Nanoparticle Tracking Analysis Limit of Detection Depends on Sample Composition

Researchers are increasingly aware of the inherent sensitivity limitations of light scattering-based particle characterization technologies such as Nanoparticle Tracking Analysis (NTA). These limitations are due to the strong decrease in the intensity of scattered light with particle diameter, scaling with diameter to the sixth power. Fewer scientists are aware, however, that NTA's limit of detection varies strongly with the polydispersity of the sample itself. We demonstrate this effect using a set of samples composed of polystyrene nanoparticles—try this easily on your own!

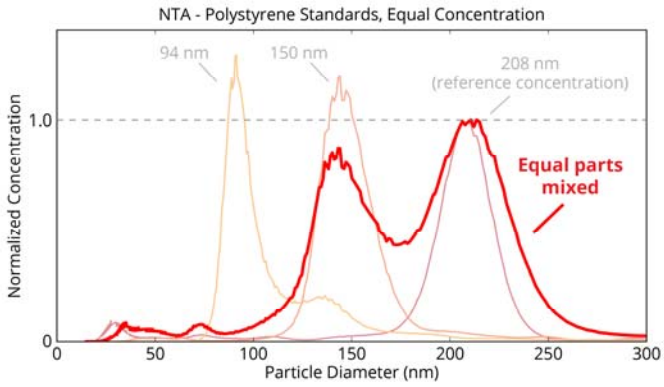

Figure 1. Strongly scattering, monodisperse polystyrene particles measured by NTA separately and after mixing in equal parts. Concentration measurements are inaccurate for particles as large as 150 nm in the mixture, and the 94 nm component of the mixture is completely undetectable.

Figure 1 shows NTA measurements of three sizes of polystyrene particles individually and after mixing in equal parts. While the separate components are reasonably measured as small as 90 nm diameter, NTA's small size limit of detection changes significantly when measuring the mixture. In the polydisperse sample, even 150 nm polystyrene particles are inaccurately measured, and the 94 nm component of the mixture goes completely undetected. Because most real-world samples are polydisperse in composition, and because NTA's sample-dependent limit of detection can impact the shape of the overall measured size distribution, researchers must exercise caution when interpreting such data.

Spectradyne's nCS1 is a microfluidic implementation of Resistive Pulse Sensing (MRPS) that counts and sizes particles one-by-one electrically, not optically. Because the measurement of any one particle is completely independent of the other particles in the sample, the MRPS limit of detection is independent of the polydispersity of the sample. This robustness is demonstrated at right by repeating the above experiment using the nCS1. The results are clear: The concentration of each component is accurately measured in the polydisperse mixture.

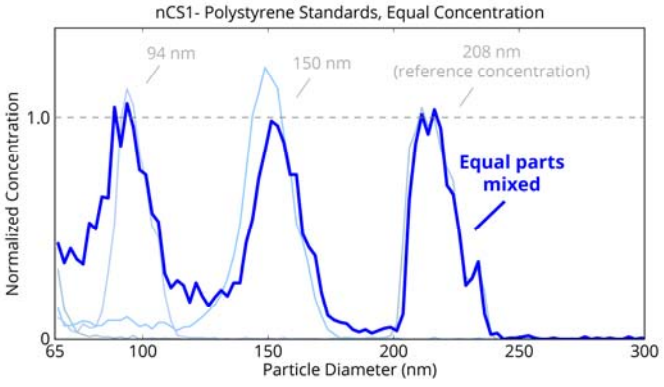

Figure 2. Spectradyne's nCS1 demonstrates accurate and robust concentration measurements in the same experiment as shown in Figure 1.

The nCS1's ability to accurately measure the concentration of particles in polydisperse samples is especially important for real-world applications, in which samples are rarely monodisperse—Are yours? Email us to arrange a demonstration and learn what's really in your sample.

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