Improving the accuracy of single particle ICPMS for measurement of size distributions and number concentrations of nanoparticles by determining analyte partitioning during nebulisation

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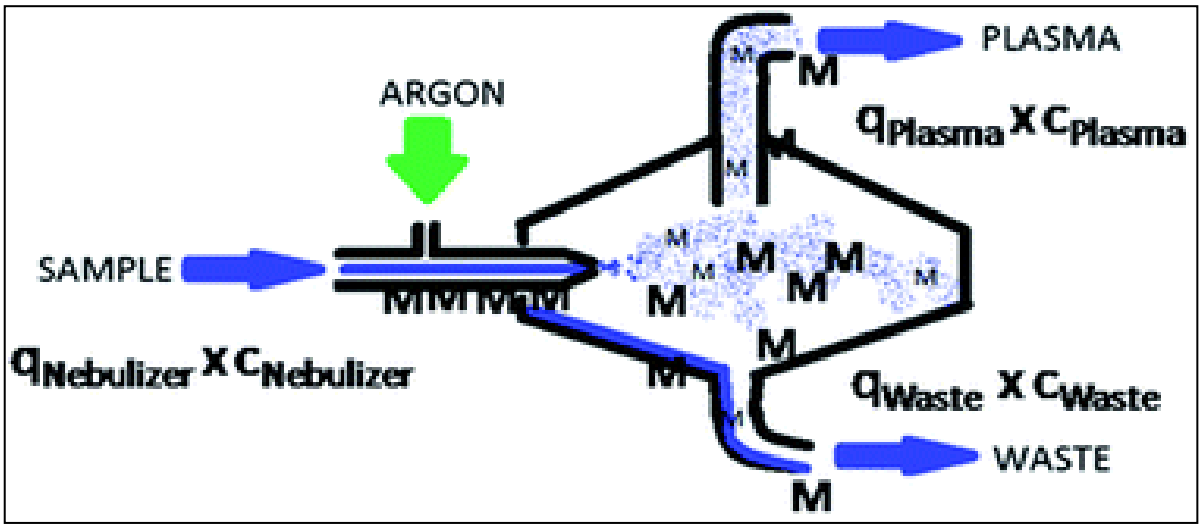
Abstract

Application of single particle ICP-MS (spICPMS) for measurement of the size and number concentration, c_p, of nanoparticles is currently hampered by insufficient accuracy. The relative contributions of different types of noise to the overall uncertainty during spICPMS measurements of Ag and Au nanoparticle dispersions were quantified showing that the accuracy of spICPMS is mainly limited by the uncertainty in nebulization efficiency (f_{neb}). This uncertainty was improved by correcting f_{neb} for analyte partitioning effects during nebulization, and the calculated Ag and Au nanoparticle sizes were in close agreement with sizes determined by scanning electron microscopy.



The duration of the particle events was measured, which allowed correction for incomplete particle events and detector dead time, and determination of the effective dwell time for particle counting. The c_p measured with spICPMS agreed with that measured by counting particles deposited on filters, and calculated from the mass concentration of the analyte.

Reference

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