

## The facile one-step hydrothermal method for the preparation of MnO<sub>2</sub> nanoparticles: Structural and electrochemical properties

MnO<sub>2</sub> nanoparticles were synthesized by the facile one-step hydrothermal method. The structural and morphological properties of the samples were investigated by X-ray diffraction (XRD) and field emission scanning electron microscopy (FE-SEM). Brunauer-Emmett-Teller (BET) was used to study the surface area and pore structure of MnO<sub>2</sub> nanoparticles. The XRD results confirmed the formation of pure phase MnO<sub>2</sub> with orthorhombic crystal structure. FE-SEM analysis revealed the combination of massively small spherical particles with average particle size 54.8 nm. The electrochemical performance of MnO<sub>2</sub> nanoparticles was evaluated using cyclic voltammetry (CV) and galvanostatic charge-discharge (GCD). The electrochemical results showed that the MnO<sub>2</sub> nanoparticles delivered the specific capacitance of 200.83 F/g at a current density of 1A/g with the rate capability of 30% after 500 cycles charge and discharge test at a current density of 5 A/g.

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