Department of Chemistry Seminar Series – Fall 2020

Gas Storage in Porous Coordination Cages

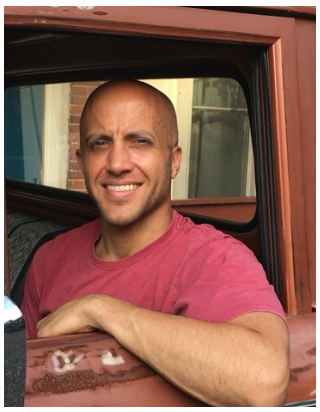
Prof. Eric Bloch

Department of Chemistry & Biochemistry, University of Delaware

Host: Prof. Fernando Uribe-Romo

October 16, 2020 10:00 AM – Zoom

Meeting Room: https://ucf.zoom.us/j/97045277738 Passcode: 760867



Methane and hydrogen are becoming increasingly important fuels for a variety of factors. The depletion of worldwide petroleum supplies, coupled with the constantly increasing levels of accessible natural gas reserves, make them attractive alternative fuels. Although more than 64 million American homes utilize natural gas for heating, its poor volumetric energy density of just 0.04 MJ/L, compared to 32.4 MJ/L for gasoline, has prevented the widespread use of natural gas in the transportation sector. This problem is exacerbated for hydrogen which has negligible volumetric energy density at STP. Adsorbed gas systems offer promise in this regard, contingent on the advent of porous storage materials with sufficient capacity. Porosity in network solids, including zeolites, activated carbons, and metal-organic frameworks, has been widely interrogated for decades. In molecular systems, however, it is a relatively novel phenomenon. This is somewhat surprising given the fact that porous molecules can display surface areas that rival those of metal-organic frameworks. This talk will focus on the design, synthesis, and characterization of highly porous coordination cages for small molecule storage. Further, it will detail the intriguing interplay between surface area and solubility in a class of paddlewheel-based cages. We have recently shown that these materials, which conceptually serve as soluble metal-organic framework analogs, display impressive porosity under specific synthesis and activation conditions. Although these cages are typically amorphous upon activation, a strategy in which pillaring ligands are utilized endow the materials with high crystallinity and thus compatibility with diffraction methods for the identification and optimization of gas binding sites.

Bio

Eric Bloch is an assistant professor in the Department of Chemistry and Biochemistry at the University of Delaware. Research in his group focuses on the design, synthesis, and characterization of novel porous materials for applications related to energy, the environment, and human health. The Bloch Group is particularly focused on the realization of new hybrid inorganic/organic molecular adsorbents for the storage of small molecules. Dr. Bloch Received his PhD in Inorganic Chemistry from the University of California-Berkeley in 2014 working for Prof. Jeffrey R. Long in the area of metal-organic frameworks for gas separations and catalysis. Prior to arriving at the University of Delaware in 2016, Bloch completed a postdoctoral fellowship in the labs of Prof. Daniel Nocera at Harvard University focusing on small molecule activation with bimetallic transition metal complexes.