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Freeze-drying method for $LiFePO_4$/C composite processing

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Based on its high capacity, stability, low toxicity and low cost of raw materials, phospho-olivine $LiFePO_4$ became a material of great interest for Li-ion battery application. Synthesis of $LiFePO_4$/C cathode material was performed by freeze-drying method using different organic acids as carbon source. Freeze-drying process consists of freezing of a precursor solution, elimination of solvent by sublimation (vacuum drying) and final calcinations of as-dried powder under slightly reductive atmosphere. The main advantage of this synthesis method is possibility of introducing a carbon source and mixing of reactants at atomic level which provides homogeneity of precursor solution. Synthesized materials were characterized by X-ray powder diffraction, scanning electron microscopy, particle size analyzer and galvanostatic charging/discharging.

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Spin glass like behaviour of magnetite nanoparticle system obtained by thermal decomposition of acetylacetonate precursor

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The research aim was to investigate the magnetic properties of strongly interacting Fe_3O_4 nanoparticles. Monodisperse nanoparticles were prepared by thermal decomposition of iron (III) acetylacetonate. Transmission electron microscopy pointed to the narrow particle size distribution with the mean particle size of (4.87±1.10) nm. The magnetic properties were studied by means of SQUID magnetometer, with AC and DC measurements carried in the wide range of applied magnetic field, temperature and frequencies. Magnetic characterization proved superparamagnetic behaviour at high, as well as spin glass like (SGL) properties at low temperatures. The experimental fingerprints for SGL behaviour were found in the observed memory effects.