

The aim of the presented project is to develop a new method allowing for a precise analysis of the isotopic ratios of elements in natural samples without their prior separation. This intention will be achieved by applying the Optimized Regression Model to correct the matrix effects caused by the different chemical composition of samples and standards.

Proper correction of isotope fractionation is a necessary condition to obtain accurate results of isotope ratios determinations with the use of multi-collector mass spectrometry (MC-ICP-MS). Matrix effects are well-documented feature of measuring isotope ratios using MC-ICP-MS. In order to reduce them, the analyzed elements are separated from the matrix elements through the use of ion exchange resins in the stage preceding the actual determination (off-line). The introduction of the above step into the research procedure extends the analysis time and may result in sample contamination or a change in the isotope ratio of the investigated element. Simplifying or eliminating sample preparation will avoid these dangers and substantially shorten the entire measurement process.

During the recent decades, it has been shown that variation in isotope composition can serve as a powerful tool for study biogeochemical cycles of metals in the environment, determine geological age, metal bioavailability, source tracking in archeology, investigate historic migrations of animals and humans, and a host of other applications. Traditionally, thermal ionization mass spectrometry (TIMS) has been the technique of choice for achieving the highest accuracy and precision of isotope ratios. Recent developments in multi-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) have brought a new dimension to this field. In addition to its simple and robust sample introduction and high sample throughput this technique provide for accurate and precise determination of isotope ratios. These features, in combination with the ability of the ICP source to ionize nearly all elements in the periodic table, have resulted in an increasing use of MC-ICP-MS for such measurements in various sample matrices.