

Magnetic Nano-Composite of Self-Doped Polyaniline Nanofibers for Magnetic Dispersive Micro Solid Phase Extraction Applications

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Abstract : An improved nano-composite of self-doped polyaniline nanofibers and silica-coated magnetite nanoparticles were prepared and evaluated for suitability to magnetic dispersive micro solid-phase extraction. The work focused on optimization of the composite capacity to extract four fluoroquinolones (FQs) antibiotics, ciprofloxacin, enrofloxacin, danofloxacin, and difloxacin from water and improvement of composite stability towards acid and atmospheric degradation. Self-doped polyaniline nanofibers were prepared by oxidative co-polymerization of aniline with anthranilic acid. Magnetite nanoparticles were prepared by alkaline co-precipitation and coated with silica by silicate hydrolysis on magnetite nanoparticles surface at pH 6.5. The composite was formed by self-assembly by mixing self-doped polyaniline nanofibers with silica-coated magnetite nanoparticles dispersions in ethanol. The composite structure was confirmed by transmission electron microscopy (TEM). Self-doped polyaniline nanofibers and magnetite chemical structures were confirmed by FT-IR while silica coating of the magnetite was confirmed by Energy Dispersion X-ray Spectroscopy (EDS). Improved stability of the composite magnetic component was evidenced by resistance to degrade in 2N HCl solution. The adsorption capacity of self-doped polyaniline nanofibers based composite was higher than previously reported corresponding composite prepared from polyaniline nanofibers instead of self-doped polyaniline nanofibers. Adsorption-pH profile for the studied FQs on the prepared composite revealed that the best pH for adsorption was in range of 6.5 to 7. Best extraction recovery values were obtained at pH 7 using phosphate buffer. The best solvent for FQs desorption was found to be 0.1N HCl in methanol:water (8:2; v/v) mixture. 20 mL of Spiked water sample with studied FQs were preconcentrated using 4.8 mg of composite and resulting extracts were analysed by HPLC-UV method. The prepared composite represented a suitable adsorbent phase for magnetic dispersive micro-solid phase application.

Keywords : fluoroquinolones, magnetic dispersive micro extraction, nano-composite, self-doped polyaniline nanofibers

Conference Title : ICACAS 2020 : International Conference on Analytical Chemistry and Applied Spectroscopy

Conference Location : Venice, Italy

Conference Dates : June 22-23, 2020