method is based upon the determination of the specific surface and the particle size distribution. The first of these we measure by the air-permeability method of Lea and Nurse, the cell being modified for coarser particles into a longer and narrower tube; the second is measured by means of an accurately calibrated set of sieves, preferably in a mechanical sieving machine.

The coefficient of rugosity is expressed by the formula :

$$\frac{S_w}{\sum a_i \cdot \pi d_i^2},$$

where S_w is the measured surface area of 1 gm. of material in c.g.s. units, a_i is the number of particles having a diameter d_i in the same mass (dimension $[M^{-1}]$), πd_i^2 is the surface of the hypothetical sphere made out of each particle, and the sum Σ represents the total surface of 1 gm. of this idealized material. Using the value w_i , the proportion of the mass in the i^{th} sieve fraction (dimensionless), we can write :

$$w_i = a_i \frac{1}{8} \pi d_i^3 \rho,$$

where ρ is the density of the material. We can also calculate a_i , which is :

$$a_i = \frac{6 w_i}{\pi d_i^3 \rho};$$

and from this we arrive at the coefficient of rugosity :

$$\frac{S_w \rho}{6 \Sigma (w_i/d_i)},$$

which is dimensionless.

It should be noted that a_i , used in the intermediate calculation, does not represent the actual number of irregularly-shaped particles, but the number of spheres that can be made out of each fraction keeping the experimentally determinable w_i and d_i correct.

An improvement can be made in the accuracy of the results if, instead of the actual sieve analysis figures, closer values are read from a frequency curve, which can be prepared by the graphical differentiation of the cumulative curve. Sieve sizes should be chosen so that not too high a proportion of the whole sample finally rests between two sieves.

The new method was developed in the course of work on the properties of synthetic steel moulding sands. It was found that two sands having the same specific surface, when mixed in the same way with the same proportion of water and 'Fulbond', a bonding material produced from fullers' earth, behaved quite differently in the green compression strength and plasticity tests. Microscopical examination showed that the grains of one of the sands were larger, rougher and more angular than those of the other.

The coefficients of rugosity of these silica sands are usually between 1.05 and 1.40, approaching unity when the grains are well rounded. The method is being applied by the Department of Refractory Materials, University of Sheffield, in the study of silica sands for use in synthetic moulding and core sands being conducted in conjunction with the Moulding Materials Sub-committee of the Iron and Steel Institute's Steel Castings Research Committee, and has yielded information of considerable value.

Coefficients of rugosity are likely to be valuable in the study of the flow properties of dry powders, and of the rheological properties of insoluble powder-liquid systems. It is a useful measurement for evaluating substances which are required to have a high specific surface combined with a high permeability

to fluids, such as fullers' earth and base exchange materials. The method can probably be used for estimating the degree of aggregation of particles the separate particle size of which can be otherwise determined. So far the measurement has not been extended to particles which are platy or acicular, but a correction for particle shape could probably be made in the sieve analysis as suggested by Rittenhouse⁴.

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Electron Microscope Studies of the Capture of Air-borne Particles by Single Fibres

IN the course of some work with the electron microscope, studies have been made on the capture of small air-borne particles by single fine fibres.

In the accompanying illustration, *a* is the electron microscope picture ($\times 1900$) of a collection of fine sodium chloride crystals clinging to a fine rubber fibre. Sodium chloride solution had been sprayed with an atomizer into air which was drawn past the fine fibre. The dotted line in *b* indicates the size of the fibre, which was approximately 0.7 μ in diameter.

The negative from which this print was made was projected on a wall screen so as to give an image considerably larger than the accompanying figure, and the apparent boundaries of the individual crystals were sketched on the screen; *b* is a photograph of the resulting drawing, and gives a very interesting picture of the way crystals are caught and packed together.

This work was carried out in the course of experiments done by Dr. Beatrice Deacon, Dr. L. T. Newman and Dr. J. H. L. Watson; this particular experiment was done by the last-named.

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