Ain shams University
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Novel nanocomposite polymeric membranes for solid phase microextraction of some insecticides and drugs of abuse

Thesis Submitted

By

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ABSTRACT

The merge of nanomaterials with polymeric compounds led to the development of materials with striking properties. Such nanoparticles based composites are used as support in a solid phase microextraction adsorption of analytes from biological samples. Precise, easy and fast drug extraction techniques are necessary for satisfactory forensic intelligent and clinical purposes.

In this study a novel chitosan and carboxylated poly vinyl chloride nanocomposite membranes were prepared and characterized. The comparison between peak areas resulted from application of pure polymer, polymer/silver nanocomposite and polymer/palladium nano-composite membranes indicated that incorporating palladium nano particles in the polymer membranes enhanced the extraction competence of the membrane to a high extent. The extraction conditions; adsorption time, ionic strength, agitation, pH and membrane thickness were studied and optimized to improve the technique sensitivity. The analytes were determined by gas chromatograph–mass spectrometer (GC–MS) for tramadol, benzhexol and the urinary metabolite of cannabis in urine; 11-nor-D^9-tetrahydrocannabinol-9-carboxylic acid (THC-COOH). While HPLC instrument was used to determine the extracted malathion. Estimated lower limit of detection (LOD) and lower limit of quantitation (LOQ) were 0.01 and 0.03 μg/ml for benzhexol, 0.02 and 0.04 μg/ml for tramadol, 0.01 and 0.03 μg/ml for THC-COOH and 0.03 and 0.05 μg/ml for malathion respectively, with relative standard deviations lower than 15%. The procedure showed linearity between the 0.03 and 25 μg/ml for tramadol, 0.04 and 25 μg/ml for benzhexol, 0.03 and 15 μg/ml for THC-COOH and 0.05 and 20 μg/ml for malathion with correlation coefficients (r^2)

ranging between 0.9627 and 0.9937. Finally, the proposed procedure has been successfully applied to determine each analyte under investigation in some real cases of the toxicological lab.

Keywords: Nano palladium, nano silver, nanocomposite membrane, Chitosan, Carboxylated polyvinylchloride, GC/MS, HPLC.