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Analytical Applications of Magnetic Multiwalled Carbon Nanotubes Composites

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Topic: Beyond the Elements: building Nano- and Bio-materials

Abstract:

The application of nanomaterials as sorbents has increased exponentiallyin recent years because of their relevance for analytes preconcentrationand/orsample clean-up, as consequence of their low resistance to diffusion, their high adsorption capacity and fast adsorption kinetics. The possibility of magnetizing these nanomaterials is interesting due to the superparamagnetic nature attributed to them, which simplifies their recovery by using a neodymium magnet.Compared with traditional solid phase extraction, dispersive magnetic solid phase extraction (DMSPE) has demonstrated higher extraction efficiencies owing to the increase of the contact surface between analyte and adsorbent.

In this work, magnetic multiwalled carbon nanotubes composites (MWCNTs-Fe_3O_4) were successfully prepared, using the coprecipitation method,[1]and applied for the DMSPE of fifteen pyrethroid insecticides and nine parabens from water and urine samples, in a rapid and efficient separation procedure. The characteristics of the magnetic MWCNTs-Fe_3O_4 material were studiedusingfieldemission scanning electron microscopy (FE-SEM) andenergy dispersive X-ray spectroscopy analysis (EDX).The enriched extracts were analyzed by gas chromatography-massspectrometry. The variables involved in the preconcentration efficiency in both adsorption and desorption MSPE steps were studied using multivariate designs. The developed methods were validated according to international guidelines,[2]and successfully applied in the analysis of water and urine samples. Detection limits in the 0.09-0.24 and 0.06 to 7.4 ng mL^{-1} ranges were obtained for pyrethroids and parabens, respectively.

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