

CHEMISTRY DEPARTMENT SEMINAR



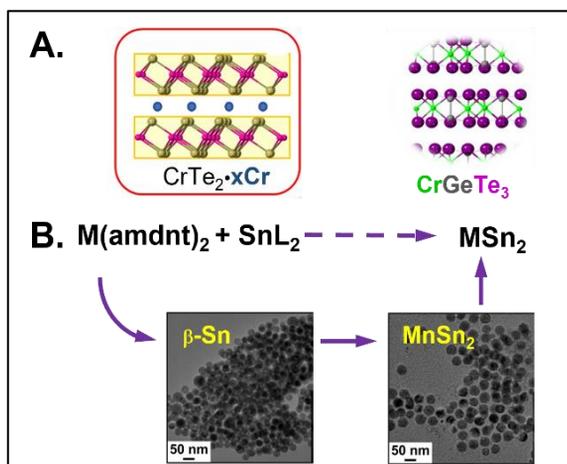
Colloidal Routes To Magnetic Nanomaterials

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World is increasingly looking for more energy-efficient ways for data storage and processing, since the information and communication technology already consumes over 10% of global energy use. One of the ways is the development of magneto-electric- and spintronic (spin manipulation)- based approaches, which require controlled application of ferromagnetic materials at nanoscale. With the major goal in mind, we explored two viable synthetic approaches to obtain nano-ferromagnetics: synthesis of A) ferromagnetic 2D materials and B) ferromagnetic nanoalloys. The availability of 2D ferromagnetic materials has remained elusive until recently, when several different systems (CrI_3 , CrGeTe_3 , etc) exhibited long range ferromagnetic ordering down to a few monolayers. A major challenge to overcome in these materials is the intrinsically low Curie temperatures, limiting their use in future applications. Here, I will discuss rich Cr-Te phase diagram, and present a solution-based method leading to the formation of CrTe_3 , Cr_2Te_3 , and GeCrTe_3 at nanoscale, including some mechanistic insights. Ultimately inspired by the existence of strongly magnetic MnBi material ($3d-6p$ alloy), we first decided to investigate the formation of $3d-5p$ alloys of $3d$ transition metal alloys with Sn and Sb.

Additional motivation for that came from the need for new Sn-based battery electrode materials, which can withstand charge/discharge volume changes, as tin enables new generation high-energy lithium and sodium batteries. I will discuss our general approach to the synthesis of a variety of nanoscale transition metal stannides MSn_x and antimonides MSb_y , including previously unreported compositions, which proceeds through the *in-situ* nucleation of 'template' b-Sn or Sb seeds, followed by the reduction of the M^{2+} cation and the diffusion of M^0 into the Sn or Sb lattice.



April 21st @ 2.00 p.m. – Lopez 106

Meeting ID: 955 4454 2732 <https://zoom.us/j/95544542732>