Distribution of magnetization in nanocrystalline $Fe_{48}Al_{52}$

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Magnetic properties of iron aluminium alloys are subject of intensive investigations. Quite recently experimental evidence for an antiferromagnetic ordering in Fe-40% at. Al alloys was presented [1]. Nature of the magnetic ground state of alloys with still higher Al concentration still remains unclear. Some theoretical predictions indicates that concentrated spin glass state may be realized [2]. Other theoretical models predict presence of some fraction of Fe magnetic moments oriented antiparallel to the net magnetization [3, 4].

The paper reports our studies of an influence of chemical environment on the formation and orientation of Fe magnetic moment in nanostructured Fe-Al alloy. Mössbauer spectroscopy with circularly polarized radiation is used as a tool sensitive to orientation of hyperfine field. The experiments bring information on the hyperfine magnetic field distribution as well as distribution of z-component of the magnetic moment, i.e. the one which contributes to the net magnetization. An advantage of the Mössbauer polarimetric measurements [5] consists in the possibility of showing how this contribution depends on local environment.

Combining an independent information about local structure, obtained in EXAFS experiments, it was possible to identify main chemical environments responsible for noncollinear arrangements of magnetic moments.

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