

## **Strategies for the mass spectrometric analysis of single nanoparticles**

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The analysis of single nanoparticles by inductively coupled plasma-mass spectrometry (ICP-MS) is a powerful approach to simultaneously determine particle concentrations and size distributions in solution as well as in biological tissues. Single particle (SP)-ICP-MS uses very short dwell times of milli- or even microseconds to ensure the analysis of only one single particle per time interval and thus improve the signal to noise ratio for analysis. The high plasma temperature leads to complete atomization and ionization of particles with sizes below one micrometer, and ion clouds with a duration of approximately one millisecond are generated. The intensity of the ion cloud is directly proportional to the size of the particle, thus allowing to determine particle size distributions upon analysis of several thousand particles within only a few seconds. The particle concentration is determined by counting the number of counted events per timescale.

Using this strategy, the growth of silver and gold nanoparticles from metal salt solutions can be monitored, as well as the growth of thin shells of one metal on a core of another. Limits of detection are at particle sizes of approximately 10 nm for gold and 20 nm for silver particles, respectively. Using laser ablation-SP-ICP-MS, it is even possible to determine kind and concentration of metal nanoparticles in thin slices of biological tissues.

The respective methods and selected applications are introduced within this presentation.