

Magnetic-Field Dependence of the Hyperfine Field at Fe in Dilute Fe-Pd Alloys

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The effect of external magnetic fields up to 130 kOe on the Fe hyperfine interaction in dilute Fe in Pd alloys has been studied using the Mössbauer effect in ^{57}Fe . The samples were prepared by diffusing ^{57}Co into Pd foil with and Fe impurity concentration of about 0.05% determined by mass spectrographic analysis. In two samples for which $T_C \approx 5^\circ\text{K}$ and less than 1.2°K , the magnitude of the induced hyperfine field was observed to increase linearly from 300 to 308 kOe as the external field was increased from 20 to 130 kOe with the samples at 1.2°K . The data for these alloys are compared with the Mössbauer-effect observations of Craig *et al.*¹ and Maley *et al.*² as well as with the susceptibility measurements at high magnetic fields.³ The results are discussed in terms of recent models suggested by theoretical work involving Knight shift, exchange enhancement, and structure in the density of states. We have attempted to fit our data to a model proposed by Doniach and Murani,⁴ in which they take account of interaction effects between the Fe atoms leading to departures from the isolated ion Brillouin function dependence at low H_0/T in the "knee region" of the curve, and in which they also suggest that there may be a Knight shift contribution of the order of 20%. Our low H_0/T data are inconclusive in that they do not uniquely fit any proposed model, perhaps because there are too many adjustable parameters and still too large probable uncertainties.⁴ At large values of H_0/T , however, we have clear evidence of the Knight shift. The slope, $\Delta H_{\text{induced}}/\Delta H_{\text{applied}}$, of the linear least-squared fit to the data in the saturation region (i.e., for $H_0/T > 10$ kOe/deg) is 0.07 ± 0.005 . Further details will be published elsewhere.

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¹ P. P. Craig, D. E. Nagel, W. A. Steyert, and R. D. Taylor, *Phys. Rev. Letters* **9**, 12 (1962).

² M. P. Maley, R. D. Taylor, and J. L. Thompson, *J. Appl. Phys.* **38**, 1249 (1967).

³ J. I. Budnick *et al.*, *J. Appl. Phys.* **39**, 960 (1968) (this issue).

⁴ S. Doniach and A. P. Murani, *Solid-State Commun.* **4**, 525 (1966).