Controlled Synthesis of Trimanganese tetroxide nanorods: Applications on electrochemical supercapacitors

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This paper reports on a controlled solution processed synthesis of trimanganese tetraoxide (Mn_3O_4) nanorods (NRs) using potassium permanganate $KMnO_4$, as precursor at low temperature of 80°C. It was found that the pH and reaction time were crucial for achieving the rods like morphology. pH 12 and 24 h were found to be the optimum conditions for the formation of Mn_3O_4 NRs. With crystalline and structural studies, the characteristic tetragonal spinel structure of Mn_3O_4 NRs was confirmed wherein the divalent manganese ions were attached in the tetrahedral coordination. The band gap of Mn_3O_4 NRs was estimated to be 2.43 eV which was slightly higher than Mn_3O_4 nanoparticles (NPs) due to the transformation of NPs to NRs morphology. The synthesized Mn_3O_4 NRs were used as electro-active materials for electrochemical supercapacitors and showed reasonably high specific capacitance of 266 F/g at 10 mV/s due to its excellent electrochemical behaviour.