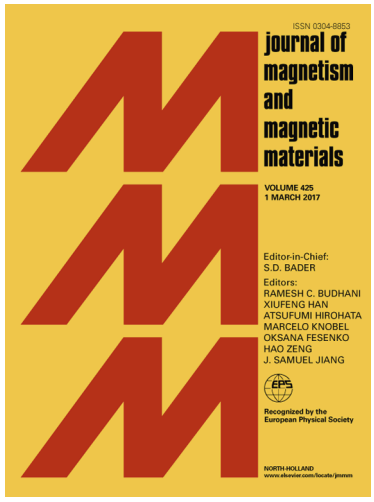

Research articles

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Influence of barium and strontium atoms on magnetic properties of iron-containing solid solutions $Bi_2MNb_2O_9$ (M – Ba, Sr)

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Abstract

Magnetic dilution and NEXAFS spectroscopy were used in the study of iron-containing solid solutions $Bi_2MNb_2O_9$ (M – Ba, Sr) with layered perovskite-like structure. The analysis of the NEXAFS Fe2p-spectra of iron-containing solid solutions and iron oxides revealed that the studied Fe atoms were mainly in the +3 oxidation state. The study of magnetic susceptibility of the $Bi_2Ba(Sr)Nb_{2-2x}Fe_{2x}O_{9-\delta}$ solid solutions showed the influence of atoms of the second coordination sphere on the distribution, degree of clustering, and intensity of exchange interactions in clusters of iron atoms. It was established that iron (III) atoms exhibited selectivity in filling the cation positions, preferring less distorted octahedral positions. The substitution of barium with strontium atoms led to intensification of the exchange of the ferromagnetic type and to a decrease in the degree of clustering of iron atoms in the solid solutions $Bi_2SrNb_{2-2x}Fe_{2x}O_{9-\delta}$.

Keywords: ferroelectric ceramics, iron, magnetic properties

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1. Introduction

Ferroelectric [1-4] and oxygen-conducting properties [5-7] of bismuth-containing complex oxides with layered perovskite-like structure of the so-called Aurivillius phases arouse inexhaustible interest of researchers. The crystal structure of the compounds of this type is described by the formula $A_{m-1}Bi_2B_mO_{3m+3}$, where the cuboctahedral positions A and partly the positions of the fluorite-like block