Special Seminar

Friday, October 13, 2023
1 pm
WSI, Seminar room S 101

“Efficient and selective electrocatalytic conversion of chemicals and fuels”

Due to the intermittent nature of renewable energy sources, practical large scale renewable energy utilization demands both efficient energy conversion and large scale energy storage. Highly active and selective electrocatalysts are needed to enable efficient and sustainable production of fuels (such as hydrogen) and valuable chemicals via electrocatalytic processes. We control the phase, defects, doping, and electronic structures of (earth-abundant) electrocatalysts for efficient hydrogen evolution reaction (HER) and oxygen evolution (OER) for water splitting. Our recent efforts include enhancing the oxygen evolution reaction (OER) catalytic activity and stability of metal oxides in acids through controlling Co3O4/CeO2 nanostructures and structural defects due to torsional strain of mesoporous iridium oxide nanoparticles and providing new mechanistic insights by combined electrochemical and in situ structural characterizations. We have combined computations and experiments to develop metal compounds as selective catalysts for two-electron oxygen reduction reaction (2e- ORR) to produce hydrogen peroxide (H2O2) and the subsequent electro-Fenton process for upgrading biomass molecules. Furthermore, because the tight coupling between paired electrochemical half-reactions requires identical reaction conditions and constrains the products and efficiency, we recently developed modular electrochemical synthesis (ModES) using redox reservoirs, which are solid energy-storage materials that can store/release electrons and desired ions, to improve energy efficiency and reduce waste by pairing multiple independent electrochemical half-reactions.

Prof. Song Jin
Francis J. DiSalvo Professor of Physical Science
Department of Chemistry
University of Wisconsin-Madison, Madison
USA