

CHEMICAL ENGINEERING

SEMINAR SERIES



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The City College of New York

Utilization of Ionic Liquids as Novel Electrolytes

ABSTRACT: Ionic liquids (ILs) are salts with melting points below 100–∞C and can be tuned to the desired properties by modifying the anion-cation pair. ILs have minimal vapor pressures, tunable solubilities, wide thermal windows, wide electrochemical potential windows (EWs) and moderate conductivities, making them favorable for electrochemical applications. Traditional electrochemical systems are commonly limited by either the EW or conductivity. In aqueous solutions the conductivities can be high by dissolving appreciable quantities of electrolyte, but the EW is small due to water splitting, preventing many redox potentials from being accessed. In organic solutions, the EW can be increased but solubility of electrolyte salts is limited, reducing conductivity significantly. With the use of ILs, the EW can be substantially widened compared to aqueous systems while having higher conductivities than what is possible in many organic systems. Two applications where ILs hold promise for use will be presented, Æ electrodeposition of palladium in ILs for nanoparticle synthesis and use of IL-like materials as switchable electrolytes for use as battery safety switches. The electrochemistry and electrodeposition phenomena of palladium in ILs and its impact on the resulting morphology of the deposited nanoparticles will be reported. The use of silylamine reversible ionic liquids that can switch between a conductive RevIL state used during normal battery operation and a non-conductive molecular liquid state when thermal excursions occur will be discussed.

RECEPTION 3:30 • LECTURE 4:00 – 5:00
PHYSICS ASTRONOMY BLDG. PAA A110

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BIOGRAPHY: Elizabeth J. Biddinger joined the Department of Chemical Engineering at the City College of New York as an Assistant Professor in the Fall of 2012. Prior to joining City College, Professor Biddinger was a Post-doctoral Fellow at the Georgia Institute of Technology 2010-2012. She received her PhD in 2010 in Chemical Engineering from The Ohio State University and her BS in 2005 in Chemical Engineering from Ohio University. Professor Biddinger recently received the 2016-2017 Electrochemical Society, Åi Toyota Young Investigator Fellowship Award to work on reversible ionic liquid systems as electrochemical safety switches. She was awarded the 2014 CUNY Junior Faculty Award for Science and Engineering from the Sloan Foundation to investigate CO₂ electroreduction. Dr. Biddinger has held multiple leadership posts including serving as the student awards chair for the Industrial Electrochemistry and Electrochemical Engineering Division of the Electrochemical Society (ECS) (2014-Present); a Teller of Elections for ECS (2016-Present); and a Director of the Catalysis and Reaction Engineering Division of the American Institute of Chemical Engineers (AIChE).