Polyaniline covering zerovalent iron-silica magnetic particle for magnetic solid phase extraction of trace phenolic compound

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Abstract: The creation of specific sorbent to preconcentrate trace toxic analytes from water resources is one of interesting research. In this work, the fabrication of new magnetic sorbents with high specific binding interaction, high stability and rapid separation was extremely focused. The magnetic solid phase extraction (MSPE) based on zerovalent iron–silica coated with polyaniline (ZVI@SiO₂@PANI) magnetic sorbent coupled with high-performance liquid chromatography (HPLC) was proposed to determine eight phenolic compounds, including phenol, 4-nitrophenol, 2-chlorophenol, 2,4-dinitrophenol, 2,4-dimethylphenol, 4-chloro-3-methylphenol, 2,4-dichlorophenol, and 2,4,6-trichlorophenol. The synthesis of zerovalent iron (Fe) was carried out through borohydride reduction method. The ZVI@SiO₂@PANI magnetic sorbent was simply prepared via sol-gel method followed by oxidative polymerization of aniline. The morphology of as-prepared magnetic sorbent showed polyaniline layer covering 180 nm of spherical zerovalent iron–silica particle. The important parameters influencing MSPE method were optimized. The ZVI@SiO₂@PANI magnetic sorbent had good adsorption affinity (%adsorption ≥ 50%). Furthermore, the 4-chloro-3-methylphenol exhibited highly sorption capacity (76 %adsorption) on magnetic sorbent in comparison with other phenolic compounds due to it could form more binding sites and stronger interaction to sorbent.

Keywords: Zerovalent iron; Polyaniline; Phenolic compound; Magnetic solid phase extraction; HPLC