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SPRING WEBINAR

MATTHEW KANAN

STANFORD UNIVERSITY

Associate Professor in the Department of Chemistry and Director of the TomKat Center for Sustainable Energy

WEDNESDAY, APRIL 21, 2021 at 10:00 AM (E.D.T)

CHEMICAL SOLUTIONS TO CHALLENGES IN ENERGY AND SUSTAINABILITY

Technology that converts CO_2 into high-volume chemicals and fuels could usher in a new era in the chemical industry in which CO_2 is a resource. This talk will describe our research to develop electrochemical and chemical processes for CO_2 utilization. I will first describe our studies to elucidate the structural origin of grain boundary effects on electroreduction catalysis and our engineering efforts to optimize the energy efficiency, carbon efficiency, and rate of electrochemical C_{2+} synthesis. In the second part of my talk, I will describe new carboxylation chemistry to synthesize high-volume (di)-carboxylic acids. Conventional carboxylation methodology relies on extremely energy-intensive reagents. We have discovered methods to carboxylate un-activated C–H bonds using simple carbonate salts as promoters. This chemistry has led to the development of a highly streamlined process to synthesize furan-2,5-dicarboxylic acid (FDCA), a performance-advantaged replacement for terephthalic acid in polyesters. To generalize this strategy, we have recently developed nanostructured carbonates that can perform hydrocarbon C–H insertion. I will discuss the fundamental nanoscience challenges for improving the rate and scope of this catalysis to unlock CO_2-based routes to numerous commodity chemicals.

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