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# Book of Abstracts

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## Main Topics

Spintronics and Magnetotransport  
Magnetophotonics  
High Frequency Properties and Metamaterials  
Magnetic Nanostructures and Low Dimensional Magnetism  
Soft and Hard Magnetic Materials  
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## CONCENTRATION-DEPENDENT ANTIFERROMAGNETIC CORRELATIONS IN MULTI-SITE $\text{Sr}(\text{Y}_{1-x}\text{Yb}_x)_2\text{O}_4$ OXIDES

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Nowadays, crystalline compounds with the general formula of  $\text{SrR}_2\text{O}_4$ , where R is a rare earth (RE) ion, attract an attention of the researchers because of quasi-1D crystal structure, magnetic frustration in zig-zag chains of RE ions and substantially different anisotropic magnetic properties of RE ions at four magnetically nonequivalent sites with the  $C_s$  point symmetry. Among the peculiar properties of the up-to-date studied compounds, one can mention a coexistence of a long-range antiferromagnetic and a short-range incommensurate magnetic order in  $\text{SrEr}_2\text{O}_4$  and  $\text{SrHo}_2\text{O}_4$  and the absence of the long-range magnetic correlations in  $\text{SrDy}_2\text{O}_4$  down to the lowest temperatures achieved in the experiments.

Another member of this family,  $\text{SrYb}_2\text{O}_4$ , undergoes a transition to the non-collinear antiferromagnetic phase at  $T_N = 0.9$  K that has been revealed by studies of the inelastic neutron scattering and the heat capacity [1]. These studies, however, didn't provide any information about the electronic structure of  $\text{Yb}^{3+}$  ions and the nature of interactions which induce the observed magnetic ordering. Some parameters of the magnetic structure should be revised because the values of magnetic moments of the  $\text{Yb}^{3+}$  ions presented in [1] are not consistent with the measured field dependencies of the magnetization.

We present the results of a systematic investigation of spectral and magnetic properties in the concentration series of  $\text{Sr}(\text{Y}_{1-x}\text{Yb}_x)_2\text{O}_4$  single crystals with  $x = 10^{-4}$ ,  $5 \cdot 10^{-3}$ ,  $5 \cdot 10^{-2}$ ,  $10^{-1}$ ,  $2 \cdot 10^{-1}$ ,  $5 \cdot 10^{-1}$ , 1. The samples were grown by the optical floating zone technique from the high-purity initial components. Energies of the crystal-field sublevels of the ground  $^2F_{7/2}$  and excited  $^2F_{5/2}$  multiplets for the two structurally non-equivalent sites Yb1 and Yb2 were determined by means of the site-selective laser spectroscopy of the strongly diluted ( $x = 10^{-4}$ ) sample. EPR study of the same sample allowed us to characterize the single-ion magnetic anisotropy (principal values and axes of the  $g$ -tensors) for the ground states of  $\text{Yb}^{3+}$  ions at both Yb1 and Yb2 sites.

Crystal-field parameters for  $\text{Yb}^{3+}$  ions were found from the optimal simultaneous fit of the crystal-field energies and  $g$ -tensors for Yb1 and Yb2 sites. These data served as a basis for a description of the magnetization curves in  $\text{Sr}(\text{Y}_{1-x}\text{Yb}_x)_2\text{O}_4$  compounds (Fig. 1) with higher Yb-concentrations. A set of exchange interaction parameters were found that allowed us to describe the observed suppression of the magnetization with the Yb-concentration increase. Collected data are used to model the magnetic structure in the  $\text{SrYb}_2\text{O}_4$  single crystal at  $T < T_N$ .

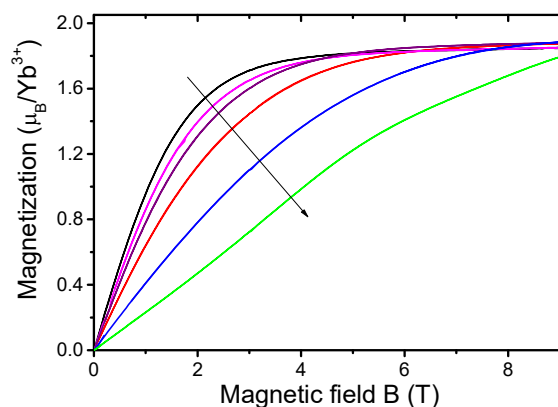


Fig. 1. Magnetization of the  $\text{Sr}(\text{Y}_{1-x}\text{Yb}_x)_2\text{O}_4$  series at  $T = 2$  K and  $\mathbf{B} \parallel c$  ( $x$  values along the arrow are 0.005; 0.05; 0.1; 0.2; 0.5; 1).

[1] D.L. Quintero-Castro et al, *Phys. Rev. B*, **86** (2012) 064203.