Analysis of nanoparticles using the ICAP Q ICP-MS - DTU Orbit (17/01/2019)

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The analysis of Nanoparticles (NPs) has become one of the hot topics in analytical chemistry. However, detailed knowledge about potential risks or hazards is still unavailable. Two approaches have been developed in recent years using ICP-MS as a detection system: hyphenation of an appropriate separation technique like Field-Flow-Fractionation (FFF), or direct analysis using spICP-MS.

The separation of particles and particle mixtures using FFF is based on the differing mobilities of different particle sizes in a laminar liquid flow. FFF is compatible for particle sizes in the low nm to low μm range and is thus perfectly suited for the separation of different NPs. Combined with other detection systems such as dynamic light scattering, it can provide also additional information about the particles of interest, like shape.

In comparison, spICP-MS is able to analyze NPs directly based on the signal intensity of single particle events in the plasma which are directly proportional to the size of the NPs. This direct approach greatly simplifies the experimental set-up. Using ICP-MS instrumentation with the very highest elemental sensitivity, NPs with diameters in the low nm range can be analyzed.

In this presentation, the basic terms of both techniques will be presented. The key benefits and drawbacks of each technique are illustrated in results from samples contain NPs of different structure and size. The challenges that remain for the characterization of NPs in real samples such as environmental matrices or foods will be briefly discussed.

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