Novel Manganese oxide-Titanium dioxide-Graphene Based Tetranary Nanohybrids for High-Performance Supercapacitor

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This research reports the first synthesis of manganese oxide-titanium dioxide-graphene ternary nanohybrids (MnO_2@TiO_2(G)-TNH) and demonstrates their excellent performances as supercapacitor electrode materials. The morphologies, microstructures, compositions and optical properties of the MnO_2@TiO_2(G)-TNH were characterized by field emission scanning electron microscopy equipped with an energy dispersive X-ray spectrometer, X-ray diffraction, X-ray photoelectron spectroscopy, UV-visible and diffuse reflectance spectroscopy. The MnO_2@TiO_2(G)-TNH offered high electrode/electrolyte interfacial contact areas, rapid charge/discharges and fast electron transfer pathways for supercapacitor applications. Due to the synergistic effect of MnO_2, TiO_2 and G in their nanostructured forms, the supercapacitor electrode with the as prepared MnO_2@TiO_2(G)-TNH existed significantly enhanced specific capacitance at a current density of 3 A g^{-1}, excellent rate capability and remarkable cycling stability (after 350 cycles). And, the present strategy offers a promising design and synthetic protocol of electrode materials for future supercapacitor applications