Inductively coupled plasma mass spectrometry in the analysis of natural materials with a focus on geological and archaeological samples

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Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS) is a widespread analytical method that has found application in various scientific fields such as geology, geochemistry, mineralogy, archeology, biology or environmental chemistry and others, not only for obtaining qualitative and quantitative information in specific areas of the studied materials, but it also enables in-situ determining the spatial elemental distribution with resolution down to the μm scale with high sensitivity and low detection limits. Moreover, isotopic and multi-element analysis or minimum destructiveness are other benefits.

The first part of the research was devoted to biominerals, specifically to study of the bioapatite alteration of recent and fossil skeletal remains by means of LA-ICP-MS. This modification including changes in the chemical composition as well as structure is a complex process depending on environmental (geo)chemical conditions and tissue properties. The research was focused on chemical alteration of bioapatite *via* determination of Rare Earth Elements as an indicators of the degree of diagenesis, and on structural changes caused by microbial activity.

The second part of the research was focused on LA-ICP-MS analyses of geological samples in order to describe geochemical processes and mineral chemistry. The aim was to fundamental study of laser ablation interaction with various minerals such as quartz, feldspar, mica, tourmaline, and to find optimal parameters of laser device as well as ICP mass spectrometer for determining the contents of matrix, minor and trace elements in rock-forming minerals of granitoids. Part of the study was also testing the effect of crystal axis orientation on the interaction with laser radiation and quantification procedure. The greatest attention was paid to study of trioctahedral mica with a high Li content (1.5-2.5 $\%_{m/m}$). An extensive study made it possible to interpret the development of granitoids, define the contents of interested elements and describe the trends of these contents during magmatic differentiation.