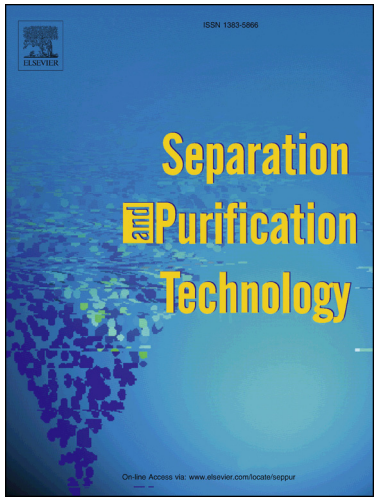

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Mohamed E. Mahmoud, Ahmed M.G. Nassar, Samir A.A. Abou Ali, Shimaa M.T. Elweshahy

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Factors optimization of super fast removal of heavy metals from aqueous solution using microwave-enforced sorption on the surface of a novel nano-composite

Mohamed E. Mahmoud[a]*, Ahmed M. G. Nassar[a], Samir A.A. Abou Ali[b], Shimaa M.T. Elweshahy[b]

[a] Faculty of Sciences, Chemistry Department, Alexandria University, P.O. Box 426, Ibrahimia 21321, Alexandria, Egypt. (E.Mail:memahmoud10@yahoo.com), Telephone number: 0020-1140933009, Fax number: 00203-3911794

[b] Faculty of Education, Chemistry and Physics Department, Alexandria University, El-Shatby, Alexandria, Egypt.

Abstract

The validity of microwave-enforced sorption (MES) technique as a green, efficient and fast approach was investigated in this work to enforce adsorptive binding, extraction and removal of Pb(II), Cu(II) and Hg(II) ions from aqueous solution. For this purpose, a newly designed nano-composite was synthesized using microwave-assisted heating technique via covalent bonding of nanolayers of 3-aminopropyltrimethoxysilane ($SiNH_2$) and salicylaldehyde (SA) on the surface of nanotitanium oxide ($NTiO_2$) for the formation of $NTiO_2$-SiN=SA nanomaterial. The proposed nano-composite was characterized by different technique such as FT-IR, SEM, TEM, TGA and XRD analysis. The investigated metal ions were allowed to heat and surface react with $NTiO_2$-SiN=SA nano-composite inside a microwave oven for a short period of time, 5-40 seconds, to enforce mass transfer of metal ions from solution onto the surface. The optimization of different important experimental parameters such as microwave heating time, mass of nano-composite, initial metal ion concentration, initial pH of metal ion solution and coexisting ions were explored and executed. The MES capacity values of Pb(II), Cu(II) and Hg(II) were characterized as 2900, 1200 and 400 µmol g^{-1}, respectively using 5 mg of $NTiO_2$-SiN=SA nano-composite and 20 sec of microwave heating. The potential suitability of MES technique for adsorptive removal and extraction