Femtosecond Laser Ablation – the last resort to improve Laser Ablation Inductively Coupled Plasma Mass Spectrometry?

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Laser ablation inductively coupled plasma mass spectrometry is currently applied in a wide variety of interdisciplinary research projects and for routine analysis as an extremely powerful technique for high spatially resolved major, minor and trace element or isotope ratio determinations in solids. The success of this technique is based on the gained insights into fundamental mechanisms about the ablation process, aerosol transport and vaporization and ionization of aerosols within the ICP. The last ten years have been focused on testing various lasers for stoichiometric ablation and on improving the quantification capabilities of this technique. Fascinating results have been achieved when using matrix-matched or non-matrix matched reference materials for calibration and a selection of such results will be presented.

However, the successful applications have not provided yet a general quantification approach which can be applied for all samples and instrument configurations. Even the application of *State of the Art* (namely UV femtosecond) lasers for sampling demonstrates the existence of uncertainties, whose origin remain unknown. There is no doubt that precision and accuracy significantly improved over the last couple of years. Unfortunately, improving the accuracy to as low as few % using non-matrix matched quantification approaches requests much more effort and is becoming very difficult. In this context, laser induced fractionation, aerosol separation within the transport system and the influence of aerosol manipulation for UV-ns and UV-fs laser will be discussed.