

Extraction of Polystyrene from Styrofoam Waste: Synthesis of Novel Chelating Resin for the Enrichment and Speciation of Cr(III)/Cr(VI) Ions in Industrial Effluents

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Abstract : Polystyrene (PS) was extracted from Styrofoam (expanded polystyrene foam) waste, so called white pollutant. The PS was functionalized with N, N- Bis(2-aminobenzylidene)benzene-1,2-diamine (ABA) ligand through an azo spacer. The resin was characterized by FT-IR spectroscopy and elemental analysis. The PS-N=N-ABA resin was used for the enrichment and speciation of Cr(III)/Cr(VI) ions and total Cr determination in aqueous samples by Flame Atomic Absorption Spectrometry (FAAS). The separation of Cr(III)/Cr(VI) ions was achieved at pH 2. The recovery of Cr(VI) ions was achieved $\geq 95.0\%$ at optimum parameters: pH 2; resin amount 300 mg; flow rates 2.0 mL min⁻¹ of solution and 2.0 mL min⁻¹ of eluent (2.0 mol L⁻¹ HNO₃). Total Cr was determined by oxidation of Cr(III) to Cr(VI) ions using H₂O₂. The limit of detection (LOD) and quantification (LOQ) of Cr(VI) were found to be 0.40 and 1.20 $\mu\text{g L}^{-1}$, respectively with preconcentration factor of 250. Total saturation and breakthrough capacities of the resin for Cr(VI) ions were found to be 0.181 and 0.531 mmol g⁻¹, respectively. The proposed method was successfully applied for the preconcentration/speciation of Cr(III)/Cr(VI) ions and determination of total Cr in industrial effluents.

Keywords : styrofoam waste, polymeric resin, preconcentration, speciation, Cr(III)/Cr(VI) ions, FAAS

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