

# MODERN DEVELOPMENT OF MAGNETIC RESONANCE

**abstracts**

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ABSTRACTS OF THE  
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## Diluted Iron Oxide in $K_2O-Al_2O_3-B_2O_3$ Studied Method EPR

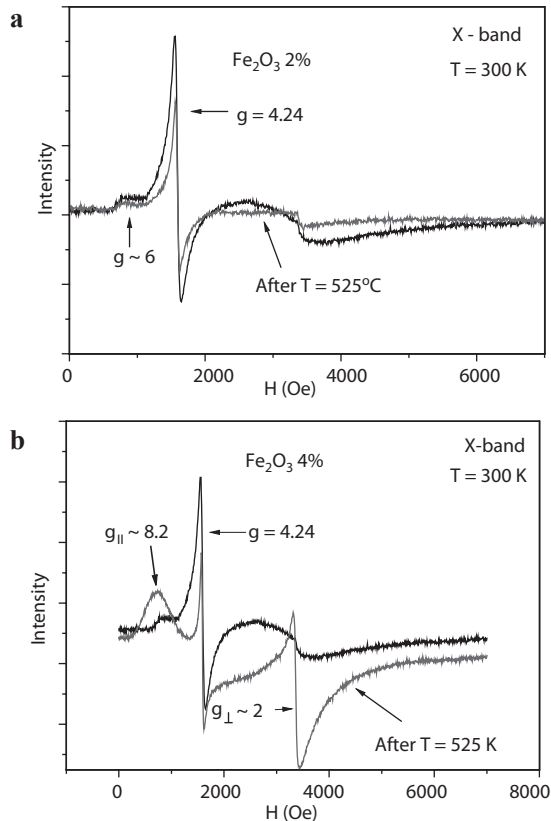
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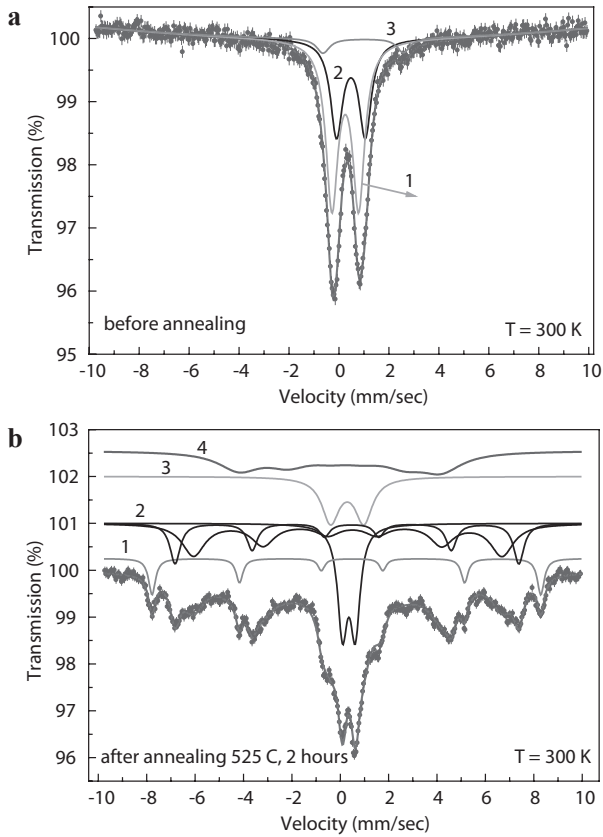
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Great interest in borate glasses and crystals is due to attractive physical properties. In particular, the borate compounds, un-doped and doped with rare-earth and transition elements, are very promising materials for nonlinear optics, quantum electronics and laser technology [1, 2], scintillators and thermoluminescent dosimeters [3], detectors and transformers of the ionizing radiation [4]. We investigated the  $K_2O-Al_2O_3-B_2O_3$  (KAB) glasses. The first sample was doped



**Fig. 1.** The ESR spectra in KAB glasses with  $Fe_2O_3$ : **a** 2% and **b** 4%, before and after annealing.



**Fig. 2.** Mössbauer spectra in KAB: **a** before and **b** after annealing.

by 2% and second sample has 4%  $\text{Fe}_2\text{O}_3$  iron oxide, the third sample KAB + 4% $\text{Fe}_2\text{O}_3$  was annealed 2 hours at 525 °C.

The continuous wave (CW) EPR spectra of iron oxides 2% and 4% before and after annealing were recorded on a Bruker EMX+ spectrometer at the frequency of 9.4 GHz. Three group of signals were observed in magnetic resonance spectra (see Fig. 1). The first line has  $g \sim 4.2$ . Detailed description of the features of the spin Hamiltonian for the observation of this line are given in the paper [5]. The magnetic resonance lines of complex shapes near  $g_{\parallel} \sim 6$  and  $g_{\perp} \sim 2$  and with weak intensity were observed in spectra samples before annealing. The line with  $g_{\parallel} \sim 6$  was described by transition between level of doublet  $|\pm 1/2\rangle$  for  $\text{Fe}^{3+}$  in octahedron position where term of ground state is  ${}^6\text{S}_{5/2}$ . The intensity of magnetic resonance signals with  $g_{\perp} \sim 2$  and  $g_{\parallel} \sim 8.2$  were increased in samples after annealing process. These lines can be connected with ferromagnetic clusters  $\alpha\text{-Fe}_2\text{O}_3$  of large size with strong magnetic anisotropy.

A Mössbauer spectra obtained with the Mössbauer spectrometer MS-1104EM at 300 K (see Fig. 2). The Mössbauer spectrum the sample KAB + 4% $\text{Fe}_2\text{O}_3$  before annealing at room temperature, is a set of 3 main doublets.

Probably the doublet the No. 1 relates to the atoms of  $\text{Fe}^{3+}$  in tetrahedral positions. The doublet No. 2 can be attributed to atoms  $\text{Fe}^{3+}$  in octahedron positions. Probably  $\text{Fe}^{2+}$  ions were occupied tetrahedral positions for a doublet number 3. After annealing, the Mössbauer spectrum has changed dramatically. The sextets were formed in third sample after annealing. We believe that ferromagnetic clusters ( $\alpha\text{-Fe}_2\text{O}_3$ ) with different size were formed in third sample.

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