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Utilization of polymer-based c18 cartridge modified with 6-{4-(2,4-dihydroxyphenyl)diazanyl}phenyl}-2-oxo-4-phenyl-1,2-dihydro-pyridine-3-carbonitrile for preconcentration and determination of cerium(III) ions from environmental samples

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Utilization of polymer-based c18 cartridge modified with 6-{4-(2,4-dihydroxyphenyl)diazenyl}phenyl}-2-oxo-4-phenyl-1,2-dihydropyridine-3-carbonitrile for preconcentration and determination of cerium(III) ions from environmental samples

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ABSTRACT

A highly selective, sensitive, and accurate method for the determination of ng mL^{-1} of Ce(III) based on the rapid reaction of Ce(III) with 6-{4-(2,4-dihydroxyphenyl)diazenyl}phenyl}-2-oxo-4-phenyl-1,2-dihydropyridine-3-carbonitrile (DDPODC) and the solid phase extraction of the colored complex with a reversed phase polymer-based C18 cartridge have been developed. The DDPODC reacted with Ce(III) to form a red complex of a molar ratio 3: 1 [DDPODC to Ce(III)] in the presence of acetate buffer solution of pH 3.25 and Triton X-114 medium. This complex was enriched by the solid phase extraction with a polymer-based C18 cartridge. The enrichment factor of 400 was achieved. The molar absorptivity of the complex is $1.35 \times 10^8 \text{ L mol}^{-1} \text{ cm}^{-1}$ at 546 nm in the examined solution. The system obeys Beer's law in the range of 2.0 – 64 ng mL^{-1} , whereas the optimum concentration ranges obtained from Ringbom plot was 5.0 – 60 ng mL^{-1} . The relative standard deviation for ten replicates sample of 30 ng mL^{-1} level is 1.32 %. The detection and quantification limits, are 0.6 and 1.94 ng mL^{-1} in the original sample. This method was applied to the determination of Ce(III) in sea, river, tap and waste waters, biological, soil and sediment samples with good results comparing to the ICP–OES method.

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