Thermospray flame furnace atomic absorption spectrometry for the determination of manganese and lead: use of organic solvents and air as carrier

Karma Wangmo, Atitaya Siripinyanond*
Department of Chemistry. Faculty of Science, Mahidol University, Bangkok. 10400, Thailand

*e-mail: atitaya.sir@mahidol.ac.th

Thermospray flame furnace atomic absorption spectrometry (TS-FF-AAS) technique is used for an analytical determination of elements like manganese (Mn) and lead (Pb) bearing different atomization temperatures. This work is targeted to have a comparative analysis on analytical signals of Mn and Pb in TS-FF-AAS with respect to various carriers. The evaluation was made with optimized parameters including carrier flow pump rate, fuel oxidant ratio, the flame position and sample concentration and volume, using organic solvents like ethanol, acetylacetone and air as carrier. Standard volume of ethanol (ranging from 5% to 50% v/v) and acetylacetone (ranging from 1% to 5% v/v) was propelled as carrier and also air with optimized pump rates were introduced as carrier. A distinguishable improvement in the detection power of about 10 times was shown in case of Pb when compared with conventional flame atomic absorption spectrometry (FAAS) with the switching of carrier solution from deionized water to ethanol, then to acetylacetone and a remarkable improvement in the analytical signal with introduction of air as carrier. A noticeable improvement in the analytical signal of Mn was shown on changing carriers. The obtained figure of merits with the optimized parameters shown with Pb, with the best R^2=0.9925 attained from 30% ethanol and R^2=0.9942 attained from 3% acetylacetone and R^2 = 0.9861 obtained when air as carrier with pump flow rate 1 $mlmin^{-1}$ respectively. The best R^2 = 0.9972 and R^2 = 0.9866 was obtained with 30% of ethanol and 4% of acetylacetone and R^2 = 0.9878 obtained with air as carrier with pump flow rate 1 $mlmin^{-1}$ for Mn, respectively. Due to its excellent detection limits this technique can be promising for the analysis of biological, pharmaceutical, environmental and food samples.

Keywords Thermospray flame furnace atomic absorption spectrometry (TS-FF-AAS); Ethanol; Acetylacetone