

FALL 2020 COLLOQUIUM SPEAKER

OCTOBER 7, 2020

Wednesday's
1-1:50pm
ZOOM

Recipes for converting water into a solar cell, and pumping ions via aratcheting process

Water is a protonic semiconductor that is doped through addition of salts of H^+ or OH^- . To fabricate a diode out of water, dopant counterions must be fixed in place. My group has synthesized protonic diodes using frozen aqueous solutions of mineral acids or alkali bases as solid ice, and using hydrated porous polymer scaffolds containing covalently bound Brønsted–Lowry acidic or basic functional groups as bipolar membranes. Diode quality factors of ~ 2 were measured in electrochemical cells fabricated as membrane–electrode–assemblies, where reversible H_2 redox chemistry was used to transduce changes in electronic electrochemical potentials into protonic electrochemical potentials, and vice versa. Moreover, through dye sensitization using photoacid molecules, we demonstrated purely protonic photovoltaic action, but where the observed polarity of the photovoltage was opposite of that observed in traditional electronic solar cells. Using simulations based on continuity of mass, mechanistic details of this novel photochemical process are becoming clear. Moreover, via application of an alternating bias across non-rectifying porous membranes, direct ionic current was observed due to a ratchet-based mechanism. Collectively, our efforts are helping to form the fundamental framework for new devices and functions that benefit from purely ionic transport.

ZOOM MEETING ID 967 5468 5049 | PASSWORD: 495951



Dr. Shane Ardo

Associate Professor of

Chemistry, Chemical & Biomolecular Engineering,
Materials Science & Engineering
University of California, Irvine

Shane obtained a B.S. Degree in Mathematics, with a minor in Computer Programming, from Towson University and subsequently worked as a software engineer, community college instructor, high school teacher, and tried out for a professional indoor soccer team, prior to attending graduate school. Shane obtained an M.S. Degree in Nutrition from the University of Maryland, College Park followed by M.A. and Ph.D. Degrees in Photo-Physical Inorganic Chemistry from the Johns Hopkins University, where he worked for Prof. Jerry Meyer. He then worked for Prof. Nate Lewis as a DOE–EERE Postdoctoral Research Awardee at the California Institute of Technology until 2013. Since that time, Shane has been an Assistant Professor (2013 – 2019) and now an Associate Professor at the University of California, Irvine in the Department of Chemistry and holds courtesy joint appointments in the Departments of Chemical & Biomolecular Engineering and Materials Science & Engineering. In 2016, Shane was named one of five inaugural Moore Inventor Fellows. He is also a recipient of a DOE Early Career Research Award and two Beall Innovation Awards, and was named a Sloan Research Fellow, a Cottrell Scholar, a Kavli Fellow, and a Scialog Fellow. Shane has given over 100 invited talks, including at the National Academy of Sciences Distinctive Voices Lecture Series and the 2017 Resnick Institute Young Investigators Symposium.

Please visit the MSE website for the 2020/21 Speaker Lineup