Dendritic, Transferable, Strictly Monolayer MoS_2 Flakes Synthesized on $SrTiO_3$ Single Crystals for Efficient Electrocatalytic Applications

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Abstract

Controllable synthesis of macroscopically uniform, high quality monolayer MoS_2 is crucial for harnessing its great potentials in optoelectronics, electrocatalysis and energy storage. To date, triangular MoS_2 single crystals or their polycrystalline aggregates have been synthesized on insulating substrates of SiO_2/Si, mica and sapphire, *etc.*, *via* portable chemical vapor deposition methods. Herein, we report a controllable synthesis of dendritic, strictly monolayer MoS_2 flakes possessing tunable degrees of fractal on a specific insulator $SrTiO_3$. Interestingly, the dendritic monolayer MoS_2 characterized with abundant edges can be transferred intact onto Au foil electrodes and serve as ideal electrocatalysts for hydrogen evolution reaction, reflected by a rather low Tafel slope of~73 mV/decade among CVD-grown two-dimensional MoS_2 flakes. In addition, we reveal that centimeter-scale uniform, strictly monolayer MoS_2 films consisting of relatively compact domains can also be obtained, offering insights into promising applications such as flexible energy conversion/harvesting and optoelectronics.

References

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Figures