



Cyanopropyl-functionalized nanosilica based dispersive micro-solid phase extraction method for rapid removal of organophosphorus pesticides from water samples

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ABSTRACT

In this study, a hydrophilic adsorbent based on cyanopropyl-functionalized silica nanoparticles (CNPr@SiO₂ NPs) was successfully synthesized via a sol-gel method. The nanoparticles were characterized using Fourier transform infrared spectroscopy, field emission scanning electron microscopy, Brunauer–Emmett–Teller analysis, and thermogravimetric analysis. The synthesized CNPr@SiO₂ NPs were then used as an adsorbent in dispersive micro-solid phase extraction (D- μ -SPE) of some polar and nonpolar organophosphorus pesticides from water samples prior to high-performance liquid chromatography-ultraviolet detection. Under the optimized parameters, the proposed method based on CNPr@SiO₂ NPs showed low limits of detection in the range of 0.047–0.059 $\mu\text{g L}^{-1}$, satisfactory recoveries (101.21%–109.12%), and good RSDs (0.20%–6.70%) for the extraction of OPPs from the various water samples. In addition, the developed D- μ -SPE method based on CNPr@SiO₂ NPs showed a superior extraction capability toward the OPPs in comparison to commercial cyanopropyl-bonded silica solid-phase extraction cartridge.

Keywords: Silica nanoparticles; Cyano-functionalized nanosilica; Dispersive micro-solid phase extraction; Organophosphorus pesticides

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