

ABSTRACT

INFLUENCE OF OLEIC ACID AND POLAR SOLVENT COMBINATION ON THE MORPHOLOGY OF LiFePO₄ CATHODE SYNTHESIZED VIA SOLID STATE REACTION METHOD

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This study successfully synthesized LiFePO₄ active material using the solid-state reaction method, examining the effect of varying additions of oleic acid surfactant and ethylene glycol polar solvent on the resulting morphology and crystal structure. LiFePO₄ synthesis was carried out using Li₂CO₃, NH₄H₂PO₄, and FeC₂O₄ as precursors. Three molar ratio variations of surfactant to solvent were applied, namely LFP-A (1:0.5), LFP-B (1:1), and LFP-C (1:2). Morphological and elemental composition characterization was performed using Scanning Electron Microscope (SEM) and Energy Dispersive X-ray (EDX), while crystal structure and phase were analyzed using X-ray Diffraction (XRD). SEM characterization results showed that the addition of ethylene glycol influenced the particle size of the material. The average particle size of the variation samples tended to decrease with increasing solvent concentration, with values of 1290 nm (LFP-A), 1100 nm (LFP-B), and 855 nm (LFP-C). However, the particle size of all variation samples remained larger than that of the control sample LFP-0, at 846 nm. XRD analysis confirmed that all samples possessed an orthorhombic olivine crystal structure with space group Pnma (JCPDS 40-1499). The addition of additives was able to suppress impurity peak intensity, but resulted in a lower degree of crystallinity for the variation samples ($\pm 65\%$) compared to the control sample (86.70%), as well as a larger crystallite size ($\pm 76-78$ nm) compared to the control sample of 47 nm. Overall, the synthesis conditions used in this study indicate that the addition of ethylene glycol and oleic acid has not yet succeeded in producing physical material quality superior to the control sample, so further optimization of synthesis parameters is needed, along with electrochemical testing to validate the material's performance.

Keywords : LiFePO₄, solid-state reaction, oleic acid, ethylen glycol