

## **Toward Understanding Mechanisms in Electrocatalytic Syntheses with Renewable Feedstocks**

Electrochemical reactions involve direct conversion between electrical energy and the energy of chemical bonds. While storage and harvesting of electricity are the most common goal, electrochemistry also provides a unique platform for performing oxidation and reduction reactions with product distributions and conversion efficiencies that can differ favorably in comparison to analogous thermochemical routes. Such processing has particular appeal for distributed-scale applications, such as utilizing diffuse renewable electricity sources to upgrade biomass-derived intermediates to fuels, chemicals, and materials.

Our recent work on electrochemical upgrading of biomass-derived small molecules into various chemical commodities will be discussed, with a focus on novel analytical approaches. These include combining online electrochemical mass spectrometry (OLEMS) and in-situ attenuated total reflectance surface-enhanced infrared absorption spectroscopy (ATR-SEIRAS) to understand aspects of the elementary chemical mechanisms that occur. Further discussion will center on a theoretical analysis and perspective on the transition from these exploratory chemistries on common metallic electrodes toward design of more active and product-selective multicomponent electrocatalysts.

### Bio

Adam Holewinski is an Assistant Professor of Chemical and Biological Engineering at the University of Colorado–Boulder, and a Fellow of the CU-NREL Renewable and Sustainable Energy Institute. His research interests lie in heterogeneous catalysis and electrochemistry for sustainable production of energy and chemicals, with emphasis on characterization through kinetics, spectroscopy, and computational modeling. Prior to CU, he obtained a Ph.D. at the University of Michigan in 2013, followed by a postdoctoral fellowship at Georgia Tech until 2015. He has been recognized with the outstanding graduate teaching award in chemical engineering at CU, and he is an NSF CAREER award recipient (2019). He was recently selected to the Industrial and Engineering Chemistry Research 2020 Class of Influential Researchers and named an RCSA Scialog Fellow for the Negative Emissions Science program.

