

Clarkson University
Department of Chemical and Biomolecular Engineering
SEMINAR

“Photocatalytic Selective Cleavage of C-C Bond in Lignin at Room Temperature”

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Leem research group explores new scientific findings in three areas: Carbon, Water, and Energy. Each centered on the development of target chemistry for chemical transformations. This talk will focus on photoelectrocatalytic selective cleavage of C-C/C-O bonds in biomacromolecules in the area of Carbon. Photocatalysis and electrocatalysis play a critical role in many organic reactions involving solar energy conversion, biomass, polymer degradation and environmental sustainability. Among reactions, oxidative cleavage of C-C/C-O linkages is a challenge for chemical transformations at room temperature. Controlling the extent of oxidation presents a key for the generation of targeted products. Here, Leem research group pioneers an aminoxyl radical-mediated (ARM) photoelectrocatalysis approach for the chemoselective oxidative cleavage reactions under ambient conditions by incorporating stable ARMs (or electron-proton transfer mediators) and heterogeneous photocatalysts. This study targets oxidative cleavage of C-C/C-O bonds in lignin, which is an aromatic polymer mainly bound via C-C/C-O bonds and the largest source of renewable aromatics, for the conversion of lignin into valuable low-molecular-weight chemicals in a dye-sensitized photoelectrochemical cell (shown in Figure below). The ARM catalyzed photoelectrocatalysis process can be applicable to oxidative cleavage reactions and expandable to a wide range of chemical transformations under aerobic mild conditions in synthetic organic chemistry and depolymerization.

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Gyu Leem earned a B.S. degree in Chemical Engineering from Hanyang University and a Ph. D. degree in Chemistry from University of Houston. He is an assistant professor in the department of chemistry at State University of New York College of Environmental Science and Forestry (SUNY-ESF) starting Fall 2018. Prior to joining the SUNY-ESF, he worked as a PostDoc at the University of North Carolina (UNC) Energy Frontier Research Center (EFRC) for Solar Fuels and the University of Florida under the guidance of Prof. Kirk Schanze. His current research interests are in photoelectrocatalysis, solar energy conversion, photodynamics, and biomass conversion. Additionally, he was a previous editorial board member in *Frontiers in Energy Research*, a newsletter published by the U.S. Department of Energy. He is invited to serve as a member of the editorial advisory board of *ACS Applied Nano Materials* and a topic editor and guest editor in multiple journals such as *Frontiers in Chemistry*, *Nano Convergence*, and *MDPI*.