curves relating to two glasses, one melted from commercial TeO_2 and the other melted from purified TeO_2 , are shown in Fig. 1. Chemical analysis of these glasses showed that they contained respectively ~ 0.004 per cent and ~ 0.001 per cent iron, expressed as Fe_2O_3 . Examination of the curves shows that with increasing purity of the glass, the ultra-violet absorption edge shifts towards shorter wavelengths. This is consistent with a decrease in proportion of ferric iron in the glass. Thus, it is concluded that the yellow-green colour of tellurite glasses melted from commercial materials is due to traces of iron impurities, and that the coloration may be greatly diminished by using a purer form of TeO_2 .

It should be pointed out that the refractive index of the glass of composition $\text{BeO} \cdot 8\text{TeO}_2$ is approximately 2.1. Thus, there occurs during the transmission measurements a loss by reflexion at both surfaces amounting to about 24 per cent. This explains, in part, why the overall transmission of the glasses is low.

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A Method of determining Particle Size of Powders

MILLS¹ recently described an apparatus for determining the mean diameter of the particles of a powder. This method, based on the measurement of the capillary pull of the interstitial pores, is not applicable in the case of very fine particles, since h , the capillary pull, cannot exceed the barometric height and l , the length of the column of the powder, must be kept as short as possible. The present communication describes in brief an alternative method (based on permeability principles) which is free from this limitation. The apparatus is illustrated in Fig. 1.

By opening the stopcock *C*, mercury from the reservoir *R* is introduced into the apparatus until the bulb *E* (about 25 c.c. capacity) is almost half full. The rest of the bulb *E* is filled with air-free water (or any other suitable wetting liquid). The powder under examination is closely packed over a plug of cotton or any other fibrous material of surface area much less than the powder at the constriction *c*, in the stem of the bulb *F* (25 c.c. capacity). The bulb *F*, detached from the main apparatus at the ground-glass joint, is then connected to a vacuum system at the lower end and water (or whatever wetting liquid is used) is poured in from above. The air contained in the pores of the powder is thereby replaced by the wetting liquid. The bulb is then mounted on the apparatus as shown in Fig. 1. This ensures an air-free joint. Sometimes tiny bubbles of air may appear at the bottom of the cotton plug on the removal of the bulb *F* from the vacuum system. These can be removed by simple manipulation.

The stopcock *D* is then closed and the mercury reservoir *R* is lowered. When the difference in the mercury levels in the tubes *A* and *B* is about 50 cm. the stopcock *C* is closed and *D* is opened. Thus a

Fig. 1

certain amount of pressure deficiency is applied at the powder end and the liquid begins to flow through it. The level of mercury in the tube *A* begins to rise. The time (t) taken by the mercury level to rise through a given length, say, 5 cm., is noted. Applying Poiseuille's equation with suitable modifications for flow of liquids through porous media², and taking into account the flow under gradually decreasing pressure head, as in the present case, the following expression can be deduced:

$$r = \frac{1 - \varepsilon}{\varepsilon} \sqrt{\frac{0.006905 L \eta R_1^2}{\varepsilon R^2 t} \log \frac{l_0}{l}}$$

where r is the mean particle radius, η is the coefficient of viscosity of the wetting liquid, R_1 is the radius of the tube *A*, R is the radius of the tube *g*, l_0 is the initial and l the final difference in the mercury levels in the two limbs, and ε is the pore space per c.c. of the powder.

The method was tested on several powders, varying in mean diameters from 0.015 to 0.0005 mm. Water and benzene were used as experimental liquids. The results obtained with both these liquids were in fairly good agreement with one another. The mean diameters were also calculated by microscopic counts and by Mills's method wherever it was applicable. The values obtained by the various methods were found to be of the same order.

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