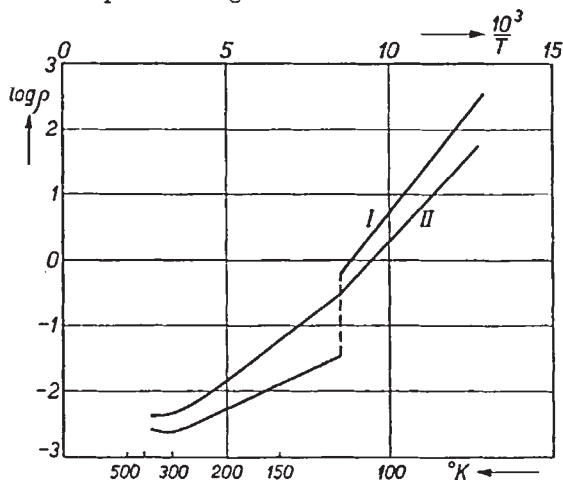


homogeneous crystalline samples of varying composition but all belonging to the  $\text{Fe}_3\text{O}_4$  or magnetite (spinel) phase<sup>7</sup>. Details of our present technique will be given elsewhere; we used pure oxide pressed into bars and sintered at about 1,300°.

We have found for magnetite with a composition in the neighbourhood of  $\text{Fe}_3\text{O}_4$  a gradual increase of the resistance (for example, by a factor 10) as one goes from 300° K. to 120° K., a sudden increase of the resistance at approximately 117° K. by a factor of the order 100, and towards still lower temperatures again a continuous increase. Samples containing an excess of  $\text{Fe}_2\text{O}_3$  in solid solution, however, show a stronger gradual increase of the resistance with decreasing temperature, but a much smaller jump in the curve at about 120° K. or even merely a change in the temperature coefficient of the resistance in that temperature region.



The accompanying graph shows  $\log \rho$  against  $1/T$  for two bars: I with  $\text{FeO} : \text{Fe}_2\text{O}_3 = 1 : 1.025$ , and II with  $\text{FeO} : \text{Fe}_2\text{O}_3 = 1 : 1.08$ . All details of the curves are in full accordance with the picture proposed above for the nature of the transition and our concept of the cation arrangement in the  $\text{Fe}_3\text{O}_4$  (and the  $\gamma\text{-Fe}_2\text{O}_3$ ) lattice. In further support of our views, we found that sample I shows a distinct drop in the susceptibility for weak magnetic fields at about 117° K., whereas with sample II the corresponding effect is much weaker.

A more complete account of this work, and details about certain hysteresis phenomena accompanying the transition, will be given elsewhere. Measurements at liquid hydrogen and liquid helium temperatures are in preparation.

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## New Iodine and Fluorine Derivatives of Monosilane

WE have recently investigated the reaction between monosilane,  $\text{SiH}_4$ , and hydrogen iodide at 80° in the presence of aluminium iodide, and have isolated from the products two stable iodides of the formulae  $\text{SiH}_2\text{I}_2$  and  $\text{SiH}_3\text{I}$ , which are formed together with silico-iodoform and silicon tetraiodide. The former is a heavy colourless liquid of low volatility (vapour pressure 2-3 mm. at 0°), while the monoiodide is a liquid of boiling point 45.8° and melting point -56.5°, which resembles methyl iodide in appearance.

Both these compounds attack mercury, and, in the case of silyl iodide, the products have been shown to consist of monosilane, disilane, hydrogen and mercurous iodide. It is possible that mercury silyl iodide,  $\text{HgSiH}_3\text{I}$ , might be formed under certain conditions, but this compound is certainly less stable than mercury methyl iodide. Silyl iodide in the vapour phase absorbs light of wave-length less than about 2800 Å. and is rapidly decomposed by light in presence of oxygen, with liberation of free iodine. Both iodides burn readily in air, with liberation of free iodine and formation of silica.

Silyl iodide reacts with magnesium in the presence of anhydrous ether. Some magnesium is dissolved and the residue is blackened. At the same time a white, ether-soluble compound separates in small amounts and hydrogen and monosilane are evolved. Addition of water results in the evolution of further quantities of hydrogen and monosilane. It is thought that this reaction is due to the formation of a Grignard compound by the silyl iodide. Its stability is evidently lower than that of the corresponding compound prepared from methyl iodide. The numerous synthetic reactions which a compound of the above type would be expected to undergo are being further investigated.

The reaction between dichlorosilane and antimony trifluoride at room temperature, in presence of antimony pentachloride as catalyst, has yielded a new fluorinated silane of the formula  $\text{SiH}_2\text{F}_2$  (boiling point, -77.5°; melting point, -119.1°). This substance is separated with difficulty from silicon tetrafluoride, which is also formed in the reaction by a process of fractional condensation at low temperatures. The fluoride is an inflammable gas which is without action on mercury or glass. Silyl chloride,  $\text{SiH}_3\text{Cl}$ , undergoes a similar reaction with antimony trifluoride, but the products have not yet been completely separated.

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## Anomalous Thermal Expansion of Carbon Disulphide at Low Temperatures

APPLYING the method of Kamerlingh Onnes and I. A. D. Boks<sup>1</sup> and using special quartz apparatus, I have determined the value of the ratio  $v_1/v_0$  for carbon disulphide in the domain of temperatures from +20° to -112° C., giving particular attention to the vicinity of -80°, because at temperatures lower than that the carbon disulphide becomes

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<sup>2</sup> Weiss, P., and Forrer, R., *Ann. Phys.*, (10), 12, 330 (1929).

<sup>3</sup> Parks, G. S., and Kelley, K. K., *J. Phys. Chem.*, 30, 47 (1926); Millar, R. W., *J. Amer. Chem. Soc.*, 51, 215 (1929).

<sup>4</sup> Ellefson, B. S., and Taylor, N. W., *J. Chem. Phys.*, 2, 58 (1934).

<sup>5</sup> Forrer, R., *C.R. Acad. Sci.*, 207, 281 (1933); Hilpert, R. S., Mäler K. H., and Hoffmann, A., *Ber.*, 71, 2676 (1933).

<sup>6</sup> Verwey, E. J. W., *Z. Krist.*, 91, 65 (1935); cf. also Hägg, G., and Söderholm, G., *Z. phys. Chem.*, (B), 29, 95 (1935).

<sup>7</sup> van Arkel, A. E., Verwey, E. J. W., and van Bruggen, M. G., *Rec. Trav. chim.*, 55, 337 (1936).