

Crystal structure and magnetic properties of $\text{Li}_{1-x}\text{Na}_x\text{FePO}_4$ based on Mössbauer spectroscopy

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The Na-doped $\text{Li}_{1-x}\text{Na}_x\text{FePO}_4$ ($x = 0.0, 0.01, 0.05, 0.1, 1$) samples were synthesized by solid-state reaction method and investigated with X-ray diffractometer (XRD), vibrating sample magnetometer (VSM) and Mössbauer spectrometer. Based on XRD patterns, analyzed by the Rietveld refinement method, $\text{Li}_{1-x}\text{Na}_x\text{FePO}_4$ samples were determined to have an orthorhombic structure with space group $Pnma$. From the temperature-dependent magnetization curve, we have determined the Néel temperature (T_N) and observed abnormal antiferromagnetic behavior. Below T_N , the Mössbauer spectra appeared to have asymmetrical line-shapes and were analyzed with one set of eight absorption lines. The Mössbauer spectra also showed the Néel temperature (T_N) as well as the abnormal antiferromagnetic behavior as in the temperature-dependent magnetization curve. The abnormal antiferromagnetic behavior is expected to be originated from the spin reorientation and the corresponding spin reorientation temperature (T_S) is determined experimentally. © 2017 Author(s). All article content, except where otherwise noted, is licensed under a Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>). [<http://dx.doi.org/10.1063/1.4977068>]