Atomically Thin 2-Dimensional Materials for Electrocatalysis

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Abstract

Graphene research has sparked great interest in a wide range of 2-dimensional layered materials with varying electronic properties. Atomically thin layered transition metal dichalcogenides (TMDs) such as MoS2, WS2, MoSe2 and WSe2 have been emerging as the cutting edge in materials science and engineering, due to their interesting electronic properties.[1] These materials open up new opportunities for a variety of applications, including optoelectronics, energy conversion, and catalysis. To realize their potential device applications, it is highly desirable to achieve controllable growth of these layered nanomaterials, with tunable structure and morphology.[2-4] TMDs exhibit promising catalytic properties for hydrogen generation and several approaches including defect engineering have been shown to increase the active catalytic sites.[5,6,7] The talk will present some of our efforts on morphological and electrocatalytic studies of engineered TMD nanomaterials and their heterostructures. Some of our recent works on the controllable growth of high-quality, ultra-thin flakes of elemental 2D materials such as bilayer selenene and its heterostructures with MoS_2 monolayers will also be discussed.[8] Our work highlights the opportunities for tuning the electrocatalytic properties of atomically thin electrocatalysts based on defect engineering and surface modification.

References

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