NANOCRYSTALLINE COMPLEX OXIDES PREPARED BY MECHANOCHEMICAL REACTIONS

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Among the typical Li ion battery cathode materials, $LiFePO_4$ of the phospho-olivine family is particularly interesting due to its high energy density, low cost, and environmental compatibility. In the present work, nanocrystalline $LiFePO_4$ with an average particle size of about 10 nm was prepared via far-from-equilibrium mechanochemical processing of the bulk $LiFePO_4$ at room temperature. HR-TEM studies revealed a nonuniform structure of $LiFePO_4$ nanoparticles consisting of an ordered core surrounded by a disordered surface shell/interface region. A comparative ^{57}Fe Mössbauer spectroscopic study of bulk and nanocrystalline $LiFePO_4$ revealed that the near-surface layers of phosphate nanoparticles are disordered due to the strongly distorted geometry of the FeO_6 octahedra. Quantitative information on hyperfine parameters of the nonequilibrium $LiFePO_4$ phase is obtained.

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