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FI-HG-ICP OES System for Simultaneous Determination of As, Sb and Se

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The potential of the continuous flow hydride generation system coupled to an inductively coupled plasma (FI-HG-ICP) was proposed in 1978 by Thompson¹. The generation of volatile compounds by FI systems exhibits several advantages, such as automation, throughput, precision, a significant decrease of sample and reagent consumption, as well as waste generation, control of interferences and potentially use in pre-concentration alternatives^{2,3}. Introduction of gaseous hydrides into the ICP OES improves sensitivity of the hydride-forming elements by 10 to 100 times⁴, but this efficiency is strongly dependent on the experimental conditions. The analyte must be converted to a lower oxidation state before the hydrides are evolved, which requires adequate sample treatment procedure before determination. As consequence, the main challenge for simultaneous determination has been to achieve an adequate condition to simultaneously form volatile hydride.

The aim of this work was to propose a FI-HG-ICP OES system for As, Sb and Se determination by hydride generation in digested agronomic samples. A peristaltic pump was used to introduce the gas-liquid mixture, to aspirate the drained liquid, and control the filling level. Owing to convert the analytes to their more favorable oxidation state, investigated operation conditions for FI-HG were sample volume, concentration and volume of the acid, and the nature, concentration and volume of the reductant. The gas-liquid separator, made of glass, was *homemade*. An ICP OES with radial view was used as detector and the nebulizer gas flow, viewing height and R.F power were the studied parameters. The evaluation of the simultaneous determination of As, Sb and Se hydride generation was performed in appropriate wavelengths, which gave the highest sensitivity and were free from spectral interferences, especially from transition elements and other hydride-forming elements. Detection limits of the proposed system were 1.5, 1.6 and 0.7 $\mu\text{g L}^{-1}$ respectively for As, Sb and Se. Recoveries from 98 to 105% of spiked mineral waters were obtained.

¹ Thompson, M.; Pahlavanpour, B., and Walton, S. J. *Analyst*. 1978; 103(1227): 568-579.

² Dedina, J., Tsalev, D.L., *Hydride Generation Atomic Absorption Spectrometry*, Wiley, Chichester, 1995.

³ Storgeom R.E.; Mester, Z., *Applied Spectroscopy*, 2002, 56(8), 202A-213A.

⁴ Kujirai, O., Kohri, M., Yamada, K., and Okochi, H. *Analytical Sciences*. 1990, 6: 379-383.

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