The low temperature γ, γ_L, is computed by weighting the individual γ_i, computed from the c_{ij} at 4 K and dc_{ij}/dp at 273 K, according to the inverse 1/3 power of the wave velocity.

The γ_L computed for Gd is 0.13. At present time there are no direct determinations of γ_L that can be used to test the accuracy of that computed from the c_{ij} data. Andres dilatation measurements in the range of 2 K to 25 K were, unfortunately, not adequate for separating the lattice, electronic, and magnetic contributions to the low temperature thermal expansion [17]. Consequently, we have a value of 0.2 for $(\gamma_L + \gamma_e + \gamma_m)$ where γ_e is related to the volume dependence of the electronic density of states. Subtracting the computed γ_L from Andre's total γ_{Lth} suggests that γ_e for Gd is a very small number on the order of 0.1, if we neglect γ_m.

It has been proposed [18] that the change in T_c with pressure, assuming a free electron model for Gd, is related to γ_e as follows :

$$-\frac{1}{T_c(\beta_V)_T}\frac{dT_c}{dp} = \frac{d\ln T_c}{d\ln V} = \gamma_e - 1 + 2\,\frac{\partial \ln (I)}{\partial \ln V} \simeq 1.8$$

where I represents the strength of the exchange interaction between ion and *s* electron spins. If we assume γ_e to be 0.1 it is clear that dT_c/dP arises almost completely from the volume dependence of the exchange interaction, with the shift in $N(E_F)$ having a very minor role.

REFERENCES

[1] Luthi B. and Pollina R. J., 1968. — *Phys. Rev.*, **167**, 488.

[2] Long M. Jr., Wazzan A. R. and Stern R., 1969. — *Phys. Rev.*, **178**, 775.

[3] Brooks M. S. S. and Goodings D. A. — Private communication.

[4] Rosen M., 1968. — *Phys. Rev.*, **174**, 504.

[5] Fisher E. S. and Dever D., 1967. — Proc. 6th Rare Earth Conf., Gatlinburg, 522.

[6] Fisher E. S. and Renken C. J., 1964. — *Phys. Rev.*, **135**, A 482.

[7] Cadieu F. J. and Douglass D. H., 1968. — *Phys. Rev. Letters*, **21**, 680.

[8] Arrott A., 1957. — *Phys. Rev.*, **108**, 1394.

[9] McSkimin H. J., 1961. — *J. Acoust. Soc. Am.*, **33**, 12.

[10] Corner W. D., Roe W. C. and Taylor K. N. R., 1962. — *Proc. Phys. Soc.*, **80**, 927.

[11] Bozorth R. M. and Wakiyama T., 1963. — *J. Phys. Soc. Japan*, **18**, 97.

[12] Voigt W., 1910. — *Lehrbuch der Kristallphysik* (Teubner, Leipzig).

[13] Jelinek F. J. et al., 1966. — *Phys. Rev.*, **149**, 489.

[14] Bartholin H. and Bloch D., 1968. — *J. Phys. Chem. Solids*, **29**, 1063.

[15] Schuele D. E. and Smith C. S., 1964. — *J. Phys. Chem. Solids*, **25**, 801.

[16] Gerlich D., 1969. — *J. Phys. Chem. Solids*, to be published.

[17] Andres K., 1963. — *Phys. Rev. Letters*, **10**, 223.

[18] Liu S. H., 1962. — *Phys. Rev.*, **127**, 1889.

Commentaires

Comments

H. G. Hopkins. — I was very much struck with the extremely large differences between the adiabatic and isothermal values of the elastic constants in your work. These values are normally coincident for all practical purposes, e.g. for isotropic or polycrystalline materials. Are the present results peculiar to Gadolinium ?

E. S. Fisher. — The large difference is created by the large thermal expansion coefficient in the temperature range of the magnetic transition, i.e. α_V is in the range -5 to -10×10^{-5}. We used the relations of Voigt for evaluating the isothermal values of each of the c_{ij}.