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Removal of cobalt from human serum and environmental samples by adsorption using Amberlite XAD-2–salicylic acid–iminodiacetic acid

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ABSTRACT

A new chelating resin was prepared by coupling Amberlite XAD-2 with salicylic acid (SAL) through an azo spacer. Then the polymer support was coupled with iminodiacetic acid (IDA). The resulting sorbent has been characterized by FT-IR, elemental analysis, thermogravimetric analysis, and scanning electron microscopy, and studied for the preconcentration and determination of trace Co(II) ion from human biological fluid and environmental water samples. The optimum pH value for sorption of the metal ion was 7.5. The sorption capacity of functionalized resin was 87.4 mg g^{-1}. The chelating sorbent can be reused for 20 cycles of sorption–desorption without any significant change in sorption capacity. A recovery of 95.3% was obtained for the metal ion with 0.5 M nitric acid as the eluting agent. The profile of cobalt uptake on this sorbent reflects good accessibility of the chelating sites in the Amberlite XAD-2–SAL/IDA. Scatchard analysis revealed that the homogeneous binding sites were formed in the polymers. The equilibrium adsorption data of Co(II) on modified resin were analyzed by Langmuir, Freundlich, Temkin, and Redlich–Peterson models. Based on equilibrium adsorption data, the Langmuir, Freundlich, and Temkin constants were determined to be 2.265, 56.82, and 148.56 at pH 7.5 and 25°C, respectively. The method was applied for cobalt ion determination from human plasma and sea water sample.

Keywords: Solid-phase extraction; Amberlite XAD-2; Cobalt determination; Isotherm study; Environmental samples

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