Abstract

The topic of this work was optimization of the conditions for the generation of volatile zinc chelates. The aim was to develop an alternative method for generating volatile Zn speciates to its reduction by sodium tetrahydridoborate. Detection was carried out by atomic absorption spectrometry. Optimization of the conditions of the chelation reaction itself included the selection of a suitable chelating agent and appropriate modifiers, pH adjustment, suitable reagent and carrier gas flow rates, and appropriate apparatus arrangement. The following method characteristics were obtained under optimal conditions: LOD 1.55 mg L^{-1}, LOQ 5.17 mg L^{-1} and sensitivity 0.245 s L mg^{-1}. The repeatability was 13,7 %. The addition of modifiers was then tested to increase the efficiency of generation of volatile zinc chelates. Potential modifiers included transition metals, organic solvents, heterocyclic organic compounds, compounds from the carbamate group and surfactants. The heterocyclic 1,10-phenanthroline and the carbamate NaPDC were included in the optimal conditions because without them it was not possible to distinguish the signal from noise. Acetonitrile proved to be the most effective modifier, increasing the efficiency to 1547 %. With the addition of acetonitrile, the LOD decreased to 0.191 mg L^{-1}, the LOQ to 0.637 mg $L^{-1}$and the sensitivity increased to 2.04 s L mg^{-1}. The repeatability was comparable to the measurement without acetonitrile, i.e. 13.2 %.

Some potential modifiers had a negative effect on the generation efficiency. CTAB, from the group of surfactants, and nickel, from the group of transition metals, appeared to be the worst interferents. At a concentration of $1 \cdot 10^{-4}$ M CTAB, no zinc signal was observed, and at a concentration of 20 mg L^{-1} Ni^{2+}, the generation efficiency of the volatile speciation decreased to 35%.