**NMI’s nanoparticle characterisation facility: supporting accurate and reproducible nanotechnology research and commercialisation**

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As nanoparticle-based products such as medicines, therapies and sensors begin to emerge on the market, there is an increasing need to be able to accurately characterise the active components to ensure production control and reproducibility as well as product quality, efficacy and safety. Particle size distribution, along with the number and/or mass concentration, chemical composition, agglomeration/aggregation state, surface charge and surface chemistry are widely recognised as the key characterisation parameters that need to be assessed, ideally in media or matrices relevant to application and use.

While a diverse range of methods for characterising these parameters for nanomaterials exists, they all have inherent strengths, limitations and biases that need to be understood in order to produce high-quality and representative results. At the National Measurement Institute, we operate a comprehensive nanoparticle characterisation facility focussed on addressing this parameter space. The facility, including staff expertise, is available for external access via facility hire agreements, or through collaborative arrangements of mutual research interest. Consultancy and measurement services, which can include a formal report and uncertainty evaluation, are also available. The staff in our facility are active in national and international committees related to the development of documentary standards (Standards Australia Committee NT-001, ISO technical committees ISO/TC 229 (nanotechnologies), ISO/TC 24 (particle characterisation)) and pre-normative standardisation research, for example VAMAS (Versailles project on Advanced Materials and Standardisation), in support of these technologies.

Here, we present an overview of the available particle size characterisation techniques, including commonly used methods such as dynamic light scattering, particle tracking analysis, atomic force microscopy and transmission electron microscopy, as well as emerging techniques based on size-separation such as differential centrifugal sedimentation, asymmetric flow-field and sedimentation-field flow fractionation. The benefits and limitations of the different methods are presented using case studies to highlight some common issues.