

ABSTRACTS

observation of the crystal lattice by an electron microscope, owing to the wideness of the spacing and the inclination to the incident electron beam.

**Comparison of the Particle Sizes of Powders  
Measured by Various Methods**

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Determination of the particle size of powder is very important for industrial and theoretical use, and, therefore, various measuring methods has been developed. The particle sizes of various powders measured by sedimentation, adsorption and air-permeability methods were compared with the results by the electron microscopy. The powders used in this study were carbon black, calcium carbonate, titanium dioxide, rouge, and clay.

The mean particle size measured by the absorption or air-permeability method is average surface diameter  $d_s$ , depending on the specific surface area of powders. To compare with the particle sizes by these method, the value of  $d_s$ , i. e.  $\sum nd^3 / \sum nd^2$ , must accordingly be used after conversion through the size distribution curve by the electron microscope. In the case of the powders having especially uniform shape and size, for example, calcium carbonate prepared by the chemical reaction all of the values of mean particle sizes by various methods were almost the same. For the ordinary powders, however, the values measured by various methods did not agree, as shown in Table 1. This was explained, from the observation of the particle shape with electron microscope, to be due to other properties of powder.

Table 1. Particle size measured by various methods ( $\mu$ ).

Sample	Electron- microscope	Sedimen- tation	Permea- bility	Adsorption	
				Liquid	B E T
Carbon black F	0.12	—	0.26	—	0.13
Carbon black C	0.024	—	—	—	0.015
CaCO <sub>3</sub> -A	3.4	3.5	3.5	3.4	—
CaCO <sub>3</sub> -B	1.6	1.8	1.7	1.58	—
CaCO <sub>3</sub> -U	0.062	—	—	0.869	—
TiO <sub>2</sub> -Z	0.19	0.52	—	0.40	—
TiO <sub>2</sub> -D	0.23	0.69	—	0.82	—
Rouge-K	0.15	—	—	0.21	—
Rouge-T	1.29	0.85	—	0.62	—
Rouge-N	$\left\{ \begin{array}{l} 14.88 \\ 0.52 \end{array} \right.$	10.2	—	0.69	—
Clay-M	4.1	4.8	2.8	—	—