

## Letters to the Editor

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### Effect of Pressure on the Superconducting Transition Temperature of Thallium

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**T**HE effect of pressure on the superconducting transition temperature of thallium has been investigated at pressures up to nearly 5000 kg/cm<sup>2</sup>. Pressure was applied to the thallium by a piston and cylinder arrangement, using solid hydrogen as the pressure transmitting medium, and the electrical resistance of the thallium was measured as a function of temperature. The experimental arrangement has been described in an earlier publication.<sup>1</sup>

The results of this preliminary study are shown in Fig. 1. The sharpness of the transitions, even at maximum pressure, suggests that the stress transmitted to the specimen is rather uniform. In Fig. 2 is shown the transition temperature *vs* pressure as derived from the curves of Fig. 1. At low pressures, we find  $\partial T_c/\partial P \sim +1.2 \times 10^{-5}$  deg/(kg/cm<sup>2</sup>), whereas for pressures greater

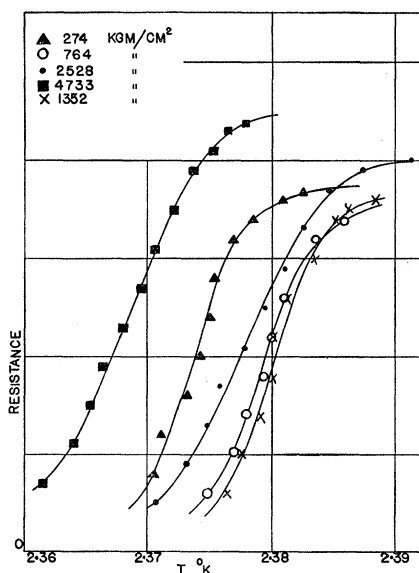


FIG. 1. Electrical resistance *vs* temperature for thallium at different pressures.

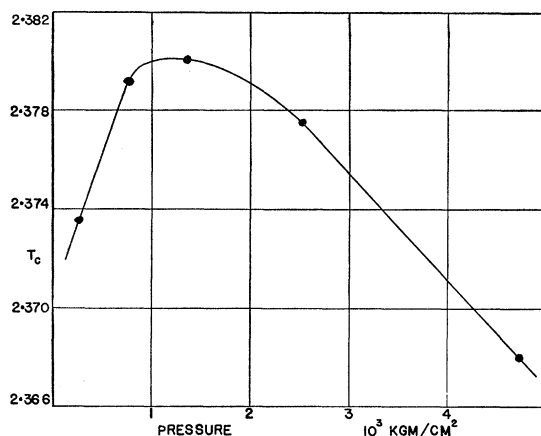


FIG. 2. Superconducting transition temperature of thallium *vs* pressure.

than about 2500 kg/cm<sup>2</sup> we get  $\partial T_c/\partial P \sim -0.43 \times 10^{-5}$  deg/(kg/cm<sup>2</sup>). The transition temperature has a maximum at a pressure in the neighborhood of 1500 kg/cm<sup>2</sup>. The values given for the pressure are calculated from the thrust on the piston and should be corrected for friction; this correction is not serious.

These results account for some of the wide disagreement between hitherto published values of  $\partial T_c/\partial P$  for thallium.<sup>2</sup>

In the experiments reported here, the pressure-transmitting medium actually used was solid HD. The results obtained when solid H<sub>2</sub> was used showed a significant difference which we ascribe to the effect of pressure on the *ortho-para* conversion rate in solid H<sub>2</sub>. It seems that this conversion rate increases appreciably with pressure, at least up to 2000 kg/cm<sup>2</sup>, but no reliable quantitative data can yet be given.

Similar investigations have been made on a number of other superconductors and a more detailed report will be submitted for publication later.

Thanks are due Mr. Ray Sawyer for his assistance with the measurements.

<sup>1</sup> J. Hatton, Phys. Rev. **100**, 681 (1955).

<sup>2</sup> N. L. Muench, Phys. Rev. **99**, 1814 (1955) gives a convenient summary of published results for thallium.

### Exchange Effects in Spin Resonance of Impurity Atoms in Silicon

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**F**LETCHER *et al.*<sup>1</sup> observed in the microwave resonance of donors in silicon weak satellite lines located halfway between pairs of the  $2I+1$  main lines. The main lines arise from the hyperfine interaction of the electron with the magnetic moment of the donor atom, while the satellites originally were believed to