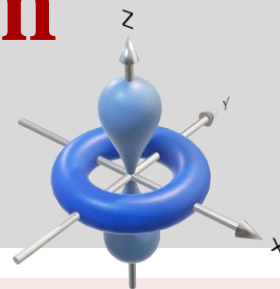




Department of Physics Colloquium

August 29, 2022



3:00 PM

Introducing Solid with Infused Reactive Liquid (SWIRL) for Effective CO₂ Capture

Dr. Mohsen Yeganeh

*ExxonMobil Technology and Engineering Co.
and MIT Energy Center*

The high capital and operation costs of the current commercial liquid-amine based carbon capture approach inhibit widespread implementation of the nearly century-old technology. Therefore, a more economically viable and effective CO₂ capture technology is desired to meet the target of limiting the global average temperature increase to 1.5°C above pre-industrial levels. In this presentation, we report on a novel approach to liquid amine-based CO₂ capture, which is motivated by liquid infused surfaces (LIS) technology. We have realized that since the impregnating liquid in LIS is strongly held by capillary forces on the solid surface, it can be formed and structured by controlling and shaping the underlying substrate, enabling a new class of technological opportunities. For example, generating an LIS using a reactive liquid on a textured and chemically-modified continuum solid structure with high A/V can shape a liquid with a similarly large A/V. We refer to this class of LIS as a “solid with infused reactive liquid” (SWIRL).

We fabricate SWIRL-amines and demonstrate their efficient CO₂ capture using neat amine*, requiring no energetically costly mechanical mixing unlike the current commercial carbon capture approach. These results may provide a pathway for compact, energy efficient, high temperature, and high-capacity isothermal absorption-regeneration carbon capture cycles.

* Yeganeh *et. al.*, Solid with Infused Reactive Liquid (SWIRL): a Novel Liquid-Based Separation Approach for Effective CO₂ capture, *Science Advances* **8**, eabm0144 (2022).

**This colloquium will be held in-person, at SERC 116
unless announced otherwise.**