

Prof. Joaquín Rodríguez-López

University of Illinois, Urbana-Champaign

Department of Chemistry

Thursday, February 9, 2017 at 12:15 pm in 1315 Chemistry

Analytical Seminar

“Elucidating Energy Storage in Soft Nanostructures through Versatile Electrochemistry”

My group is interested in exploring the impact of structural and reactive heterogeneity in soft materials with the intention of discovering synergies at the nano and mesoscale that enhance properties of interest for energy storage applications. In my talk, I will discuss two emerging systems where nano-scale heterogeneity has an impact on macro-scale performance: novel redox active polymers (RAPs) for size-selective flow batteries, and ultra-thin graphene electrodes. Highly soluble RAPs are new players in redox flow technologies, and as part of our collaboration with the Joint Center for Research Energy Storage (JCESR), we are exploring the opportunities that polymeric design offers for tuning their electrochemical performance. Likewise, graphene is an emerging material that offers new opportunities in contrast to bulk carbon due to its unique thickness-dependent electron and ion transfer behavior. In both cases, short range interactions between their components determine charge transfer and transport mechanisms, so it is essential to count with the right toolbox to elucidate their functioning. For this purpose, my group develops nano-electrochemical methods based on scanning electrochemical microscopy (SECM) that uniquely probe electronic and ionic processes in situ. Using these and other tools, we are starting to understand fundamental balances between electronic and ionic reactivity that we hope will have an impact on a various other applications for energy conversion and storage.

