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Molybdenum disulfide microflowers assembled by few-layered nanosheets and their electrochemical performance for supercapacitor

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Abstract

MoS_2 microflowers are fabricated by a facile hydrothermal route with polyquaternary ammonium salt (Polyquaternium-11, PQA) as a soft template. The experimental results indicate that the MoS_2 microflowers are of hexagonal phases and have a hierarchical flower-like morphology, which are assembled by numerous few-layered nanosheets. A probable assembly process is proposed to illustrate the formation of the MoS_2 microflowers. Additionally, as an electrode material for supercapacitor, the resultant MoS_2 microflowers demonstrate a superior electrochemical property which could be attributed to their robust hierarchical architectures and few-layered feature.

Keywords: Crystal growth; Nanocrystalline materials; Microstructure.

1. Introduction

Supercapacitors, which are also named electrochemical capacitors, are a new class of energy storage devices that can store a large amount of charge, and deliver it at high power ratings [1]. Supercapacitors can be divided into two types: (i) electrical double-layer capacitors (EDLCs) that utilize the capacitance arising from charge separation at an electrode/electrolyte interface, and (ii) pseudocapacitors that utilize the charge-transfer arising from redox reactions occurring on the surface of the electrode [2]. The pseudocapacitors rely on faradic reaction and can achieve much higher specific capacitance than electrochemical double layer capacitors and therefore are being widely investigated. The electrode material is essential to improving performance and it remains a great challenge to find novel and efficient electrode materials. Up to now, a variety of electrode materials