5.7	6.4	0.533	0.194	0.47	1.042	1

5.75	6.9	4.6	0.986	0.08	0.227	1.832	1.001
11.1	12.1	10.1	0	0	0.338	1.432	1.003
3.175	3.5	2.85	0	0	0.344	1.029	1
4.7	5.2	4.2	0	0	0.321	1.022	1
5	6.2	3.8	0.536	0.196	0.47	1.042	1

7.05	8.2	5.9	0.974	0.079	0.226	1.833	1.001
11.9	13.901	9.9	0	0	0.339	1.431	1.003
3.175	3.45	2.9	0	0	0.344	1.029	1
4.4	4.6	4.2	0.001	0.001	0.321	1.022	1
5.55	4.8	6.3	0.537	0.196	0.47	1.042	1

5.7	6.8	4.6	0.005	0	0.121	2.595	1
15.001	14.901	15.101	0	0	0.297	1.58	1.001
5.3	6.6	4	0.025	0.018	0.382	1.013	1.034
18.401	21.201	15.601	0.995	0.391	0.354	1.01	1
6.9	6.2	7.6	0	0	0.488	1.059	1.029

5.7	6.5	4.9	0.004	0	0.12	2.599	1
15.451	15.401	15.501	0	0	0.296	1.581	1.001
5	5.9	4.1	0.027	0.019	0.382	1.014	1.034
18.501	17.001	20.001	0.999	0.392	0.355	1.01	1
6.15	6	6.3	0	0	0.488	1.059	1.029

6.55	7.5	5.6	0.004	0	0.12	2.602	1
15.551	18.201	12.901	0.001	0	0.296	1.583	1.001
5.3	5.65	4.95	0.027	0.019	0.382	1.014	1.034
18.801	19.401	18.201	1.008	0.396	0.355	1.01	1
6.95	7.4	6.5	0	0	0.488	1.059	1.029

5.45	5.5	5.4	0.005	0	0.121	2.591	1
14.651	16.801	12.501	0	0	0.297	1.578	1.001
4.8	4.85	4.75	0.026	0.019	0.381	1.013	1.034
19.201	23.402	15.001	0.987	0.388	0.354	1.01	1
5.75	5.9	5.6	0	0	0.488	1.058	1.029

5.95	7.5	4.4	0.884	0.072	0.222	1.854	1.001
10.75	13.101	8.4	0.004	0.001	0.341	1.427	1.003
3.025	3.45	2.6	0.005	0.003	0.345	1.028	1
4.3	5.6	3	0.015	0.006	0.322	1.022	1
6	5.7	6.3	0.534	0.195	0.471	1.042	1.001

7.15	8.3	6	0.906	0.074	0.219	1.866	1.001
14.601	18.301	10.9	0	0	0.337	1.435	1.002
3.2	3.2	3.2	0.001	0.001	0.346	1.027	1.001
4.8	5.2	4.4	0.043	0.017	0.322	1.021	1
5.35	4.8	5.9	0.496	0.181	0.47	1.043	1.001

7.05	8.2	5.9	0.724	0.059	0.217	1.875	1.001
13.351	14.801	11.9	0.076	0.018	0.348	1.414	1.002
3.15	3.7	2.6	0.001	0.001	0.346	1.027	1.001

6.5	6.6	6.4	0.048	0.019	0.322	1.021	1
5.95	6.3	5.6	0.488	0.178	0.469	1.044	1.001

7.5	7.6	7.4	0.773	0.063	0.214	1.888	1.001
12.251	14.501	10	0.001	0	0.342	1.426	1.003
4.35	4.7	4	0.001	0	0.345	1.029	1.001
6.2	5.8	6.6	0.052	0.021	0.322	1.022	1
6.2	6.1	6.3	0.553	0.202	0.472	1.042	1.001

6.2	6.3	6.1	0.776	0.063	0.215	1.884	1.001
11.25	12.801	9.7	0.001	0	0.343	1.425	1.003
2.975	3.05	2.9	0.001	0.001	0.345	1.028	1.001
6.3	7.4	5.2	0.048	0.019	0.322	1.022	1
6	7.2	4.8	0.536	0.195	0.472	1.042	1.001

5.9	7.2	4.6	0.888	0.072	0.223	1.848	1.001
12.801	14.601	11	0.014	0.003	0.341	1.425	1.002
3.5	4.1	2.9	0.005	0.003	0.345	1.028	1
4.5	5.6	3.4	0.01	0.004	0.321	1.021	1
7.05	6.5	7.6	0.523	0.191	0.47	1.042	1.001

6.4	7.2	5.6	0.753	0.061	0.215	1.881	1.001
12.251	13.901	10.6	0.011	0.003	0.344	1.421	1.002
3.5	4.05	2.95	0.001	0.001	0.345	1.027	1.001
4.9	4.8	5	0.046	0.018	0.322	1.021	1
5.95	4.7	7.2	0.506	0.185	0.471	1.042	1.001

6.35	7.3	5.4	0.766	0.062	0.215	1.886	1.001
13.801	15.301	12.301	0.002	0	0.343	1.424	1.003
3.4	4.05	2.75	0.002	0.001	0.345	1.029	1.001
4.9	5	4.8	0.048	0.019	0.322	1.022	1
6.95	6.3	7.6	0.546	0.199	0.472	1.042	1.001

5.45	6.2	4.7	0.771	0.063	0.215	1.884	1.001
12.05	13.601	10.5	0.001	0	0.343	1.424	1.003
3.8	4.4	3.2	0.001	0.001	0.345	1.029	1.001
5.2	5.2	5.2	0.046	0.018	0.322	1.022	1
6.1	5.2	7	0.548	0.2	0.472	1.042	1.001

7.3	7.4	7.2	0.905	0.073	0.223	1.847	1.001
12.501	13.701	11.3	0.002	0	0.341	1.427	1.003
3.35	3.9	2.8	0.004	0.003	0.344	1.028	1
6	7.4	4.6	0.007	0.003	0.321	1.022	1
5.6	5.7	5.5	0.536	0.196	0.471	1.042	1

6.7	8.1	5.3	0.786	0.064	0.215	1.883	1.001
13.951	16.201	11.7	0.001	0	0.342	1.426	1.003
4.075	3.85	4.3	0.001	0.001	0.345	1.029	1.001
5.6	6.6	4.6	0.046	0.018	0.322	1.022	1
5.7	6.5	4.9	0.55	0.201	0.472	1.042	1.001

5.45	6.5	4.4	0.797	0.065	0.216	1.88	1.001
12.501	14.001	11	0.001	0	0.342	1.426	1.003
3.65	4.2	3.1	0.001	0.001	0.345	1.029	1.001
4.9	4.2	5.6	0.042	0.017	0.322	1.022	1
5.8	5.6	6	0.554	0.202	0.472	1.042	1.001

6.65	7.8	5.5	0.785	0.064	0.216	1.881	1.001
12.951	16.201	9.7	0.003	0.001	0.343	1.425	1.003
2.85	3.4	2.3	0.002	0.001	0.345	1.029	1.001
5.3	5.6	5	0.043	0.017	0.322	1.022	1
5.6	5.2	6	0.541	0.197	0.472	1.042	1.001

8.7	10	7.4	0.886	0.072	0.217	1.883	1.001
16.551	19.101	14.001	0.028	0.007	0.339	1.439	1.003
4.4	4.4	4.4	0.001	0.001	0.346	1.032	1.001
7.8	7.6	8	0.056	0.022	0.324	1.024	1
8.1	8.9	7.3	0.618	0.225	0.474	1.045	1.001

6.7	7.3	6.1	0.888	0.072	0.223	1.851	1.001
12.1	13.801	10.4	0.002	0	0.341	1.426	1.003

2.975	3.15	2.8	0.003	0.002	0.344	1.029	1
4.3	4.2	4.4	0.009	0.004	0.321	1.022	1
5.95	5.6	6.3	0.548	0.2	0.471	1.042	1

6.25	7.6	4.9	0.881	0.072	0.223	1.848	1.001
11.5	12.501	10.5	0.021	0.005	0.342	1.424	1.003
2.9	3.1	2.7	0.004	0.003	0.345	1.028	1
5.8	7.6	4	0.01	0.004	0.321	1.022	1
5.35	4.9	5.8	0.53	0.193	0.47	1.043	1.001

5.85	6.1	5.6	0.876	0.071	0.223	1.849	1.001
11.6	12.2	11	0.022	0.005	0.342	1.424	1.003
3.75	4.2	3.3	0.004	0.003	0.345	1.028	1
5.3	6.4	4.2	0.011	0.004	0.321	1.022	1
5.55	6	5.1	0.529	0.193	0.47	1.043	1.001

5.65	6.3	5	0.784	0.064	0.218	1.871	1.001
11.55	14.201	8.9	0.003	0.001	0.345	1.421	1.003
3.2	3.45	2.95	0.002	0.002	0.345	1.029	1.001
6.7	6.8	6.6	0.026	0.01	0.322	1.022	1
5.8	6.5	5.1	0.561	0.205	0.472	1.041	1.001

7.2	7.8	6.6	0.766	0.062	0.215	1.883	1.001
11.55	13.601	9.5	0.004	0.001	0.343	1.423	1.003
3.175	3.6	2.75	0.001	0.001	0.345	1.029	1.001
4.4	4.2	4.6	0.045	0.018	0.322	1.022	1
5.4	4.6	6.2	0.541	0.197	0.472	1.042	1.001

5.85	6.8	4.9	0.85	0.069	0.221	1.859	1.001
12.801	14.001	11.6	0.001	0	0.343	1.424	1.003
4.25	4.6	3.9	0.003	0.002	0.344	1.029	1
7	9	5	0.016	0.006	0.321	1.022	1
5.8	5.7	5.9	0.558	0.204	0.472	1.042	1.001

6.95	8.5	5.4	0.785	0.064	0.215	1.882	1.001
11.9	12.501	11.3	0.005	0.001	0.342	1.425	1.002
3.1	3.6	2.6	0.003	0.002	0.345	1.028	1.001
5.2	4.4	6	0.046	0.018	0.322	1.021	1
5.2	5.5	4.9	0.525	0.191	0.471	1.042	1.001

6.4	5.7	7.1	0.005	0	0.201	1.963	1.001
16.151	18.901	13.401	0.002	0	0.389	1.347	1.005
4.125	4.35	3.9	0.002	0.001	0.342	1.043	1
4.9	5.2	4.6	0.001	0.001	0.321	1.033	1
8	8.5	7.5	1.006	0.367	0.486	1.034	1

6.4	7.2	5.6	0.009	0.001	0.202	1.956	1.001
16.301	17.801	14.801	0.034	0.008	0.389	1.346	1.005
4	4.2	3.8	0.001	0.001	0.342	1.042	1
4.6	5	4.2	0.005	0.002	0.321	1.032	1
8.8	8.8	8.8	0.963	0.351	0.484	1.035	1

7.25	8.6	5.9	0.765	0.062	0.218	1.87	1.001
11.7	14.201	9.2	0.077	0.019	0.346	1.418	1.002
3.975	4.5	3.45	0.003	0.002	0.346	1.028	1.001
4.9	3.6	6.2	0.043	0.017	0.323	1.021	1
5.4	4.8	6	0.505	0.184	0.469	1.045	1.001

6	6.8	5.2	0.908	0.074	0.223	1.848	1.001
11.35	13.501	9.2	0.005	0.001	0.341	1.428	1.003
3.55	3.65	3.45	0.003	0.002	0.344	1.029	1
4.1	5	3.2	0.009	0.004	0.321	1.022	1
6.75	6.8	6.7	0.549	0.2	0.471	1.042	1

7.25	7.6	6.9	0.056	0.005	0.208	1.924	1.002
14.951	18.401	11.5	0.14	0.034	0.391	1.34	1.004
3.875	4.4	3.35	0	0	0.343	1.038	1
4.7	4	5.4	0.003	0.001	0.321	1.029	1
6.4	6.8	6	0.837	0.305	0.479	1.039	1

6.15	7.2	5.1	0.048	0.004	0.205	1.942	1.001
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15.051	16.701	13.401	0.054	0.013	0.388	1.346	1.005
3.975	4	3.95	0	0	0.342	1.041	1
6.8	6.8	6.8	0	0	0.321	1.031	1
8.3	6.8	9.8	0.931	0.34	0.483	1.036	1

6.95	7.8	6.1	0.6	0.049	0.209	1.917	1.001
14.701	16.401	13.001	0.026	0.006	0.35	1.414	1.003
3.85	4.2	3.5	0.003	0.002	0.346	1.031	1.001
6.1	6.2	6	0.066	0.026	0.323	1.023	1
6.7	6.6	6.8	0.606	0.221	0.475	1.042	1.002

7.2	7.3	7.1	0.623	0.051	0.208	1.921	1.001
13.101	14.801	11.4	0.005	0.001	0.348	1.419	1.003
3.625	4.1	3.15	0.003	0.002	0.346	1.031	1.001
5.2	4	6.4	0.07	0.028	0.323	1.023	1
5.2	5.4	5	0.61	0.223	0.475	1.041	1.002

6.45	7.1	5.8	0.151	0.012	0.205	1.939	1.001
15.001	15.701	14.301	0.033	0.008	0.381	1.359	1.005
3.875	4.05	3.7	0.001	0.001	0.342	1.04	1
5.9	6.8	5	0.004	0.002	0.321	1.031	1
6.6	6.2	7	0.916	0.334	0.483	1.037	1

6.7	7.6	5.8	0.871	0.071	0.22	1.86	1.001
10.85	10.9	10.8	0.003	0.001	0.341	1.428	1.003
3.325	3.5	3.15	0.003	0.002	0.345	1.029	1
5.2	5	5.4	0.021	0.008	0.322	1.022	1
5	5.7	4.3	0.542	0.198	0.471	1.042	1.001

6.1	7.7	4.5	0.876	0.071	0.221	1.856	1.001
12.951	13.001	12.901	0.005	0.001	0.341	1.427	1.003
3.7	3.9	3.5	0.005	0.004	0.345	1.029	1
5.2	5.4	5	0.015	0.006	0.322	1.022	1
7.1	5.7	8.5	0.541	0.197	0.471	1.042	1.001

6.2	6.6	5.8	0.641	0.052	0.213	1.894	1.001
14.551	17.201	11.9	0.115	0.028	0.35	1.411	1.002
4.1	4.7	3.5	0.003	0.002	0.347	1.027	1.002
7.2	9	5.4	0.072	0.028	0.323	1.021	1
6.85	8	5.7	0.477	0.174	0.469	1.046	1.002

6.35	7.6	5.1	0.901	0.073	0.223	1.848	1.001
11.7	12.701	10.7	0.005	0.001	0.341	1.427	1.003
3.225	3.65	2.8	0.003	0.002	0.344	1.029	1
5.8	5.8	5.8	0.007	0.003	0.321	1.022	1

5.3 4.6 6 0.557 0.203 0.471 1.042 1

6.45 7 5.9 0.869 0.071 0.221 1.857 1.001
10.7 10.5 10.9 0.002 0 0.342 1.426 1.003
3.15 3.1 3.2 0.003 0.002 0.345 1.029 1
4.5 5.8 3.2 0.017 0.007 0.322 1.022 1
5.65 4.6 6.7 0.554 0.202 0.471 1.042 1.001

6.2 5.9 6.5 0.004 0 0.201 1.962 1.001
13.201 15.201 11.2 0.003 0.001 0.389 1.347 1.005
3.425 3.8 3.05 0.002 0.001 0.342 1.042 1
6.6 5.2 8 0.001 0 0.321 1.032 1
7.65 8.8 6.5 1.001 0.365 0.486 1.034 1

7.75	9.1	6.4	0.003	0	0.201	1.962	1.001
14.901	16.501	13.301	0.001	0	0.389	1.347	1.005
3.95	3.8	4.1	0.001	0.001	0.342	1.043	1
5.2	5	5.4	0.001	0	0.321	1.033	1
8.05	7.8	8.3	1.011	0.369	0.486	1.034	1

6.3	6.9	5.7	0.013	0.001	0.205	1.941	1.001
13.951	15.901	12	0.091	0.022	0.391	1.341	1.005
3.875	3.65	4.1	0.001	0.001	0.342	1.04	1
6.8	6	7.6	0.004	0.002	0.321	1.03	1
6.2	5.8	6.6	0.89	0.325	0.481	1.037	1

7.15	8.2	6.1	0.006	0	0.201	1.964	1.001
16.551	19.401	13.701	0	0	0.388	1.348	1.005
4.45	4.6	4.3	0.002	0.001	0.342	1.043	1
5.8	5	6.6	0.003	0.001	0.321	1.033	1
8.85	8.6	9.1	1.005	0.367	0.486	1.034	1

5.85	6.7	5	0.877	0.071	0.222	1.855	1.001
13.201	15.701	10.7	0.004	0.001	0.341	1.426	1.003
3.65	4	3.3	0.007	0.005	0.345	1.029	1
4.5	4.8	4.2	0.01	0.004	0.322	1.022	1
6.15	6.1	6.2	0.547	0.2	0.471	1.042	1.001

6.85	6.1	7.6	0.006	0	0.2	1.965	1.001
13.501	15.201	11.8	0	0	0.388	1.348	1.005
3.15	2.85	3.45	0.001	0.001	0.342	1.043	1
6.3	6.6	6	0.005	0.002	0.321	1.032	1
7.7	7.7	7.7	1.002	0.365	0.486	1.034	1

6.65	7.6	5.7	0.878	0.071	0.222	1.855	1.001
11.25	12.301	10.2	0.005	0.001	0.341	1.427	1.003
3.5	3	4	0.005	0.004	0.345	1.029	1
6.5	7.4	5.6	0.012	0.005	0.322	1.022	1
5.45	5.4	5.5	0.546	0.199	0.471	1.042	1.001

6.7	5.9	7.5	0	0	0.201	1.961	1.001
14.351	17.401	11.3	0.001	0	0.389	1.346	1.005
4.4	5.1	3.7	0.001	0.001	0.341	1.042	1
5.1	4.4	5.8	0.001	0	0.321	1.032	1
6.85	6.4	7.3	0.99	0.361	0.486	1.034	1

6.3	7.1	5.5	0.001	0	0.201	1.961	1.001
13.651	16.601	10.7	0	0	0.389	1.346	1.005
3.875	3.75	4	0.001	0.001	0.341	1.042	1
4.7	5.8	3.6	0	0	0.321	1.032	1
8.55	8.3	8.8	0.997	0.364	0.486	1.034	1

6.45	6.8	6.1	0	0	0.201	1.961	1.001
13.751	15.001	12.501	0	0	0.389	1.346	1.005
4.15	3.95	4.35	0.001	0.001	0.341	1.042	1
6.4	4.6	8.2	0	0	0.321	1.032	1
7.75	6.4	9.1	0.993	0.362	0.486	1.034	1

7.7	6.4	9	-0.002	0	0.201	1.961	1.001
15.201	17.401	13.001	0	0	0.389	1.346	1.005
3.525	4	3.05	0.001	0.001	0.341	1.042	1

6.5	5.8	7.2	0	0	0.321	1.032	1
7.05	6.3	7.8	0.992	0.362	0.486	1.034	1

5.3	6.2	4.4	0.967	0.079	0.226	1.833	1.001
10.55	11.6	9.5	0	0	0.339	1.43	1.003
3.525	4.05	3	0	0	0.344	1.028	1
4.1	4.4	3.8	0.001	0	0.321	1.022	1
5.95	5.6	6.3	0.534	0.195	0.47	1.042	1

6.35	7.1	5.6	0.97	0.079	0.226	1.834	1.001
11.75	12.301	11.2	0	0	0.339	1.43	1.003
2.825	3.2	2.45	0	0	0.344	1.028	1
4.1	4	4.2	0.002	0.001	0.321	1.022	1
4.85	5.5	4.2	0.534	0.195	0.47	1.042	1

6.5	7	6	0.003	0	0.12	2.595	1
14.151	14.201	14.101	0.001	0	0.297	1.58	1.001
5.375	5.7	5.05	0.025	0.018	0.382	1.013	1.034
17.901	21.802	14.001	0.995	0.391	0.354	1.01	1
6.65	6	7.3	0	0	0.488	1.058	1.029

5.35	7	3.7	0.004	0	0.121	2.592	1
15.201	15.101	15.301	0	0	0.297	1.579	1.001
6.225	6.85	5.6	0.025	0.018	0.382	1.013	1.034
17.701	19.201	16.201	0.991	0.389	0.354	1.01	1
6.35	6.9	5.8	0	0	0.488	1.058	1.029