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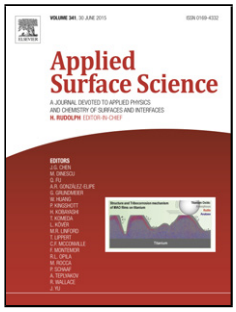

Title: Facile hydrothermal synthesis of cubic spinel AB_2O_4 type $MnFe_2O_4$ nanocrystallites and their electrochemical performance

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<AT>Facile hydrothermal synthesis of cubic spinel AB_2O_4 type $MnFe_2O_4$ nanocrystallites and their electrochemical performance

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<ABS-HEAD>Highlights► Cubic spinel $MnFe_2O_4$ nanoparticles were synthesized using a simple hydrothermal method. ► The effects of the reaction temperature on the crystallinity, morphology, and electrochemical performance were studied. ► $MnFe_2O_4$ nanoparticles delivered a specific capacitance of 282.4 F g^{-1} at a current density of 0.5 A g^{-1}. ► $MnFe_2O_4$ nanoparticles showed ~85.8 % capacitance retention after 2000 cycles at a current density of 3 A g^{-1}.

<ABS-HEAD>Abstract

<ABS-P>Cubic spinel $MnFe_2O_4$ nanoparticles were synthesized using a simple hydrothermal method followed by post-annealing. The effects of the reaction temperature on the crystallinity, morphology, and electrochemical performance were studied. The reaction temperature played an important role in the synthesis of highly crystalline $MnFe_2O_4$ nanoparticles. At low reaction temperatures (< 160 °C), the synthesized product contained a secondary inactive Fe_2O_3 phase as well as $MnFe_2O_4$ nanoparticles. In contrast, pure $MnFe_2O_4$ nanoparticles were obtained at temperatures above 180 °C. Furthermore, the crystallinity of the $MnFe_2O_4$ nanoparticles was enhanced significantly by increasing the reaction temperature to 200 °C. The cubic spinel $MnFe_2O_4$ nanoparticles synthesized at 200 °C delivered a maximum specific capacitance of 282.4 F g^{-1} at a current density of 0.5 A g^{-1} in a 2 M aqueous KOH solution, and exhibited long-term cyclic stability of 85.8 % capacitance retention after 2000 cycles. This was attributed to the cubic spinel ferrite nanocrystallite particles not only providing the more active sites for OH^- ion diffusion but also reducing the path lengths for OH^- ion diffusion. These results show that the