NANO-PARTICLE ANALYSIS USING DATA ACQUISITION DWELL TIMES BETWEEN 10μS AND 50μS WITH A DYNAMIC RANGE EQUIVALENT TO MORE THAN 1E9 CPS

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Abstract

Inductively coupled plasma mass spectrometry (ICP-MS) is proving to be a useful tool for characterization and quantification of metallic nanoparticles. However, the short (150 – 400 ms) transient signals generated by single particle events present challenges to current ICP-MS instrumentation. Minimum dwell times are available now in the 50-100μs timings but limitations in sensitivity for quadrupole ICP-MS make analysis of smaller particles difficult below 50μs.

This work will present data acquired with dwell times down to 10μs for a range of nanoparticles. The advantages of the higher sensitivities possible with the Nu AttoM will be demonstrated. We will describe the unique detection system of the AttoM which can measure fast transient signals to > e7 cps. We will also describe an additional range extension facility based on physical attenuation of the ion beam which allows the same faster dwell times to be used for signals in excess of 1e9cps.

High signal to noise detection of 10nm particles will be demonstrated along with the ability to display and process nanoparticle data within the Nu Quant data processing package. The flexible capabilities of NICE scripts (Nu Instrument Calculations Editor) to customise the processing and reporting of particle numbers and sizes will be shown with the charting capability to report multiple distributions from a single data collection. The data processing methods allow easy discrimination of 15nm and 20nm particles from significant levels of ionic background signals with graphical and tabulated reports available for particle size, particle concentration, ionic concentration, detection limits, calibrations and size distributions with normal and log-normal fitting.

Keywords: nanoparticles, gold, 10nm, distribution, calibration

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