

Advancements in nanoparticle standardisation through VAMAS inter-laboratory comparisons

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The National Physical Laboratory is the UK Measurement Institute and for many years we have been contributing to the development of the metrology infrastructure that underpins the implementation of nanotechnologies. Engineered nanoparticles add high value to commercial products and have the potential to improve our quality of lives and boost prosperity. For example, they provide radical new approaches to cancer drug delivery, biosensing, medical imaging and catalysis. However, the effective implementation of these materials relies on the ability to measure and control their properties, such as their surface chemical identity, size and concentration. To grow confidence in these new technologies, it is crucial that standard measurement procedures and reference materials are established and that measurements show time and place consistency. For these reasons, we have been leading two VAMAS (Versailles Project on Advanced Materials and Standards) inter-laboratory studies: in 2015 we concluded a VAMAS TWA 2, Project A19 study on the measurement of nanoparticles' coating thickness and chemical composition with techniques such as X-ray Photoelectron Spectroscopy and Low and Medium Energy Ion Scattering [1]. Through the adoption of a common sample preparation and data analysis protocol, the study achieved 12% reproducibility in the measurement of nanoparticle coating thickness and highlighted the importance of a consistent, standardised approach to ensure reproducibility. Currently we are running a VAMAS TWA34 Project 10 study on the measurement of the number concentration of colloidal nanoparticles [2]. The study responds to regulatory and commercial needs and will establish international consensus on the methods, providing confidence in the instrumentation available to the stakeholder community. These VAMAS studies have been instrumental in initiating further standardisation in the field, whose needs and impact will be further discussed.