CEE691 Seminar Series in Spring 2017

The Department of Civil and Environmental Engineering
University of Hawaii at Manoa

Diffusiophoresis: from targeted particle delivery to membraneless water filtration

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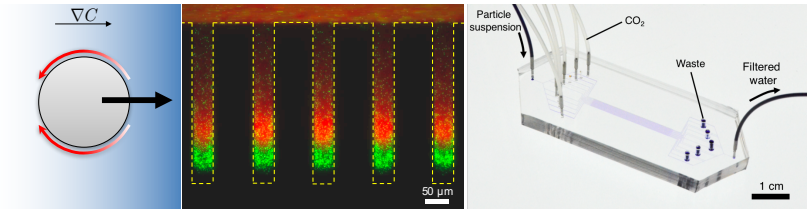

Abstract Diffusiophoresis describes a process by which a particle moves in response to the local chemical gradients. Although this transport process has been known for decades, it is often considered to be an esoteric laboratory phenomenon. In this talk, I will present how this subtle electrokinetic effect can impact across a wide range of applications, from targeted particle delivery for drugs and personal care products to membranless water filtration. In the first part of the talk, we will discuss about delivering colloidal particles into dead-end pores, which are commonly found in many natural/artificial systems. Particle transport into dead-end pores is often important, but is difficult to achieve owing to the confinement. We explore the possibility of using diffusiophoresis as a means to enhance the transport of particles in such geometries. Our findings have implications for various manners of controlled release processes, ranging from drug delivery to cosmetics. In the second part, we will further exploit diffusiophoresis to achieve membraneless water filtration. Water purification technologies such as micro/ultrafiltration utilize porous membranes to remove suspended particles. These membranes, however, cause many drawbacks such as a high pumping cost and a need for periodic replacement due to fouling. We present an alternative membraneless method for separating suspended particles by exposing the colloidal suspension to CO_2. Dissolution of CO_2 into the suspension creates chemical gradients that drive diffusiophoretic motion of particles. Using this directed motion of particles induced by CO_2, we demonstrate a scalable, continuous flow, membraneless particle filtration process that exhibits low energy consumption and is essentially free from fouling.

Tuesday, February 21st
2:30 p.m. – 3:20 p.m.

Crawford Hall
Room 105

Building Select: Crawford Hall (Craw or CR)