LETTERS TO THE EDITOR.

Magnetic Properties of Copper Amalgams.

The magnetic behaviour of copper in dilute copper amalgams has recently elicited some controversy. One of us[1] has observed that dilute copper amalgams of low copper content are merely mechanical mixtures of the two metals and the magnetic susceptibility varies from that of pure mercury to that for pure copper. Bates and Tai[2] observed that of all the metals which are diamagnetic in the solid state, only copper retained its diamagnetic character in amalgams of dilute concentrations whereas elements like bismuth became paramagnetic. Recently Venkataramiah[3] has, however, reported that even copper becomes paramagnetic in dilute amalgams. This difference, observed in the magnetic behaviour of copper in dilute amalgams, may be due to the variations in the conditions under which the experiment might have been conducted. Therefore, amalgams were prepared under definite conditions and their magnetic susceptibilities were determined on a Gouy's balance and were checked on magnetic interference balance.

Dilute amalgams containing copper upto 3% were prepared by electrolytes. Pure mercury of $-0{\cdot}165 \times 10^{-6}$ magnetic susceptibility was used as cathode, and copper sulphate prepared from pure copper of $-0{\cdot}085 \times 10^{-6}$ magnetic susceptibility was used as an electrolyte. Pure copper sulphate from the stores was not used because even the *Analar* variety was found to contain 0·014% iron which lowered the susceptibility value of copper and consequently that of the amalgams. It was further observed that when the electrolysis was carried out at room temperatures, the solution became hot and the susceptibility values of the amalgams formed corresponded to those obtained by Venkataramiah, but when the electrolysis was done in an ice-cold solution no lowering in susceptibility value was observed. This difference may be due to the formation of such compounds as copper oxides, because copper has the tendency to get easily oxidised at higher temperatures.

Copper amalgams of higher concentration were not prepared by electrolysis because these took two to three days to be prepared, during which period they hardened and gave low magnetic susceptibility values. Therefore these were prepared by grinding the known weights of pure copper and pure mercury under dilute analytical sulphuric acid in an agate pestle and mortar. Upto 50% the amalgams when freshly prepared are fluids but amalgams of higher concentration are all solids. The magnetic susceptibility value of freshly prepared amalgams whether dilute or concentrated varies from that of pure mercury to that for pure copper. If, however, copper amalgams were kept in air, they hardened and their magnetic susceptibility values fell considerably. For example, in the case of an amalgam, containing 34% copper, the susceptibility fell from $-0{\cdot}136 \times 10^{-6}$ to $0{\cdot}071 \times 10^{-6}$ after twelve hours. If this sample was kept in vacuum its susceptibility fell to $-0{\cdot}119 \times 10^{-6}$. Chemical analysis of these samples

revealed that the hardened black and brittle sample kept in air contained 33·03% copper and the one in vacuum contained 33·98%. The fall in the percentage of copper in the sample kept in air is probably due to the formation of some oxide. Therefore, the greater fall in susceptibility of the sample kept in air seems to be due to the formation of oxide which is known to be paramagnetic. The amalgams were, therefore, kept in vacuum. In spite of this it was observed that they became brittle, their colour showed signs of fading and their magnetic susceptibility values fell from day to day till they acquired constant values. A maximum fall from $-0\cdot136\times10^{-6}$ to $-0\cdot047\times10^{-6}$ was observed in an amalgam containing 34% copper. Terry and Wright[4] have recorded a change in the crystal structure of copper amalgams on hardening and have suggested the formation of a copper mercury compound in an amalgam containing 34% copper. The fall in the magnetic susceptibility value of copper amalgams on hardening therefore is due to the change in their crystal structure and the maximum deviation at 34% is due to the formation of a compound. A detailed publication on copper amalgams will shortly follow.

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[1] S. S. Bhatnagar and K. N. Mathur, *Physical Principles and Applications of Magneto-Chemistry*, p. 341.

[2] L. F. Bates and L. C. Tai, *Proc. Phys. Soc.*, 1926, **48**, 795.

[3] H. S. Venkataramiah, *Proc. Ind. Acad. Sci.*, 1937, **5A**, 532.

[4] H. Terry and C. W. Wright, *Phil. May.*, 1928, **28**, 1055.

Preparation of Flavones from *o*-Aroyloxyacetophenones.

Virkar and Wheeler[1] showed that the Baker-Venkataraman transformation of *o*-aroyloxyacetophenones (I) into the corresponding *o*-hydroxybenzoylmethanes (II), from