ADSORPTION OF Au (III) IONS BY CARBONIZED APRICOT STONES IN PRESENCE OF HEAVY METAL IONS

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ABSTRACT

The adsorption of gold ions on carbonized apricot stones (CAS) is studied. The carbonization applied is carried out at a temperature of 500°C in an argon atmosphere. The CAS characterized by electron microscopy are used as adsorbents of $[AuC1_4]^-$. It is found that Au (III) ions are quantitatively (99 - 100 %) adsorbed within a wide range of HCl concentrations. The values of the sorption rate, the semi sorption time, the sorption rate constant and the sorbent dynamic and static capacity are determined. It is shown that the presence of excessive amounts (100 - 800 times) of Fe^{+3}, Cu^{+2}, Cd^{+2}, Zn^{+2}, Hg^{+2}, Pb^{+4} ions does not affect Au^{+3} sorption by CAS-2 sorbent.

Keywords: Au (III), apricot stone, adsorption, sorbent, kinetics.

INTRODUCTION

According to the literature review, there are many investigations focused on using carbon adsorbents for removal of metals and metal compounds [1 - 3]. However, under certain conditions, the efficiency of the carbon adsorbents can be significantly improved using adsorption/desorption or electrosorption/electrodesorption (ES/ED) aiming to increase their potential and facilitate their subsequent regeneration [4].

Most data concerning ES/ED reported in the literature is devoted to organic compounds. There is less data on ES of metals. Jayson et al. [5] report the extraction of Hg^{+2} acetate from an aqueous solution through an adsorption and ES on an activated charcoal cloth (ACC). The adsorption capacity of ACC is equal to 2.10^{-3} mol (g of carbon)$^{-1}$ at pH = 5.5. The application of an electric potential to ACC significantly increases the adsorption of Hg^{+2}, which is the best expressed at a potential of -1 V. Afkhami and Conway [6] consider the removal of Cr^{+6}, Mo^{+6}, W^{+6}, V^{+4} and oxy ions of V^{+5} from industrial wastewater by adsorption and ES using a carbon cloth of a high surface area.

E.J.Bain and J.M.Calo [7] study the ES of arsenic using carbon materials also in presence of heavy metal ions, such as Cr, Ni, and Fe. It is noted that the adsorption of arsenic could be improved by treating the activated carbons by certain metals [8-12]. Lorentzen et al. [10] find that carbon pre-treatment with solutions of Cu^{+2} results in a more efficient removal of As^{+5}. It is concluded that parallel mechanisms are responsible for the experimental observations. Arsenic can form insoluble metal arsenates with copper impregnated on carbon. Also, arsenic can independently be adsorbed on carbon. It is found that the optimum pH value of arsenic adsorption equals about 6. Desorption of arsenic is easily reached by using concentrated acidic or alkaline solutions.

It is stated [13] that silicates adsorb gold from leaching solutions according to a phenomenon known as preg-