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## Electrochemical Behaviors of Two-Dimensional Materials for Energy and Environmental Applications

In this talk, several aspects of the electrochemical behaviors of two-dimensional (2D) materials for energy and environmental applications will be discussed. We developed a local probe electrochemical measurement method 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<sub>2</sub> basal plane versus edge as well as the 1T'-MoS<sub>2</sub> basal plane are identified by this measurement. 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. Finally, we will demonstrate the application of 2D h-BN as high-performance anti-corrosion coatings for electrothermal membrane distillation of hypersaline waters.