Size Discrimination and Detection Capabilities of Single-Particle ICPMS for Environmental Analysis of Silver Nanoparticles

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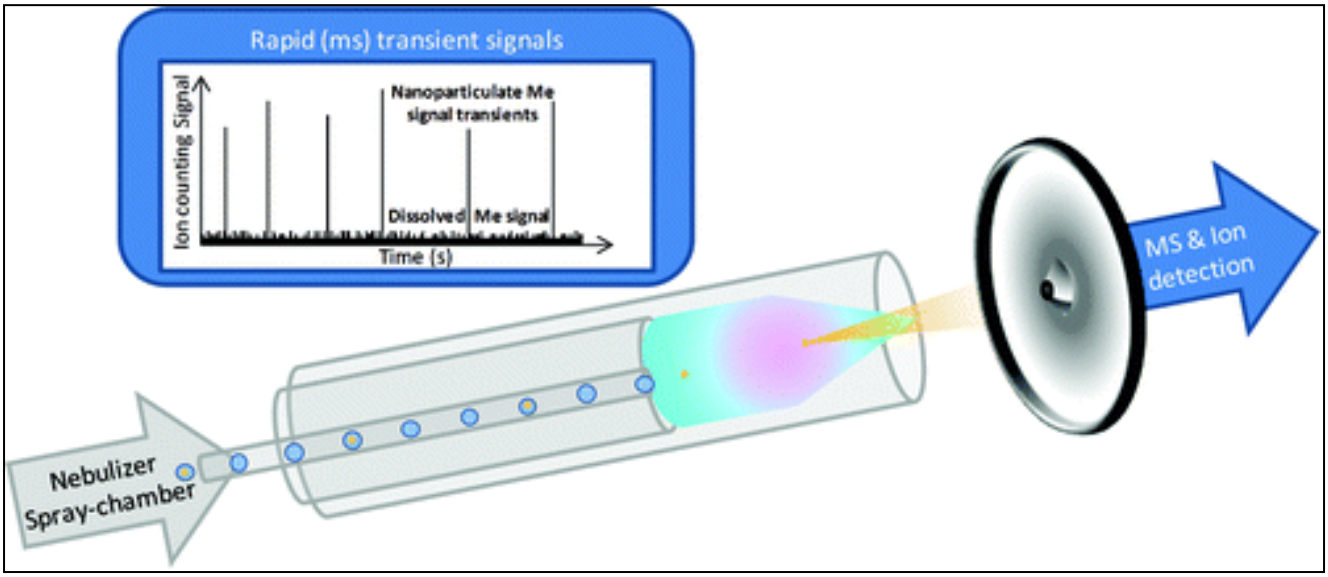
Abstract

The detection capabilities of single particle inductively coupled plasma-mass spectrometry (spICPMS) with respect to particle size and number concentrations are investigated for the case of silver nanoparticles (ca. 20–80 nm). An iterative algorithm was developed where particle measurement events were distinguished as outliers from the more continuous dissolved ion signal if the measured intensity was more than five times the standard deviation of the whole data set. The optimal dwell time for 40–80 nm particles, limiting both incomplete and multiple particle events, was 5 ms. The smallest detectable particle size (ca. 20 nm) is mainly limited by the overlap of particle events and dissolved signal that increases with noise on both signals. The lowest measurable number concentration is limited by the relative frequency of erroneously identified particle events, a limit that can be reduced by acquiring more data points. Finally, the potential of spICPMS for environmental detection of nanoparticles is demonstrated for a wastewater treatment plant effluent sample.



Reference

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