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Self-assembled MXene($Ti_3C_2T_x$)/α-Fe_2O_3 Nanocomposite as Negative Electrode Material for Supercapacitors

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Abstract

To further improve the electrochemical performance of MXene materials, MXene($Ti_3C_2T_x$)/α-Fe_2O_3 nanocomposites are fabricated by a self-assembly method via electrostatic attraction between negatively charged $Ti_3C_2T_x$ MXenesand positively charged cocoa-like α-Fe_2O_3 nanoparticles at room temperature. As a negative electrode material, the resulting nanocomposites show excellent electrochemical performance, including a wide operating potential of 1.2 V (-1.2 ~0 V), a high specific capacitance of 405.4 F g^{-1} at the current density of 2A g^{-1} and a specific capacitance of 197.6 F g^{-1} even at the current density of 20 A g^{-1} in 5 M LiCl. In addition, the nanocomposites possess a high cycling stability with 97.7% capacitance retention of the initial capacitance after 2000 cycles. The impressive results indicate that the prepared MXene($Ti_3C_2T_x$)/α-Fe_2O_3 nanocomposites is a promising