Thermal Expansion Coefficient and Spontaneous Volume Magnetostriction of Fe-Ni (fcc) Alloys

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Abstract

The thermal expansion coefficient α of Fe-Ni (*fcc*) alloys was measured in the range from 800°C to room temperature. Below the Curie temperature T_c, the α-T curve exhibits an anomaly corresponding to the spontaneous volume magnetostriction ω_s. The *'paramagnetic'* thermal expansion coefficient α_p below T_c was determined by the extrapolation of the α-T curve above T_c, and the value of ω_s was estimated from the difference between α_p and α below T_c. The relation between ω_s and the change of T_c with pressure was discussed. The α_p vs. composition curve at a fixed temperature shows a minimum around the invar alloys. This minimum corresponds to the anomaly in the elastic moduli vs. composition curves. It is thus pointed out that the lattice energy must be considered in addition to the magnetic energy in discussing the origin of the invar properties.

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