Abstract

This master's thesis deals with the optimization of conditions for photochemical generation of volatile species of cobalt. Volatile species of cobalt were generated in a flow injection system using a high-efficiency flow through UV generator from formic acid based medium. For detection a high-resolution continuum source atomic absorption spectrometer was used. The volatile species were atomized using a diffusion flame atomizer because of its high robustness.

First the optimizations of the parameters affecting the atomization in the diffusion flame and the parameters affecting the transport of the volatile species from the UV generator into the atomizer were carried out (flow rates and composition of the gases, type of a separator, observation height). After that, the optimization of the parameters of the photochemical generation itself was carried out. These were the composition of a reaction medium (concentration of formic acid and formate, type of formate salt) and irradiation time. The possibility of generation of the volatile species from acetic acid based medium was also investigated, but no signal was observed.

At chosen optimal conditions of generation the influence of potential interferents was examined, mainly from inorganic acids (HNO_3 and HCl) and some transition metals (Fe, Cu and Ni). It was found that nitric acid seriously interferes at concentrations higher than 1 mmol dm^{-3}.

Lastly, analytical performance was determined. The limit of detection and limit of quantification were 2,7 μg dm^{-3} and 6,3 μg dm^{-3}, respectively, which translates to 1,4 ng (3,2 ng) for 0,5 cm^3 injected volume of a sample. The repeatability of this method at concentration of 250 μg dm^{-3} was 1,8 %.

Key words

Photochemical volatile species generation, atomic absorption spectrometry, cobalt, UV radiation