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Mössbauer study of the magnetic phase composition of single-crystalline rutile (TiO2) implanted with iron ions

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Abstract

Depth-resolved Mössbauer measurements have been performed for four ferromagnetic samples obtained by the implantation of iron ions (enriched to ~ 50% with 57Fe isotope) into single-crystalline rutile (TiO2) substrates with two crystallographic orientations [(100) and (001)] at different temperatures (300 and 900 K). It is established that the ferromagnetic properties of iron-implanted rutile samples at room temperature are determined by the presence of α-Fe and Fe3O4 phases. The phase composition of samples obtained by iron implantation into substrates heated to 900 K depends on the crystallographic orientation of the substrate, which is explained by a significant anisotropy of the diffusion of iron atoms in rutile. © Pleiades Publishing, Ltd., 2009.

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