Thermal Expansion, Electrical Resistance and the Effect of Hydrostatic Pressure on the Neel Temperature in Fe-Mn Alloys

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Thermal Expansion, Electrical Resistance and the Effect of Hydrostatic Pressure on the Néel Temperature in Fe–Mn Alloys*

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Abstract

Thermal expansion, temperature change of electrical resistance and its change due to hydrostatic pressure, and magnetic susceptibility were measured with some antiferromagnetic Fe-Mn alloys containing 30 to 40 at% Mn. It was found that an additional magnetic volume expansivity, $\delta V/V$, due to an antiferromagnetic spin ordering is as large as $10^{-3}\sim 10^{-4}$, and the change of the Néel temperature with pressure, $\partial T_N/\partial P$ is about -2.5×10^{-3} deg. $Kg^{-1}\cdot cm^2$ in 30 at% Mn alloy. With these values, the volume dependence of the molecular field constant, $\partial A/\partial\omega$ is estimated to be positive by the molecular field theory with the localized moment model. The results are discussed in comparison with Bethe-Slater's and Weiss' theories and with the similar behavior in some ferromagnetic invar-type alloys.

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