Abstract

This bachelor thesis deals with an optimization of the conditions of photochemical vapor generation of rhenium with detection by inductively coupled plasma mass spectrometry. Photochemical vapor generation was realized using an ultraviolet irradiation in a high-efficiency photochemical reactor with an inner reaction channel from a formic acid based medium in presence of reaction modifiers.

Optimizations of parameters affecting the generation efficiency was implemented step by step – reaction medium flow rate (irradiation time), formic acid concentration, addition of acetic acid and reaction modifiers (transition metals) and carrier gas flow rate.

The addition of an appropriate combination of reaction modifiers – cadmium(II) and iron(II) ions, had a key impact on photochemical generation of volatile species of Re and led to more than 40-fold increase in generation efficiency. A further (2-fold) increase in generation efficiency was achieved by wrapping the high-efficiency photochemical reactor with an aluminum foil, probably due to more efficient irradiation of the sample in the generator. The limit of detection and quantification were determined as 0.24 ng dm^{-3} and 0.80 ng dm^{-3} Re, respectively. The repeatability of the method 100 ng dm^{-3} Re was 4.8%.

Key words

photochemical vapor generation, rhenium, inductively coupled plasma mass spectrometry