Samarkand State University named after Sharof Rashidov

Samarkand International Symposium on Magnetism

2 – 6 July, 2023

BOOK OF ABSTRACTS

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Book of Abstracts

Main Topics

Spintronics, Magnonics, Magnetotransport
Magnetophotonics (linear and nonlinear magnetooptics, magnetophotonic crystals)
High Frequency Properties and Metamaterials
Diluted Magnetic Semiconductors and Oxides
Magnetic Nanostructures and Low Dimensional Magnetism
Magnetic Soft Matter (magnetic polymers, complex magnetic fluids and suspensions)
Soft and Hard Magnetic Materials
Magnetic Shape-Memory Alloys and Magnetocaloric Effect
Multiferroics
Topological Insulators
Magnetism and Superconductivity
Theory
Magnetism in Biology and Medicine
Miscellaneous

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DISTRIBUTION OF Co^{2+} IONS IN SINGLE CRYSTALS OF $Li_{0.5}Ga_{2.5}O_4$

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The active study of spinels is due to their wide scientific and technological applications [1]. The distribution of cobalt Co^{2+} ions in single crystals of ordered reversed lithium–gallium spinel $Li_{0.5}Ga_{2.5}O_4$ has been studied by Electron Spin Resonance (ESR). The distribution of cobalt Co^{2+} ions depends on the structural and magnetic nonequivalence of ions in the elementary cells of single crystals. When an admixture of cobalt Co^{2+} is introduced into the matrix of an ordered lithium–gallium spinel, the latter replaces Ga^{3+} ions in tetra-positions (upper row – tetrahedra) and in octahedra (lower row - octahedra), and Li^+ ions located in octahedrons (Figure 1).

The study of the angular dependence of the position of the lines of the ESR spectrum of "tetrahedral Co^{2+}" showed the presence of four magnetically nonequivalent positions of ions in the unit cell. The Hamiltonian constants at T=4.2K are $g_{//}$ = 2.203±0.002, A=(30±1)·10^{-4} cm^{-1}, $g_{\perp}$ = 4.621±0.005, B=0. The analysis of the angular dependence of the spectrum of "octahedral Co^{2+}" indicates the presence of four magnetically nonequivalent positions of Co^{2+} ions in the unit cell. The nearest cationic environment of the ion under study creates only axial distortions along the axes <111>. Experimental values of spin-Hamiltonian constants are $g_{//}$ =7.295±0.005, A=(283±2)·10^{-4} cm^{-1}, $g_{\perp}$ = 2.311±0.002, B=0.

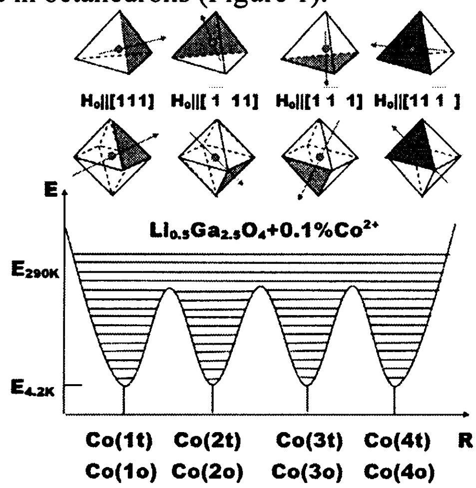

Figure 1. The dependence of the potential of the crystal field E on the distance R. The minima are located along the axes of type [111]. Tetrahedral (t) and octahedral (o) magnetically unequal positions of Co^{2+} ions in the unit cell are shown.

The study of the angular dependence of the spectrum of "octahedral Co^{2+}" located in a crystal field of low symmetry showed the presence of twelve magnetically nonequivalent positions of rhombic Co^{2+} in the unit cell. Experimental values of spin-Hamiltonian constants in three main orientations are g_z = 6.927±0.005, A = (229.6±3)·10^{-4} cm^{-1}, g_x = 1.972±0.002, B = (30.4±1)·10^{-4} cm^{-1}, g_y = 2.855±0.005, C=0.

[1] V. Tsurkan et al., *Physics Reports*, **926** (2021) 1–86.