Czech Chemical Society Lecture

Thursday, September 26, 2024, 14:00

University Campus Bohunice, Kamenice 5, Building A11 / room 132

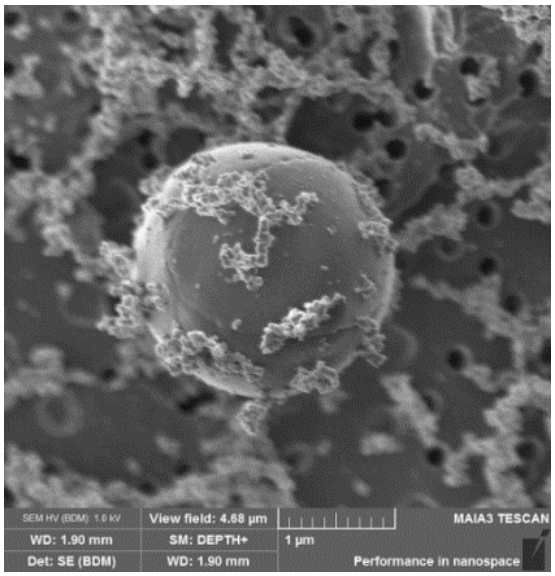
Laser-matter interaction as a key process for sampling by laser ablation

Markéta Holá

Department of Chemistry, Faculty of Science, Masaryk University, Kamenice 5, 625 00 Brno, Czech Republic

Laser ablation (LA) offers an alternative sampling method for inductively coupled plasma mass spectrometry (ICP-MS), expanding the application of ICP-MS to the localised analysis of very small areas on solid samples without prior digestion. Sampling by LA operates on the principle of laser pulse interaction with the sample surface, removing part of the material , which is then transported in the form of an aerosol to the inductively coupled plasma. The extent and nature of this interaction are influenced by both the conditions of the laser ablation and the sample's properties, playing a key role in generation of a quality aerosol suitable for analysis. Numerous variables can be adjusted, including the optimization of laser parameters, the choice of ablation cell, the flow rate and type of carrier gas, or modifications of the sample surface.

A deeper understanding of the laser-matter interaction process allows for control over various critical variables. These include efficient coupling of the laser beam to the sample, reproducible ablation, control of the volume of material removed, minimization of preferential ablation, achieving stoichiometric ablation, and controlling the size distribution of laser-generated particles. Gaining an overview of the complexity of laser ablation process is extremely beneficial for optimizing the sampling conditions and the processing of the measured data, opening the way to obtain accurate and precise results using the LA-ICP-MS technique.



Particles generated by LA visualized using Scanning Electron Microscopy