

N-doped Mesoporous Molybdenum Disulfide Nanosheets: Synthesis and Application in Lithium Ion Batteries

Si Qin, Weiwei Lei, Dan Liu, and Ying Chen

Institute for Frontier Materials, Deakin University, 75 Pigdons Rd, Waurn Ponds, Victoria 3216, Australia
E-mail: siq@deakin.edu.au

Abstract (Arial 10)

Molybdenum disulfide (MoS_2) nanosheet has unique physical and chemical properties, which make it a promising candidate for next generation electronic and energy storage applications. Two-dimensional MoS_2 nanosheets can be feasibly synthesized by a simple, effective and large-scale approach. MoS_2 nanosheets synthesised by this method show a porous structure formed by curled and overlapped nanosheets with well-defined edges. Analysis of the nanosheets shows that they have an enlarged interlayer distance and high specific surface. X-ray photoelectron spectroscopy analysis shows the nanosheets have Mo-N bond indicating successful nitrogen doping. The nitrogen content of the product can be modulated by adjusting the ratio of starting materials easily with within the range from ca. 5.8 to 7.6 at%.

MoS_2 as anode material in lithium ion battery usually suffers from poor cycling stability and low rate capability. N-doped MoS_2 nanosheets show enhanced lithium storage performance, delivering a high reversible specific capacity, rate performance, coulombic efficiency, and cycling stability compared with particles and non-doped nanosheets. The discharge capacity of 998.0 mAh g^{-1} at 50 mA g^{-1} after 100 cycles, and 610 mAh g^{-1} at a rate of 2 A g^{-1} can be achieved with their better electrical and ionic conductivity, improved lithium ion diffusion and lower polarization. The excellent lithium storage performance of the MoS_2 nanosheets can be attributed to their large surface area, layered and porous structure, increased interlayer distance, and high concentration N doping.

References

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Figures

