

Particle-Sizing/Field-Flow-Fractionation

The most accurate characterization of sub-micron particles in suspension is achieved by examining them one-at-a-time within a well defined microscopic field. Many particles are painstakingly measured this way by transmission electron microscopy (TEM). An alternative, accurate, and far *easier* approach involves separating particles by their size and then measuring them in real time *on-line* by a DAWN or miniDAWN.

Using a flow field flow fractionator, microparticle samples may be separated in a manner similar to the separation of molecules within a chromatography column. Immediately after the fractionation, the separated particles are measured sequentially in a DAWN detector to yield an exact average size for each eluting fraction, on a slice-by-slice basis. Once the mass or number concentration of each slice is known, the size distribution of the sample may be derived directly.

Figure 1 presents the size distributions for two polystyrene latex samples that appeared *identical* when analyzed by photon correlation spectroscopy (PCS). The two samples were analyzed by an FFFF/DAWN system and show clear differences—even though the average diameters of the particles are only a few nanometers apart.

Figure 2 shows the size distribution for two narrow polystyrene latex samples (Duke Scientific, Palo Alto, CA) of 150 and 200 nm. The precise diameter and monodisperse nature of these samples is easily verified. Finally, Table 1 contrasts the results of FFFF/DAWN with TEM and PCS.

The FFFF/DAWN combination produces answers that have virtually the same precision as TEM—yet take but a fraction of the time and effort that it does. These results are more precise than PCS, and produce *absolute* particle size distribution information instead of answers based upon theoretical models.

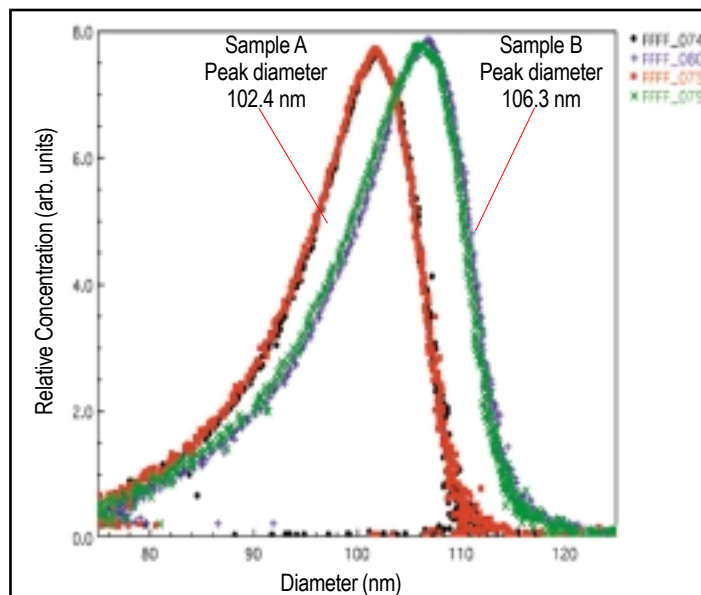


Figure 1. Two latex samples (each run twice) that could not be distinguished by PCS are shown to be different by FFFF/DAWN analysis.

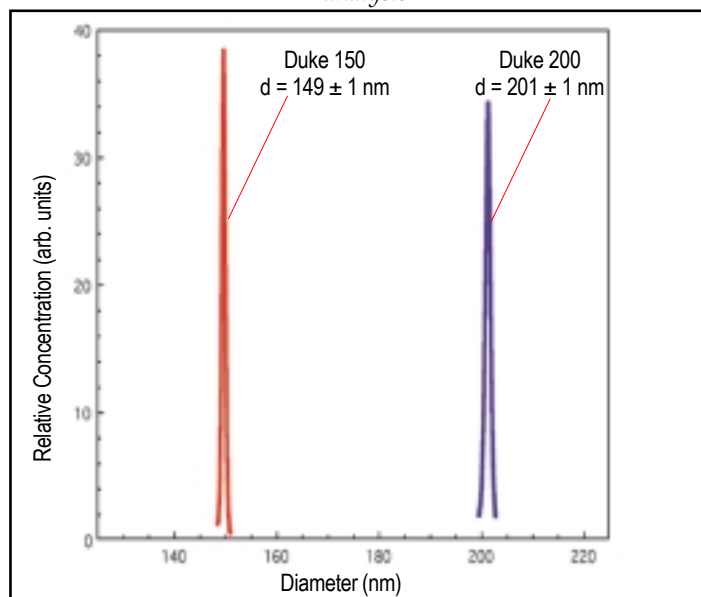
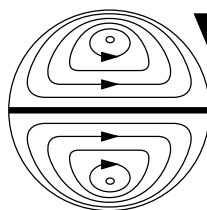


Figure 2. Size distributions for two narrow polystyrene latex samples of 150 and 200 nm, respectively.

Sample	FFF-MALLS	TEM	PCS
Nanosphere 50	50±2	50±2.0	54±2.7
Nanosphere 70	72±2	73±2.6	74±2.7
Nanosphere 150	149±1	155±4	150–158
Nanosphere 200	201±1	204±6	201–207
Nanosphere 350	354±3	343±9	352–361
Nanosphere 500	505±7	503±4	505–530
Nanosphere 730	722±30	730	NA

Table 1. Particle Sizing Results



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