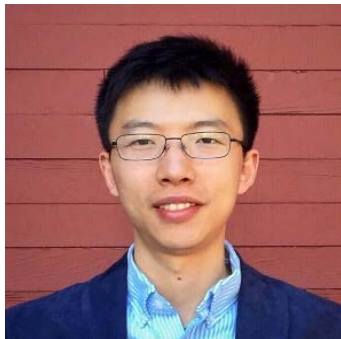


UCSD NANOENGINEERING/CHEMICAL ENGINEERING
SPECIAL SEMINAR

Friday, August 23, 2019

Seminar Presentation: 11:00am - 12:00pm

SME room 348*“Electrons in Two-Dimensional Materials: Mobility and Chemistry”***Yuanyue Liu Ph.D.***Assistant Professor**Texas Materials Institute**and Department of Mechanical Engineering**University of Texas at Austin*

Abstract: Two-dimensional (2D) materials possess attractive properties for many applications such as (opto)electronics and electrocatalysis. However, their developments are impeded by a number of significant challenges, many of which root in the 'problems of electrons'. On the physics side, the electrons/holes in current 2D semiconductors do not move fast enough under electric field (i.e. low mobility), impeding their use in high-performance electronics and optoelectronics. On the chemistry side, the current 2D electrocatalysts still suffer from relatively low activity/selectivity, hindering their use in efficient energy conversion. These challenges urge for an improved understanding of the electrons in 2D materials, and using these insights to design/discover 2D host materials with better performance.

Here I will discuss our recent progress in understanding the physics and chemistry of electrons in 2D materials, including: (1) what limits the intrinsic mobility of electrons in 2D metal dichalcogenides [1], the mobility in group-15 monolayers, and the guidelines towards high-mobility semiconductor; (2) how the electronic structure of 2D material affects its binding with atoms/molecules, which allows us to explain some puzzling observations and discover materials with desired performance [2-5].

[1] L. Cheng, Y. Liu, JACS, 2018 DOI: 10.1021/jacs.8b07871

[2] D. Kim, J. Shi, Y. Liu, JACS, 2018, 140, 9127

[3] Y. Liu, J. Wu, K. P. Hackenberg et al, Nature Energy, 2017, 6, 17127

[4] Y. Liu, B. Merinov, W. A. Goddard III, PNAS 2016, 113, 3735

[5] Y. Liu, Y. M. Wang, B. I. Yakobson, B. C. Wood, Phys. Rev. Lett. 2014, 113, 028304

Biosketch: Yuanyue Liu is currently an assistant professor at Texas Materials Institute and Department of Mechanical Engineering at University of Texas at Austin. He received B.S. degree from University of Science and Technology of China (USTC) in 2008, and Ph.D. from Rice University in 2014. He did postdoc studies at National Renewable Energy Laboratory (NREL) and California Institute of Technology, and then started independent career in Fall 2017. He has received a number of awards, including Chinese Government Award for Outstanding Students Abroad (2012), Franz and Frances Brotzen Award (Rice University, 2014), and Resnick Prize Postdoc Fellowship (Caltech, 2015).