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Growth of MnO2 nanoflakes on TiO2 nanorods for pseudocapacitor

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Abstract:
In this work, we report the synthesis of TiO_2 (core)/MnO_2(shell) nanorods by a redox reaction and TiO_2 nanorods generated in-site from H-titanate nanorods during hydrothermal process. The MnO_2 nanoflakes were grown densely on TiO_2 nanorods to form core-shell nanorods. Owing to the strong TiO_2-MnO_2 interfacial interaction and enriched oxygen vacancies, TiO_2/MnO_2 nanorods are highly active and stable as capacitive electrodes. The quantitative analysis of XPS shows more oxygen vacancies were generated in the TiO_2/MnO_2 materials. The specific capacitance of TiO_2/MnO_2 is 368.9 F/g, more than double of 140.8 F/g on the MnO_2 materials. At 1.5 A/g, 92% of the initial capacitance of the TiO_2/MnO_2 was still retained after 3000 charge-discharge cycles. However, the specific capacitance on the pure MnO_2 materials lost 39% after 3000 cycles. Our results suggest that the improved capacitive properties of TiO_2/MnO_2 are closely related to enriched oxygen vacancies, unique structure, higher surface area, as well as interfacial interaction between TiO_2 and MnO_2.