Organic Semiconductors for Biosensors and Energy Conversion

Conductive polymer electrodes have exceptional promise for next generation electronic and electrochemical devices due to inherent mechanical flexibility, printability, biocompatibility, and low cost. Yet conductive polymers continue to suffer from lower conductivity than conventional semiconductors, which ultimately can limit performance. Electrical conductivity can be increased by increasing the total number of carriers through a charge transfer reaction – oxidation or reduction. The first half of this talk will focus on the use of spectroscopic methods to evaluate the effects of chemical, electronic, and physical structure changes of organic semiconductors that accompany charge transfer reactions at interfaces, with consequences on device performance.
The second half of this talk will focus on the unique hybrid electronic-ionic conduction of conductive polymers, which has enabled novel electrochemical devices including bioelectronics, molecular catalysis, and redox flow batteries. These technologies necessitate control over electron transfer in competition with mass transport (diffusive or convective). The potential-dependent microstructure and relative distribution of electronic states (percent doping) are found to be critical to control device efficiencies, with careful consideration across multiple length scales.

BIOSKETCH

Dr. Erin Ratcliff is an Assistant Professor of Materials Science and Engineering at the University of Arizona and a member of the Bio5 Institute. Dr. Ratcliff's research group –the Laboratory for Interface Science of Printable Electronic Materials - (ratcliff.faculty.arizona.edu) is focused on the application of electrochemistry and spectroscopy to better understand the functionality of printable electronic materials, interfaces, and devices. The majority of her research efforts target understanding the structure-property relationships that govern charge transfer kinetics and transport of electronic and ionic species, with connections to biosensors and energy conversion devices.

Department of Physics
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Theoretical and Applied Physics

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Asst. Professor, Dr. Erin L. Ratcliff
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4:00 PM

Lafayette Hall

Room L207

Refreshments will be available at 3:30 PM.

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