Abstract

This Master thesis is a part of a project: Hydride atomizers for atomic absorption and atomic fluorescence spectrometry - new horizons (GA ČR, P206/17-04329S, principal investigator: prof. RNDr. Jiří Dědina, CSc. DSc.) of which the general target is to make a leap towards the ideal hydride atomizer by optimization of atomization based on the knowledge of the distribution of free atoms and hydrogen radicals inside the atomizers. This thesis contributes to the project by optimizing the atomization parameters for atomic absorption spectrometry with hydride generation. The atomization parameters were optimized for three different types of atomizers - multiatomizer, diffusion flame and „flame-in-gas-shield“ atomizer using three different analytes - bismuth, lead and tin.

Optimal atomization parameters were found for each of the atomizer and each of the analyte - carrier gas flow and flow of other gases if needed for the analysis. Calibration curves and analytical figures of merit such as sensitivity, LOD and LOQ were estimated. Final comparison is based on the data obtained from calibration curves. MDF and FIGS atomizers are mostly used with AFS detection and they provide lower sensitivity and higher detection limits with AAS detection in comparison with MMQTA.

Since the analytes are known to trap inside MDF and FIGS atomizer, an experiment defining the place and the approximate extent of trapping was performed. Determination of the amount of analyte trapped was performed by GF-AAS using iridium as a permanent matrix modifier. Trapping of the analyte was found to be severalfold more significant in MDF than in FIGS atomizer.