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Magnetic Properties of h.c.p. Fe-Ru Alloys*

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Abstract

X-ray diffraction experiments at room temperature and magnetization measurements from 4.2 to about 1000°K have been performed on the whole composition range of Fe-Ru alloys. The magnetic susceptibility, χ , in the ϵ phase of 100 at% Ru to 13 at% Ru-Fe alloy shows a Pauli-paramagnetic temperature dependence at high temperatures with small negative and positive temperature coefficients for the alloys less than and more than 30 at% Ru, respectively. The value of χ at room temperature increases with increasing Fe concentration from 100 at% Ru; the extrapolated value of χ , that is χ of the ϵ Fe, is as large as 10^{-3} /Oe/mole. The Fe-rich alloys in the ϵ phase shows some decrease in χ at low temperatures, suggesting the occurrence of metallic antiferromagnetic ordering.

The reason for the variation in χ with Fe concentration may be attributed to the change in the density of states at the Fermi level due to the change of the width of the d -band, relative position of the Fermi level being unchanged because of the fixed number of outer electrons.

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