Acoustofluidics for the removal of microplastics and the detection of viruses

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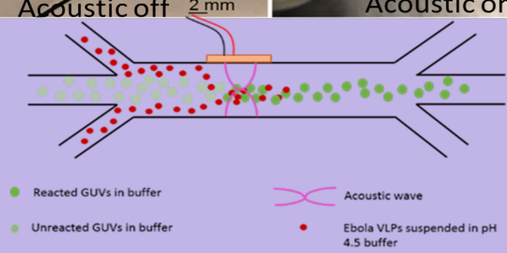
Ph.D. defense

Acoustofluidic devices use standing acoustic waves to manipulate particles in a flow-through format. The ability to control and concentrate particles precisely in these devices can offer new tools in chemical analysis. In this talk, I will discuss our findings in developing new acoustofluidic devices to isolate microplastics and detect viruses.

The remnants of degraded plastic wastes in aquatic systems have threatened life on earth due to their bioaccumulation and capture of heavy metals. The degraded plastics smaller than 5 mm are known as microplastics (MPs). We showed the capability of acoustofluidics to address one of the major limitations in MPs removal, the inability to simultaneously remove all types and sizes of microplastics in aquatic media. In this presentation, I will discuss how we use acoustofluidics technology to remove environmentally relevant microplastics in aqueous media with different densities and the scaling up of the technique for large-scale removal. Even though acoustofluidics is widely used for the concentration and separation of particles, the capability of using acoustofluidics for chemical reactions is yet to be realized. We investigated the implementation of acoustofluidics to detect virus-like particles by reacting them with virus-sensitive particles in acoustofluidic devices. The utilization of acoustofluidics for detecting viruses can provide automatable, high-throughput, and cost-effective detection, and I will discuss our findings on developing an acoustofluidic-based virus detection method. Further, I will discuss the development of a three-layer micro-scale device designed to perform amplification of COVID-19 viral RNA for the colorimetric detection of the virus.



June 27 2023 3.00 p.m.

Lopez 106

Zoom:https://zoom.us/j/94953141578?pwd=bFkrZ0dJcWt2cXJXKy9TN0F3SVQwUT09

Meeting ID: 949 5314 1578

Passcode: 586929

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