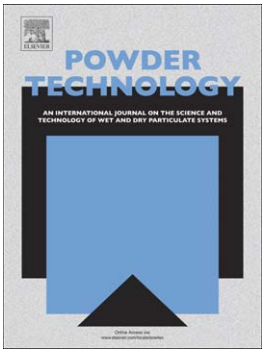

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Probing on the hydrothermally synthesized iron oxide nanoparticles for ultra-capacitor applications

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Abstract:

Herein, we report a facile synthesis of iron oxide nanoparticles by a hydrothermal route. The X-ray diffraction analysis confirms that these nanoparticles are pure magnetite (Fe_3O_4) phase. Further, the morphology and average particle size were investigated using scanning electron microscopy. The average particle size of was observed ~ 65 nm. The magnetic measurement reveals the ferromagnetic nature of the synthesized Fe_3O_4 nanoparticles at room temperature. The coercivity and remanence magnetization were observed to be 98 Oe and 0.51 μ_B/molecule, respectively. Fe_3O_4 nanoparticles showed a sharp transition (Verwey transition) around 120 K in M *vs.* T measurements. The observation of the Verwey transition indicates the high quality and phase purity of the synthesized Fe_3O_4. Moreover, the Fe_3O_4 nanoparticles were electrochemically characterized for their potential application as an electrode for ultra-capacitors. The specific capacitance of 97 F/g at the current of 1 mA was observed with excellent cyclic stability. The present facile synthesis method could be a potential approach for fabrication of ultra-capacitors using cheap and environment friendly ferromagnetic iron oxide nanoparticles for high performance energy materials.

Keywords: Iron oxide, hydrothermal synthesis, scanning electron microscopy, magnetic properties, cyclic voltammetry, ultracapacitor

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