Product Bulletin   97

Reporting Particle Diameters
with the SediGraph Particle Size Analyzer

This document explains the use of the terms *High*, *Low*, and *Average particle diameters* used in the SediGraph software.

The SediGraph analyzer determines particle size based upon x-ray monitoring of gravity sedimentation of particles of known density through a liquid of known density and viscosity. Prior to the start of the analysis it is assumed that all particle sizes in the sample are homogeneously distributed throughout the cell.

At the beginning of the analysis, the circulating pump is stopped; the time, cell position, and x-ray intensity are recorded. The cell then starts moving incrementally relative to the x-ray detection system. The Beer-Lambert relationship is used to calculate relative mass concentration of sample present at a particular depth in the cell as a function of elapsed time from analysis initiation. From each such height and time, a diameter is calculated according to Stokes' equation to yield an equivalent spherical diameter.

The calculated relative concentration is that of particles still suspended and smaller than the equivalent diameter of particles that started settling at the top of the cell and are just passing through the collimated beam of X-rays used in the concentration measurement. Thus, we continuously determine the cumulative mass finer than each equivalent spherical diameter.

The SediGraph reports this cumulative distribution, as well as the incremental or frequency distribution, over an interval defined by the current data point and the previous point. In our reporting system, the current diameter is that at the low end of this interval, and the previous point is that at the high end of the interval. Thus we call the diameter for the current point, the *Low Particle Diameter* [of the interval], and for the previous point, the *High Particle Diameter* [of the interval]. Therefore the cumulative mass distribution determined by the SediGraph is the cumulative mass finer than our defined Low Particle Diameter.

The other diameter calculated by the SediGraph, the *Average Particle Diameter*, is the midpoint of the interval defined by the High and Low Particle Diameters. It is used when you wish to represent all of the mass found in an interval by a single diameter, such as when reporting a frequency distribution as a histogram. Thus you should only use the Average Particle Diameter with frequency or mass in diameter interval reporting, and not cumulative mass finer than equivalent diameter.

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