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Seminar Presented by

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11:00am – 12:00pm
MCB 101

Creating Value from CO_2 using Geo-inspired Perovskite Oxide Materials

With the recent IPCC report on the state of Earth's climate, there needs to be sustained efforts to reduce carbon dioxide and other greenhouse gases. The presentation will discuss carbon capture and utilization efforts to convert CO_2 and CH_4 into value-added products. The first part of the presentation will discuss the development of regenerable Ni/Fe intelligent catalysts for dry methane reforming (DRM). DRM is looked at as an environmentally friendly process that fully utilizes greenhouse gases (CO_2 and CH_4) and converts them into syngas. The syngas can be converted to higher-value chemicals such as methanol and diesel fuel. In this work, we studied DRM using a series of Ni/Fe catalysts supported on $LaFeO_3$. We endeavored to design catalysts that can effectively activate C1 molecules while maintaining their stability at elevated temperatures. Manipulating bulk defects of the perovskite oxide precursor catalysts qualitatively shows changes in the metal-support interaction imparting nanoparticles with different sizes and compositions.

The second part of the presentation looks at the development of dual-functional (DFM) perovskite oxide materials for the ready capture and utilization of CO_2. The capture of CO_2 from significant point sources and subsequent conversion to valuable products is seen as a potential solution to alleviate anthropogenic climate change. In this work, we discuss CO_2 capture and conversion with Sr-based perovskites with Ni substitution as DFMs. We synthesized Ni-supported $SrZrO_3$ perovskites and tested them for dry methane reforming in co-fed and looping modes. Strontium acts as a strong basic site that can absorb CO_2 in the form of surface carbonate species. Nickel atoms are the sites for catalytic activity where adsorbed CO_2 reacts with methane to form syngas. Future insights are discussed for catalyst and absorbent oxide material developments.

Bio: Dr. Kandis Leslie Abdul-Aziz is an Assistant Professor in the Chemical and Environmental Engineering department at the University of California, Riverside. She joined the University in 2018 after receiving her Ph.D. in Chemistry from the University of Illinois at Urbana-Champaign. Before joining UC Riverside, she was a Provost postdoctoral fellow at the University of Pennsylvania, where she developed procedures for synthesizing heterogeneous catalysts using atomic layer deposition. She has also worked previously as a Forensic scientist for the Philadelphia police department and as a Refinery chemist at Sunoco Chemicals in Philadelphia after receiving a B.S. in Chemistry from Temple University. Her research group develops sustainable catalytic processes using an interdisciplinary toolset from materials and chemical engineering and physical chemistry for sustainable applications.

Host: Dr. Qiming Wang