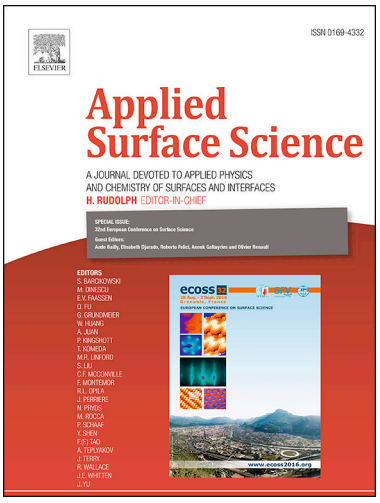

Full Length Article

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A novel ternary nanocomposite for improving the cycle life and capacitance of polypyrrole

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Abstract

A novel ternary nanocomposite MoS_2/MoO_3/polypyrrole (PPy) has been fabricated. MoO_3 nanoparticle-decorated few-layered MoS_2 nanosheets were first prepared via the exfoliation of partially oxidized MoS_2. In situ oxidation polymerization was then used to fabricate the ternary nanocomposites. We show the synergetic effects provided by the ternary composites via investigating the electrochemical performance of supercapacitors using the nanocomposites as the electrodes. Furthermore, the morphology evolution during the synthesis of the MoO_3 nanoparticle-decorated MoS_2 nanosheets was also examined. This not only allows the understanding of the formation mechanism but also leads to the surprising discovery of unprecedented amorphous carbon (a-C) layers intercalated in between the MoS_2 nanosheets. We therefore propose a mechanism to explain the formation of such a-C layer and demonstrate that the a-C plays a critical role in the supercapacitor performance. Finally, we demonstrate that the cycle life and capacitance of PPy are enhanced via the addition of MoS_2/MoO_3 with an excellent Csp of 352 Fg^{-1} and electrochemical stability with Csp retention up to 105% after 2000 cycles.

Keywords: MoS_2, MoO_3, polypyrrole, amorphous carbon, supercapacitor