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## ACCEPTED MANUSCRIPT

<AT>Facile hydrothermal synthesis of cubic spinel AB<sub>2</sub>O<sub>4</sub> type MnFe<sub>2</sub>O<sub>4</sub> nanocrystallites and their electrochemical performance

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<ABS-HEAD>Highlights  $\blacktriangleright$  Cubic spinel MnFe<sub>2</sub>O<sub>4</sub> nanoparticles were synthesized using a simple hydrothermal method.  $\blacktriangleright$  The effects of the reaction temperature on the crystallinity, morphology, and electrochemical performance were studied.  $\blacktriangleright$  MnFe<sub>2</sub>O<sub>4</sub> nanoparticles delivered a specific capacitance of 282.4 F g<sup>-1</sup> at a current density of 0.5 A g<sup>-1</sup>.  $\blacktriangleright$  MnFe<sub>2</sub>O<sub>4</sub> nanoparticles showed ~85.8 % capacitance retention after 2000 cycles at a current density of 3 A g<sup>-1</sup>.

## <ABS-HEAD>Abstract

<ABS-P>Cubic spinel MnFe<sub>2</sub>O<sub>4</sub> 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<sub>2</sub>O<sub>4</sub> nanoparticles. At low reaction temperatures (< 160 °C), the synthesized product contained a secondary inactive Fe<sub>2</sub>O<sub>3</sub> phase as well as MnFe<sub>2</sub>O<sub>4</sub> nanoparticles. In contrast, pure MnFe<sub>2</sub>O<sub>4</sub> nanoparticles were obtained at temperatures above 180 °C. Furthermore, the crystallinity of the MnFe<sub>2</sub>O<sub>4</sub> nanoparticles was enhanced significantly by increasing the reaction temperature to 200 °C. The cubic spinel MnFe<sub>2</sub>O<sub>4</sub> nanoparticles synthesized at 200 °C delivered a maximum specific capacitance of 282.4 F g<sup>-1</sup> at a current density of 0.5 A g<sup>-1</sup> 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<sup>-</sup> ion diffusion but also reducing the path lengths for OH<sup>-</sup> ion diffusion. These results show that the

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