



Development of Solid Phase Extraction Procedure Using Modified Activated Carbon Cloth As New Adsorbent For Preconcentration of Pb(II), Cd(II) and Ni(II) From Environmental Samples

Mohamed Habila (1), Erkan Yilmaz (2), Zeid ALOthman (1), and Mustafa Soylak ()

(1) Advanced Materials Research Chair, Chemistry Department, College of Science, King Saud University, Riyadh-11451, Kingdom of Saudi Arabia (mhabila@ksu.edu.sa), (2) Erciyes University, Fen Fakultesi, Department of Chemistry, 38039-Kayseri-Turkey.

Heavy metals such as lead, cadmium and nickel are common pollutants of water, food, soil and biological samples and have generated intense research interest due to their toxicity to humans, animals, and other living creatures. Hence, the development of fast, reliable and effective analytical methods for the determination of trace amounts of lead, cadmium and nickel in real samples is an important area of research. Herein, activated carbon cloth was impregnated with 1-(2-Pyridylazo)-2-Naphthol (PAN-imp-ACC) and used as solid phase adsorbent for the simultaneous separation and preconcentration of trace amounts of lead, cadmium and nickel in water, soil and sewage sludge samples prior to their determination by flame atomic absorption spectrometry (FAAS). The parameters controlling the efficiency of the method were optimized, including the pH, the eluent type and volume, the sample and eluent flow rates, diverse ion effects and the sample volume. A preconcentration factor of 100 was obtained for all the metal ions, with detection limits of $0.1\text{--}2.8\ \mu\text{g L}^{-1}$ and relative standard deviations below 6.3 %. The adsorption capacity of the PAN-imp-ACC for Pb(II), Cd(II) and Ni(II) ions was found to be $49.1\ \text{mg g}^{-1}$, $45.0\ \text{mg g}^{-1}$ and $19.5\ \text{mg g}^{-1}$, respectively. The method was validated by the analysis of the certified reference materials TMDA-64.2 fortified Lake Ontario water and BCR-146R Sewage Sludge Amended Soil (Industrial Origin). The procedure was applied to determine the analyte contents in real samples. The developed method exhibits the following advantages:

- PAN-imp-ACC can be used over 100 times without any loss of adsorption capacity.
- PAN-imp-ACC can be applied to the real samples mentioned above without suffering from matrix interferences.
- PAN-imp-ACC shows high preconcentration factors and low LODs, LOQs and % RSDs.
- The method, in contrast to some other preconcentration techniques, was used without organic solvent; hence, the environmental waste is limited to a small amount of organic solvent.