



Activated carbon immobilized dithizone phase for selective adsorption and determination of gold(III)

Hadi M. Marwani^{a,b,*}, Hassan M. Albishri^a, Taghreed A. Jalal^a, Ezzat M. Soliman^a

^aFaculty of Science, Department of Chemistry, King Abdulaziz University, P.O. Box 80203, Jeddah, Saudi Arabia 21589

^bCenter of Excellence for Advanced Materials Research, King Abdulaziz University, P.O. Box: 80203, Jeddah, Saudi Arabia 21589
Tel. +966 2 6952293 Ext. 68930; Fax: +966 2 6952292; email: hmarwani@kau.edu.sa

Received 21 August 2011; Accepted 1 January 2012

ABSTRACT

A simple method for selective adsorption and determination of gold(III) based on activated carbon immobilized dithizone (AC-DTZ) phase combined with inductively coupled plasma-optical emission spectrometry was developed. Surface properties of the new chemically modified AC-DTZ phase were confirmed by Fourier transform infrared spectroscopy. The effect of pH on the selectivity of AC-DTZ towards eight metal ions, including Au(III), Cd(II), Co(II), Cu(II), Fe(III), Ni(II), Pb(II) and Zn(II), was investigated. Based on the pH study, it was found that the selectivity of AC-DTZ phase was the most towards Au(III). For a deeper mechanistic understanding of the analytical potential of the AC-DTZ phase towards Au(III), other factors influencing the maximum uptake of Au(III) on AC-DTZ were also investigated. The results showed that the adsorption capacity for Au(III) was improved by 64.07% with the AC-DTZ phase as compared to the carboxylic acid derivative of activated carbon after only 1 h contact time. Adsorption isotherm data confirmed that the adsorption process was mainly monolayer on a homogeneous adsorbent surface. Results displayed that the adsorption of Au(III) onto the AC-DTZ phase obeyed a pseudo second-order kinetic model. In addition, the efficiency of this methodology was supported by applying it to real water samples with satisfactory results.

Keywords: Au(III); Dithizone; Modified activated carbon; Separation; ICP-OES; Batch method

*Corresponding author.