DISCUSSION OF

"A RIGOROUS, SIMPLE METHOD OF MEASURING AND RECORDING PARTICLE-SIZE DISTRIBUTION IN DISPERSED MATERIAL"

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The author is to be congratulated for presenting an instrument built of easily available parts. An instrument of this type, when perfected, would conceivably prove valuable in many parts of the world. As it stands, it should be emphasized, however, that the new instrument cannot very well handle materials of wide range of size variation, because the feed of glass beads is to be kept at a constant rate. During the earlier stage of a run, when the coarse portion of the sample is settling, the feed might be too slow to preserve the equilibrium of the float; yet, during the later stage, when the finer portion is settling, the same rate of feed might become too high. Moreover, since the same sedimentation tube has to be used throughout a single test, particles of all sizes must settle through the same height. This might mean unduly long time required to complete a run, when the non-uniform sample contains very fine particles; whereas in the bottom-withdrawal tube or manometric methods, the height of suspension is or can be reduced as the test goes on.

In the writer's opinion, none of the generally known hydraulic methods for size analysis of fine materials, including the author's method, could be truly rigorous, without having the problem of concentration completely solved. Study with uniform particles settling in a container has shown that the reduction in fall velocity could be as high as 20% of the single-particle fall velocity when the concentration is only 1% by dry weight (LIN, 1951 or McKOWN and LIN, 1952). In the case of non-uniform particles, only when the suspension is gradually stratified can the effect of hydrodynamic interference on the fall velocity of a particle be calculated (LIN, 1951).

As to the matter of disturbance due to the interchange of liquid between the sedimentation tube and the measuring element, attention is called to the fact that there are already methods capable of reducing this to a minimum. For instance, in manometric methods of size analysis, if the measuring element is a differential manometer of the fixed interface type, such as the Wahlen gage (SKIDMORE, 1948), there should be very little interchange of liquid between the sedimentation tube and the manometer. In fact, when properly operated, there may be even less interchange of liquid than that which might take place in the bellow system mentioned by the author. Nevertheless, the interchange of liquid in a well proportioned instrument operating at small concentrations is generally of minor importance. It is often the introduction of sample or the initial dispersion of the sample in the process of creating a suspension that creates considerable turbulence and even persistent density currents. Indeed, the writer would not be surprised, if one should find the creation of a good suspension of a required type to be a baffling problem in the construction of a good instrument. From this viewpoint, it will be of interest to know how the sample is introduced and dispersed in the new instrument, initially how homogeneous is the suspension, and how is the sedimentation tube introduced into the bath without loss of solution from the tube and also without causing objectionable mixing to take place. Obviously, the height of the sedimentation tube will limit the largest size that can be analysed, and the method of operating the instrument in turn limits the height of the tube which can be used.

Size distribution curves for a given sample tested by various well known methods (U. S. GOVERNMENT and IOWA INSTITUTE OF HYDRAULIC RESEARCH), as well as the author's method, will be most interesting.

References

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