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Synthesis, characterization and electrochemical properties of KFeO2 nanoparticles prepared by sol-gel method

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In this work, we report the electrochemical properties of the KFeO2 nanoparticles synthesized by a sol-gel method. The synthesized KFeO2 nanoparticles were calcined in air at the different temperatures from 500 to 800°C for 2 h. The X-ray diffraction (XRD) pattern confirms the phase formation of KFeO2 with the average crystallite sizes ranging of 20-50 nm. With increasing calcination temperature, the crystallite size of the calcined samples decreased. SEM and TEM images revealed the calcination temperature affect to the morphology of the calcined samples, causing the formation of nanoparticles different in sizes. Moreover, the formation of KFeO2 phase of the calcined samples was also confirmed by energy dispersive spectroscopy (EDS) and selected area electron diffraction (SAED) techniques. The electrochemical performances were studied by cyclic voltammetry (CV), galvanostatic charge/discharge (G-CD), and electrochemical impedance spectroscopy (EIS). The CV results show that the highest specific capacitance (CS) was calculated to be 175.03 F/g at scan rate of 2mV/s in the sample calcined at 700°C. For the G-CD results, the highest CS was determined to be 263.18 F/g at current density of 1A/g in the sample calcined at 800°C. Ragone plots of power density versus energy density show that the calcined samples are supercapacitors. In addition, the EIS analysis of the results is also discussed.

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