PRECISELY MEASURING THE SIZE OF SILICA PARTICLES ACROSS A WIDE RANGE OF CONCENTRATIONS

Context

Silica nanoparticles exhibit versatility across numerous domains, such as chromatography, ceramics, catalysis, drug delivery, pigments, therapeutic systems, semiconductors, and sensors. Accurate size measurement of silica nanoparticles is crucial in all these cases, as the properties and functionalities of nanoparticles are intricately tied to their size.For instance, the semiconductor industry utilizes silica-based Chemical Mechanical Polishing (CMP) slurries with concentrations ranging from 5% to 30% by weight for polishing silica wafers.

Similarly, in pharmaceutical and research settings, silica nanoparticles of varying sizes and lower concentrations are required for targeted drug delivery and imaging. Therefore, it is essential to accurately measure silica nanoparticles of different sizes over a range of concentrations.

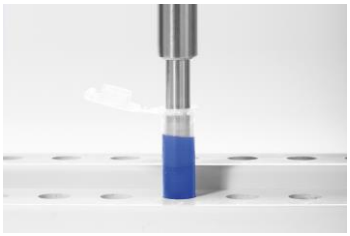

***Fig.1**: The probe is placed into the sample*

Silica scientists frequently depend on Transmission Electron Microscopy (TEM) due to its reliability in measuring nanoparticle sizes in dry states. However, attaining this level of precision proves challenging under both very high and very low concentrations. In this app note, we demonstrate that the NANOTRAC Flex not only matches TEM's accuracy in nanoparticle size measurement but also excels in analyzing particle size across a broad concentration range.

Sample Preparation

In this study, we used the Stöber process to synthesize silica nanoparticles. One advantage of silica nanoparticles is that their hydrodynamic radii remain consistent even in dry state. We measured their size at various time points during synthesis and made the TEM grid at that time to compare the data obtained from NANOTRAC Flex with TEM. Additionally, we investigated the lowest and highest concentrations at which Flex can accurately measures silica nanoparticle size.