MRL/Materials Seminar

Creating Value from CO_2: The Development of Sorption–Enhanced Catalysts to Promote a Circular Economy

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A circular CO_2 economy aims to redefine growth by focusing on society-wide benefits and looking beyond the current take–make–waste industrial model. Developing thermally robust catalysts and sorbents can help create new processes for full CO_2 utilization. To begin the presentation, I will discuss the advantages of a circular economy on society based on my experience as a former refinery chemist. I will then delve into the technical aspects of creating new, dual-functional materials that capture and convert carbon. Specifically, two examples will be presented: Ni/Zr/CaO and Ni/$CaTiO_3$/CaO catalysts, both used to capture and convert CO_2. These catalysts are used within a cyclical CO_2 capture and conversion process to convert CO_2 from simulated flue gas into methane (*power-to-gas*) or synthesis gas. Typically, the embedded Ni catalyst and CaO sorbent materials deactivate quickly due to thermal fluxes that promote sintering and carbon deposition. The loss of surface area in both the sorbent and catalyst leads to a decrease in the CO_2 capture capacity and productivity. Recent studies using Ni/Zr/CaO and Ni/$CaTiO_3$/CaO have shown improved thermal stability, leading to insights on further catalyst/sorbent development to reach industrial practicality.

Brief bio: Before joining USC, Dr. Abdul-Aziz directed the Sustainable Lab at the University of California, Riverside, between 2018 and 2023. She earned her Ph.D. in Chemistry from the University of Illinois at Urbana-Champaign and was a Provost Postdoctoral Fellow at the University of Pennsylvania. She has previously worked as a forensic scientist for the Philadelphia police department and as a refinery chemist at Sunoco Chemicals in Philadelphia. She was awarded a DOE Early Career Award in 2023 for developing high-entropy alloy nanoparticles and an NSF Career Award in 2022 for sorption-enhanced bifunctional carbon capture and utilization catalysts.

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Date: Friday November 22, 2024
Time: 11:00 am + Venue: ESB 1001
pizza served after
Hosted by Ram Seshadri