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Validation of the ICP-MS method for lanthanum determination

The increasing concern regarding the presence and environmental impact of rare earth elements, as well as their effect on human health, emphasizes the need to develop reliable and well-validated methods for their quantitative and qualitative determination. Inductively coupled plasma mass spectrometry (ICP-MS) is an analytical technique characterized by exceptional sensitivity and accuracy in the determination of trace elements. The aim of this study was to validate a method for the determination of lanthanum using ICP-MS.

The validation was performed in accordance with the requirements of ISO 17025 standard and EURACHEM guidelines. In order to validate the method, samples of distilled water and tap water enriched with speciefied amounts of lanthanum using a single-element standard (Certified Reference Material) at a concentration of 1000 mg La/l were analyzed. Samples were prepared at several lanthanum dilution levels: 50 ppb, 5 ppb, 1 ppb, 0.5 ppb, 0.1 ppb, 0.050 ppb, 0.010 ppb and0.005 ppb.

The basic parameters of the method were evaluated, including: detection limit, quantification limit, linearity, accuracy, precision (repeatability and reproducibility) and measurement uncertainty. The selection of the matrices allowed to assess potential interferences resulting from the presence of other ions contained in tap water in contrast to deionized water. The validation procedure used allows for precise and repeatable results. The method showed high sensitivity, good repeatability, and linearity over a wide range of lanthanum concentrations. The results obtained confirm that the ICP-MS method is suitable for the determination of lanthanum in samples requiring precise quantitative analysis. The research project was supported by program “Excellence initiative – research university” IDUB for the AGH University of Krakow (Action 12, project number 11764).

Keywords: lanthanum, ICP-MS, method validation

Biography

I hold a B.Sc. in Mining and Geology and a master's degree in Applied Geology from AGH University of Krakow. My areas of interest include hydrogeology, engineering geology, and geotechnics.

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