Accelerating Nanoparticle Characterization: High Throughput Size Resolved Elemental Analysis using SMPS-ICP-MS

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Over the past decades, the production of engineered nanoparticles has increased from thousands of kilograms to thousands of tons! The simultaneous analysis of physical and chemical properties of nanoparticles is crucial for understanding their properties and behaviour. This work presents the hyphenation of a scanning mobility particle sizer (SMPS) with inductively coupled plasma mass spectrometer (ICP-MS), allowing for simultaneous size and elemental analysis of nanoparticles. The system demonstrated the ability to characterize nanoparticles in highly concentrated suspensions. Validation of results was performed using various techniques, including single-particle ICP-MS, low-resolution transmission electron microscopy (LR-TEM), and scanning transmission electron microscopy energy-dispersive X-ray spectroscopy (STEM-EDX). This establishes the SMPS-ICP-MS system as a promising high throughput, complementary analytical tool for characterizing nanoparticles. This work has broad implications for understanding and controlling nanomaterial properties in different industrial and research contexts.