Electrochemical Behaviours of Two-Dimensional Materials

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Abstract

In this talk, several aspects of the electrochemical behaviours of two-dimensional (2D) materials for energy applications will be discussed. First, large-area continuous few-layer molybdenum disulfide film is prepared by simple solid-gas elemental reaction and transferred onto fluorine doped tin oxide glass substrate as the counter electrode for dye-sensitized solar cells. The catalytic activities of the MoS_2 atomic layers are dramatically improved by carving the MoS_2 film and creating artificial edges on it [1]. Next, we developed a local probe electrochemical measurement method (Fig. 1) and successfully applied it to the electro-catalytic activity measurement of various kinds of transition metal dichalcogenides. The catalytic activity and turnover frequencies of the 2H-MoS_2 basal plane versus edge as well as the 1T'-MoS_2 basal plane are identified by this measurement [2]. At the same time, the basal plane activity and turnover frequencies of transition metal dichalcogenides from different element groups has been systematically studied. We have shown that the general trend of the transition metal dichalcogenides in the form of volcano plot follows the trend of metals. VB-VIA dichalcogenides have been identified as the preferred selection for non-noble metal hydrogen evolution reaction (HER) catalysts [3].

References

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[3] J. Zhang, J. Wu, X. Zou, K. Hackenberg, W. Zhou, W. Chen, J. Yuan, K. Keyshar, Gautam Gupta, A. Mohite, P.M. Ajayan, J. Lou, Materials Today, Issue (2019) page

Figures

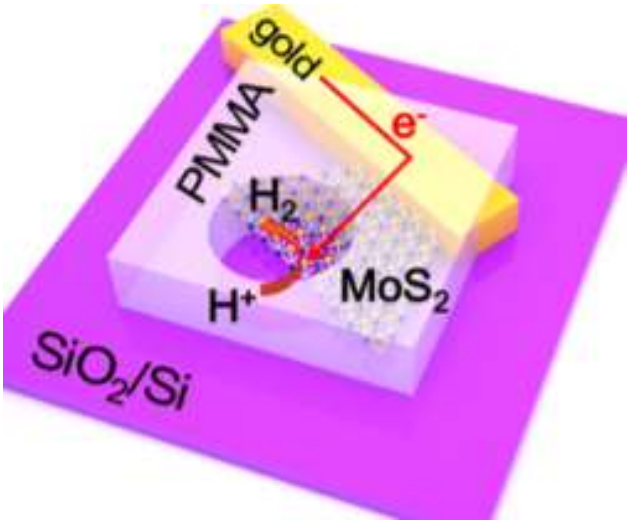

Figure 1: Schematic illustration of the on-chip local probe measurement setup [2]