Abstract

The functionality of the add-on Millennium Merlin Satellite module towards the PSA Millennium Excalibur atomic fluorescence spectrometer for determination of mercury has been proven. At the same time, the ratios of the average signal to the sample standard deviations of the results of repeated measurements of this module were compared with the mercury determination using an atomic absorption spectrometer ContrAA700 with a radiation source with continuous spectrum and high resolution.

In model experiments performed on an atomic absorption spectrometer, the experimental conditions of the cold vapor detection above the level of the elemental mercury were optimized. The flow rate of argon and hydrogen, the temperature of the detection cell and the storage bottle and the mercury evaporation time were optimized. It has been shown that the reduction environment in the detection tube reduces the signal. The need to heat the detection tube up to 650 °C has been surprising. The causes of this phenomenon were discussed and confronted with data from the available literature. Subsequently, the mercury signal was monitored unde roptimal conditions found on the AAS, using an atomic fluorescence PSA Millennium Excalibur spectrometer with an additional Millennium Merlin Satellite unit for mercury determination.

In the second part of this work calibration dependences were measured and compared under optimum conditions using an electrochemical and UV-photochemical generation of cold mercury vapors. The analytical characteristics of the determination of Hg(+II) were used for this: limits of detection, limits of quantification, sensitivity of calibrations, repeatability and linear dynamic ranges. The evaluation of peak heights when injecting 170 μL of sample in the mode of flow injection analysis performed by the UV-photochemical generation of cold mercury vapors with detection by the atomic fluorescence detector was chosen as the most advantageous of the tested variants.

Key words: atomic absorption spectrometry, atomic fluorescence spectrometry, Millennium Merlin Satellite, mercury, electrochemical mercury cold vapor generation, UV-photochemical mercury cold vapor generation