Battling the elements: Rethinking Strategies for Characterising Nano- and Microstructures

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Nano- and microstructures play a fundamental role in basic biology and geology but are often neglected. In the past, one reason for this was a lack of suitable methods to provide complementary perspectives on integrated and discrete structures and to establish models on parameters such as sizes, masses, composition and number concentrations. Inductively coupled plasma – mass spectrometry (ICP-MS) and its associated techniques initiated a paradigm shift for the investigation of micro- and nanostructures. In its single particle (SP) mode, it is capable to count individual particles rapidly whilst estimating critical particles features in a bottom-up fashion. In conjunction with laser ablation (LA), it provides opportunities to inquire the spatial distribution of elements in micro-scaled microstructures.

This presentation will provide a general overview of ICP-MS principles in both SP and LA-ICP-MS and consider relevant instrumental and methodical facets. New approaches for the characterisation of small and heterogenous structures are covered subsequently and a focus is directed to the analysis of low abundant particles in complex matrices. A second focus is set on the hyphenation of ICP-MS and the implementation of new instrumentation, specifically optical traps and single particle Raman spectroscopy, providing new opportunities to characterise single particles from various perspectives and to create new, more comprehensive bottom-up models.