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A new and effective approach for $Fe_2V_4O_{13}$ nanoparticles synthesis: Evaluation of electrochemical performance as cathode for lithium secondary batteries

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ABSTRACT

The $Fe_2V_4O_{13}$ is considered as one of the most promising cathode materials for next generation secondary batteries owing to its high specific capacity and energy density. However, the synthesis of pure $Fe_2V_4O_{13}$ is difficult because of complicated Fe_2O_3–V_2O_5 phase diagram. Thus, in this paper, a facile solution combustion method which operates relatively at low temperature was proposed to synthesize impurity free $Fe_2V_4O_{13}$ nanoparticles. The selection of fuel, oxidizer/fuel (O/F) ratio and temperature on the formation of impurity free $Fe_2V_4O_{13}$ has been investigated. The optimum temperature and time for the preparation of impurity free $Fe_2V_4O_{13}$ nanoparticles was found to be 350 °C/1 hour. The synthesized $Fe_2V_4O_{13}$ nanoparticles exhibit monoclinic phase with high surface area of 36 m^2/g. The prepared $Fe_2V_4O_{13}$ nanoparticles were tested as cathode material for lithium secondary battery and charge discharge results show that the 154 $mAh \cdot g^{-1}$ is retained after 50 cycle.

Keywords: Chemical synthesis: Iron Vanadate: Electrode materials: Energy storage materials