

Particle Size and Magnetic Susceptibility.

COPPER powder of particle size  $0.4\mu$  was prepared by displacement from copper sulphate by extra pure zinc followed by treatment with hydrochloric acid and fractionation. Copper powder was also prepared by electrodeposition at high current densities. The value of the mass magnetic susceptibility of the two samples was found to be  $-0.82 \times 10^{-7}$  which is the normal value for copper.

Rao<sup>1</sup> has prepared copper coagula by sparking between copper electrodes in a medium of propyl alcohol or benzene and concludes from his measurements that the diamagnetic susceptibility of this metal is size-dependent, the value increasing with the decreasing particle size. Although Rao started with a sample of copper of 99.964 per cent. purity, an analysis of the resulting coagula was desirable, for the present authors find that a considerable quantity of carbon is included in the coagulum obtained by the above method. Very probably this inclusion is responsible for Rao's results.

The authors have also carried out the susceptibility measurements with lead powders prepared by a variety of methods. The values of magnetic susceptibility measurements are given in the table below after the powders had been washed free from the oxide or other impurities.

	$\times 10^{-7}$
Lead metal . . . . .	-1.22
Lead powder (0.4 to 0.6 $\mu$ ) (mechanical grinding) . . . . .	-1.23
Lead powder (displacement from lead acetate by magnesium) . . . . .	-1.22
Lead powder (cathodic pulverisation) . . . . .	-1.22

From these experiments it is concluded that there is no effect of particle size on the magnetic susceptibility in the case of copper or lead. Similar results are to be expected in the case of the rest of the elements provided no change is brought about in the crystalline structure during powdering or colloidalisation.

Full details will be published elsewhere.

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New Bands of Beryllium Oxide.

WHILE looking out for a new band system of BeF molecule in the near infra-red, we photographed the spectrum of carbon arc in air fed with powdered potassium beryllium-fluoride. Two moderately intense bands in the region 8500-10000 Å degraded to further infra-red were recorded on our plates. On identification, it was found that these bands could not be attributed to the BeF molecule. By introducing beryllium oxide instead of potassium beryllium-fluoride in the lower electrode of the carbon arc these bands were recorded with still greater intensity. This led us to make a search for any of the band systems of BeO molecule. Looking for the latest references on the subject, we found that the red system  ${}^1\pi \rightarrow {}^1\Sigma$  which Herzberg<sup>1</sup> has analysed is deficient in sequences  $v' - v'' = +1, 0, -1$ , etc., and these evidently must lie above 8204 Å, the limit to which Herzberg has recorded his bands.

In view of the above, we made accurate measurements of wave-lengths by photographing the bands on Kodak IIIQ and Agfa Infra-red plates by means of Hilger's infra-red glass-prism instrument with a dispersion of about 125 A.U. per mm. at 8700 Å and 150 A.U. at 9600 Å. The heads of the new bands were found to have wave-lengths 8710.17 and 9641.9 Å with a possible error of  $\pm 1$  A.U. Using Herzberg's zero-line (band origin) equation for  ${}^1\pi \rightarrow {}^1\Sigma$  system, we could tentatively assign the following vibrational quantum numbers to these bands in this system:

Band at	Intensity	$v', v''$	Observed $\nu_{\tilde{\lambda}}$	Calculated $\nu_0$ (Herzberg)
9641.9 ..	10	0,0	10368.54	10364.17
8710.17 ..	4	1,0	11477.67	11475.14

From the fact that these bands could only be obtained in the outer flame when BeO salt is excited in the arc and appear along with and similar to the existing bands of the infra-red system, makes us believe that these bands are probably due to BeO molecule. A revised vibrational analysis of the whole system along with the new bands is proceeding.

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<sup>1</sup> Proc. Ind. Acad. Sci., 1935, 2, 249.

<sup>1</sup> L. Herzberg, Zeit. f. Phys., 1933, 84, 571.