

## Evolution of crystal structure of KFeO<sub>2</sub> nanoparticles at aging

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KFeO<sub>2</sub> magnetic nanoparticles, which are biocompatible and have a relatively high saturation magnetization are considered as promising heat mediators for magnetic hyperthermia applications. In this work, we study aging effects in KFeO<sub>2</sub> nanoparticles and show that they change their structural characteristics over time. As-produced KFeO<sub>2</sub> nanoparticles synthesized by sol-gel technique have been aged in the ambient atmosphere for 10,000 h. Aging effect was studied by X-ray diffraction methods. Crystal structure of nanoparticles undergoes essential changes, including an increase of lattice parameter and average coherent block size, and decrease of the microdeformation of crystal lattice. The diffraction pattern of aged KFeO<sub>2</sub> sample generally reproduces the Fe<sub>3</sub>O<sub>4</sub> diffraction spectrum and is indexed well in a cubic crystal lattice with  $a = 0.8337(2)$  nm. Parameters of real structure have also estimated.

A modeling the possible placement of potassium atoms in the lattice of the oxide studied has revealed that non-equivalent iron atoms in the Fe<sub>2.5</sub>K<sub>0.3</sub>O<sub>4</sub> and Fe<sub>3</sub>O<sub>4</sub> structures have octahedral FeO<sub>6</sub> environment of oxygen atoms, while the potassium atom, which is located at certain positions of the iron atoms in magnetite structure, inherits its setting of oxygen atoms, namely, KO<sub>6</sub> with K–O interatomic distances equal to 0.2101 nm.

### Topics

Session A. Physics of condensed matter and spectroscopy

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