In Situ Characterization of Electrocatalysis at Electrified Interfaces

Yi YU[1,2,*], Yong HAN[1,2], Hui ZHANG[3], Zhi LIU[1,2,3,*]

[1]Center for Transformative Science, ShanghaiTech University

[2]School of Physical Science and Technology, ShanghaiTech University

[3]State Key Laboratory of Functional Materials for Informatics, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences

*yuyi2@shanghaitech.edu.cn

Abstract: Studying electrochemical reactions at interfaces between different states of matter has been a long-term interest for both experimentalists and theorists in wide-range research areas. Revealing the fundamental properties at such interfaces is critical for a complete description of relevant electrochemical processes and for future designs of advance materials. In this talk, we will present a brief review on our in situ investigations at electrified interfaces, including gas/solid interface of solid oxide electrochemical cells and liquid/solid interface of magnesium rechargeable batteries.[1, 2] These examples highlight the importance of studying "living" interfaces in a dynamic environment and the value of correlative in situ methods.[3] We will discuss our beamline at Shanghai Synchrotron Radiation Facility, which allows in situ studies at pressures up to 20 mbar with high spatial resolution.[4] We will also share recent progress on our lab-based system dedicated for in situ investigations of liquid/solid interfaces. Other new experimental methods will be briefly discussed as well.

References:

1. Zhang, C.; Yu, Y.; Grass, M. E.; Dejoie, C.; Ding, W.; Gaskell, K.; Jabeen, N.; Hong, Y. P.; Shavorskiy, A.; Bluhm, H.; Li, W. X.; Jackson, G. S.; Hussain, Z.; Liu, Z.; Eichhorn, B. W., Mechanistic studies of water electrolysis and hydrogen electro-oxidation on high temperature ceria-based solid oxide electrochemical cells. *J Am Chem Soc* **2013,** *135* (31), 11572-9.

2. Yu, Y.; Baskin, A.; Valero-Vidal, C.; Hahn, N. T.; Liu, Q.; Zavadil, K. R.; Eichhorn, B. W.; Prendergast, D.; Crumlin, E. J., Instability at the Electrode/Electrolyte Interface Induced by Hard Cation Chelation and Nucleophilic Attack. *Chemistry of Materials* **2017,** *29* (19), 8504-8512.

3. Han, Y.; Zhang, H.; Yu, Y.; Liu, Z., In Situ Characterization of Catalysis and Electrocatalysis Using APXPS. *ACS Catal.* **2021,** *11* (3), 1464-1484.

4. Cai, J.; Dong, Q.; Han, Y.; Mao, B. H.; Zhang, H.; Karlsson, P. G.; Ahlund, J.; Tai, R. Z.; Yu, Y.; Liu, Z., An APXPS endstation for gas-solid and liquid-solid interface studies at SSRF. *Nuclear Science and Techniques* **2019,** *30* (5), 81.

Biography:

Yi Yu is currently a Research Assistant Professor at the Center for Transformative Science and the School of Physical Science and Technology at ShanghaiTech University. She received her B.S. degree in Chemistry from Nankai University and PhD in Chemistry from the University of Maryland – College Park. After her graduate study, she worked as a postdoctoral fellow at the Advanced Light Source, Lawrence Berkeley National Laboratory. She joined ShanghaiTech University since 2017. Her research focuses on in situ investigations of electrochemistry at interfaces to enable high performance energy conversion based on understanding interfacial properties at operating and dynamic conditions. It features the application of complementary in situ tools to link atomistic details and chemical states with electrochemical performance.