



Synthesis and characterization of nano-pore thallium (III) ion-imprinted polymer as a new sorbent for separation and preconcentration of thallium

Mohammad Hossien Arbab-Zavar*, Mahmoud Chamsaz, Golamhossien Zohuri, Abolfazl Darroudi

Department of Chemistry, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran

ARTICLE INFO

Article history:

Received 7 February 2010

Received in revised form 16 August 2010

Accepted 22 August 2010

Available online 27 August 2010

Key word:

Ion-imprinted polymer

Thallium (III)

Solid phase extraction

ABSTRACT

Thallium (III) ion-imprinted polymer (IIP) particles were synthesized by preparing the ternary complex of thallium (III) ions with 5,7-dichloroquinoline-8-ol (DCQ) and 4-vinylpyridine (VP). Thermal copolymerization with methyl methacrylate (functional monomer, MMA) and ethyleneglycoldimethacrylate (cross-linking monomer, EGDMA) was then performed in the presence of acetonitrile (porogen) and 2,2-azobisisobutyronitrile (initiator, AIBN). The imprinted ion was removed from polymer by stirring of the above particles with 5 M HNO₃ to obtain the leached IIP particles. Moreover, control polymer (CP) particles were similarly prepared without the thallium (III) ions. The unleached and leached IIP particles were characterized by surface area analysis (BET), X-ray diffraction (XRD), Fourier transform infra-red spectroscopy (FT-IR), thermo gravimetric analysis (TGA) and scanning electron microscopy (SEM). The preconcentration of thallium (III) from aqueous solution was studied during rebinding with the leached IIP particles as a function of pH, the weight of the polymer material, the uptake and desorption times, the aqueous phase and the desorption volumes. Electrothermal atomic absorption spectrometry (ETAAS) was employed for determination of thallium in aqueous solution. The limit of detection for the method was 0.02 ng mL⁻¹, while the relative standard deviation for five replicates was 2.6%.

© 2010 Elsevier B.V. All rights reserved.