Mn and V co-doped $\text{Li}_2\text{FeSiO}_4$ Cathode Materials with Enhanced Electrochemical Properties

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Co-substitution at Fe site has been shown to enhance electrochemical properties of $\text{Li}_2\text{FeSiO}_4$ -based cathode materials. Hence, Mn and V co-doped $\text{Li}_2\text{Fe}_{0.8(1-x)}\text{Mn}_{0.2(1-x)}\text{V}_x\text{SiO}_4$ ($x=0, 1\%, 2\%$, and 5%) were prepared in this study through citrate-assisted sol-gel method. Effects of Mn and V co-substitution on structures, morphologies, and electrochemical behaviors of obtained materials were investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM), charge-discharge testing, and AC impedance measurements. The results indicated that specimens with doping content of $x=1\%$ displayed the best initial discharge specific capacity of 134.5 mAh/g at 0.1 C rate with retention capacity over 80% after 100 cycles. These improvements were linked to several factors, including lamellar-like particle morphology, electrochemical activity of V-ion, high Li-ion diffusion coefficient, and large exchange current.

Keywords: Cathode material, $\text{Li}_2\text{FeSiO}_4$, Mn and V co-substitution, Electrochemical properties

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