复旦大学物理系物质科学报告

Probing Solid-Liquid Interface Using APXPS

Physics Department Colloquium

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Multiple new ambient pressure x-ray photoelectron spectroscopy (AP-XPS) endstations are currently under planning or development at US and international synchrotron light sources. Recently we have installed a new hard x-ray AP-XPS endstation at ALS Beamline 9.3.1 (2.5keV- 5keV). By using X-ray up to 5KeV, we can perform AP-XPS at a pressure up to 110 torr. The probing depth of photoelectrons also increases to >10 nm, which will allow us to study not only the gas/solid interface but also the liquid/solid interface. In this talk, I will present results of in-situ studies to probe the EDL region at the solid-liquid interface.

The conceptual model of the Electrical Double Layer (EDL) constitutes one of the pillars of modern electrochemistry and is the starting point to understand the solid/liquid electrochemical interface. More than one hundred years had passed since Hermann von Helmholtz first proposed this concept. Since then, many EDL models have been developed, refined, and used to guide our understanding of this interface. As A. J. Bard and L. R. Faulkner elegantly pointed out in their textbook [Electrochemical Methods], “EDL is the essence of electrochemistry”. Therefore, experimental validation of these models is crucial for the electrochemical community. To do so, two aspects of the EDL layer have

to be addressed:

i). What is the structural construct of EDL, i.e. the organization of ions in the EDL?

ii). What is the electrical potential profile within the EDL?

The results presented here is our attempt to address the second question directly. We believe the successful development of soft and hard X-ray APXPS techniques will provide us and community beyond a powerful in-situ tool to directly study the solid-liquid interface of many important electrochemical devices.

At the end, I will give a brief introduction of the current Shanghai Xray Free Electron Laser Project.

References

[1] D. E. Starr et.al, Chemical Society reviews 42, 5833-57 (2013).

[2] S. Axnanda et. al, Scientific Reports, 5,9788 (2015)

刘志，研究方向：表界面物理化学；催化、电池新材料原位表征；物质电子结构研究；同步辐射表征测量。

毕业于北京大学地球物理系与物理系。在美国斯坦福大学分别取得电子工程硕士与物理学博士。2005-2007 年在斯坦福大学和斯坦福线性加速器中心担任助理研究员、2007-2014 在美国劳伦斯伯克利国家实验室担任研究员。

全职回国后，任中科院上海微系统与信息技术研究所研究员，上海科技大学物质学院副院长（特聘教授），伯克利劳伦斯国家实验室担任访问研究员（Guest Faculty）。担任 Scientific Reports 的 Editorial Board Member 和【核技术】杂志的编委。刘志博士长期从事基于同步辐射的各种方法学与表界面物理化学研究，近年来在美国加州大学伯克利分校先进同步辐射光源部（ALS）领导原位近常压 X 光电子光谱及吸收谱研究及其在能源与环境方面的应用。刘志博士所领导的课题组和合作团队在催化，环境科学和电化学器件的原位测量方面取得多项研究成果。在国际学术刊物上发表论文 160 余篇。刘志研究员现担任国家自然科学基金委员会国家重点仪器设备研制专项“基于上海同步辐射光源的能源环境新材料原位电子结构综合研究平台”（2013.01-2017.12）的项目负责人。zliu2@mail.sim.ac.cn

Time： 2:00pm,Tuesday, 2016.05.17

Location： Physics Building, Room 221B

(Cookies and coffee are served from 1:45 pm)