



Article No.A0163

The use of alumina nanoparticles and polyvinyl chloride as a new stationary phase for stir bar sorptive extraction of pesticides from water samples

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Stir bar sorptive extraction (SBSE), which was first presented by Sandra et. al. [1] in 1990s, is an "environmental friendly" sample preparation technique, used mainly for the pre-concentration of analytes from aqueous samples before chromatographic analysis [2,3]. The technique utilizes glass bars with a magnetic core and usually coated with a polydimethylsiloxane as extraction phase. Due to the importance of stationary phase role in extraction efficiency and better recovery, we were interested in developing of a new nanocomposite coating for stir bar sorptive extraction of pesticides (Amitraz, Fenpyroximate and Spirodiclofen) from water samples prior to analysis by high performance liquid chromatography with diode array detection. Alumina nanoparticles were synthesized via sol-gel technique by the acidic hydrolysis of aluminium ion in 2-propanol. Then alumina nanoparticles were poured into a solution of polyvinyl chloride in tetrahydrofuran. Glass bar with a magnetic core was introduced into the suspension and after evaporation of solvent, nanocomposite film formed on glass bar. Scanning electron micrographs of the stir bars revealed a homogeneous surface with a film thickness of 100–250 μm attributing to different coating times. Coating composition and microextraction conditions such as temperature, time, pH and salt effect and also desorption conditions: kind of solvents, sonication, time, and number of desorption steps were investigated. The method proposed showed good linearity over the concentration range tested (0.01–1000 ng/ml). The limits of detection were within the range of 0.008–0.03 ng/ml. Reproducibility with RSD less than 5.6% for extractions of real water samples was obtained.

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