Characterization of $LiFePO_4$ olivine synthesized by the hydrothermal route

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olyanion materials, in special olivine-type $LiMPO_4$(M = Fe, Mn, Co, Ni), have gained considerable interest as cathode materials for high-power lithium-ion batteries due to their various merits including: cost-effectiveness, less toxicity, abundant availability, stability of the structure , the redox potential and high specific capacity [1,2]. In this study olivine-type $LiFePO_4$powders were synthesized. $LiFePO_4$precursors were prepared using the following: $LiOH{\cdot}H_2O$, $FeSO_4{\cdot}H_2O$, H_3PO_4(85 wt.%) and ascorbic acid where the molar ratio used was 3:1:1:0.2. First, two beakers were prepared: (i) $LiOH{\cdot}H_2O$, H_3PO_4(85 wt. %) and 40mL of deionized water and (ii) $FeSO_4{\cdot}H_2O$, ascorbic acid and 40mL of deionized water, each beaker was shaken separately for 30 minutes and after that the contents of beaker (ii) are slowly added to (i). This mixture of precursor materials was transferred to Teflon autoclave inside a stainless steel container kept in the oven at a temperature of 160˚C at different times (3h, 6h, 9h, 15h). The precipitates were analyzed by XRD and the $LiFePO_4$phase was identified, ICSD card nº 15448, belongs to the olivine family of lithium ortho-phosphates with an orthorhombic lattice structure in the space group Pnma. The structure consists of corner-shared FeO_6octahedra and edge-shared LiO_6octahedra running parallel to the b-axis, which are linked together by the PO_4 tetrahedra. It is expected that the powders obtained have a performance adequate to their already mentioned characteristics.

References:

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