

# Nature-inspired, Graphene-wrapped 3D MoS<sub>2</sub> Ultrathin Microflower Architecture as a High-Performance Anode Material for Sodium-Ion Batteries

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In response to the increasing concern for energy management, molybdenum disulfide (MoS<sub>2</sub>) has been extensively researched as an attractive anode material for sodium ion batteries (SIBs). The proficient cycling durability and good rate performance of SIBs are the two key parameters that determine their potentials for practical use. In this study, nature-inspired three-dimensional (3D) MoS<sub>2</sub> ultrathin marigold flower like microstructures were prepared by controlled hydrothermal method. These micro-scale flowers are constructed by arbitrarily arranged but closely interconnected two-dimensional (2D) ultrathin MoS<sub>2</sub> nanosheets. The as-prepared MoS<sub>2</sub> microflowers (MFs) have then been chemically wrapped by layered graphene (G) sheets to form the bonded 3D hybrid MoS<sub>2</sub>-G networks. TEM, SEM, XRD, XPS and Raman characterizations were used to study the morphology, crystallization, chemical compositions and wrapping contact between MoS<sub>2</sub> and graphene. The ultrathin nature of MoS<sub>2</sub> in 3D MFs and the graphene wrapping provide strong electrical conductive channels and conductive networks in an electrode. Benefitting from the 2 nm ultrathin crystalline MoS<sub>2</sub> sheets, chemically bonded graphene, defect induced sodium storage active sites, and 3D interstitial spaces, the prepared electrode exhibited an outstanding specific capacity (606 mA h g<sup>-1</sup> at 200 mA h g<sup>-1</sup>), remarkable rate performance (345 mA h g<sup>-1</sup> at 1600 mA), and long cycle life (over 100 cycles with tremendous Columbic efficiencies beyond 100%). The proposed synthesis strategy and 3D design developed in present study reveal a unique way to fabricate promising anode materials for SIBs.

## Biography

**Dr. Shoaib Anwer** has completed his Ph.D. degree in Material Science and Engineering from Beijing Institute of Technology. This school ranked among top 50 schools in the field of Materials Science and Engineering. Dr. Anwer is now serving in Khalifa University, UAE (Ranked QS #315) as a Research Scientist. Dr. Shoaib Anwer has made significant contributions in science and published about 17 quality research articles in peer-reviewed SCI journal under *Nature*, *Springer*, *ACS*, *Elsevier*, *Wiley*, *IOP* banner. His main research interests focus on the nanomaterials metal-semiconductors and hetero-nanostructures for applications in energy conversion and storage.

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