

APPLICATION OF IRON IMPREGNATED ACTIVATED CARBON FOR REMOVAL OF ARSENIC FROM WATER

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ABSTRACT

The presence of arsenic in drinking water is one of the greatest threats to public health. The aim of this experimental investigation was to study the removal efficiency of As(v) from water by application of iron-impregnated activated carbon(Fe-AC). Coating of activated carbon with iron salt was carried out by impregnation method and thermo-chemical reactions with using of 100 mM FeCl₃ solution. The Fe-AC was pulverized using ASTM standard sieves with the range of 16-20 mesh. The solid structure and surface characteristics of Fe-AC were determined using conventional techniques. Batch adsorption experiments were carried out with 300 and 600µg/L arsenate. Langmuir, Freundlich and Dubinin-Radushkevich models were used to describe the isotherm and energy of adsorption. The results of this study showed that 2.5 h contact time was enough to achieve the equilibrium. The adsorption of As(v) had a good compliance with Langmuir model ($R^2 = 0.995$) and the maximum adsorption capacity was obtained as 0.024 mg/g. The results of kinetic studies showed that As(v) adsorption on Fe-AC may be limited by film diffusion step ($m=0.26$). The mean free energy of adsorption (E) calculated from Dubinin-Radushkevich isotherm was found to be 1.52 kJ/mol which implies that the adsorption of As(v) on Fe-AC is a physical adsorption. The results indicated that Fe-AC is one of the suitable adsorbents which can be used for the treatment of arsenic contaminated waters.

Key words: Arsenic, Adsorption, Water, Isotherm models, Activated carbon, Iron impregnated

INTRODUCTION

Arsenic is a ubiquitous element in the environment that can be found in trace amounts in rocks, water, soils and even in air. Nowadays, pollution of water with arsenic is one of the most important understudy topics of the public health organizations (Ahsan *et al.*, 2007).

The problems related to As are distributed among millions of people in several countries such as Bangladesh, India, Nepal (Matschullat, 2000) Pakistan, Mexico, Mongolia, Germany, Thailand, China, Iran, Chile, USA, Canada and Myanmar

(Mesdaghinia *et al.*, 2005; Mondal *et al.*, 2006). In these countries, As-contaminated water and endemic exposure with this pollutant emerged as a single catastrophe affecting the people in these regions. Survey of groundwater quality in Iran shows that drinking water in some rural areas in Kurdistan province, located in the west of Iran, has high concentrations of arsenic (Mesdaghinia *et al.*, 2005).

Survey of environmental geology in Iran shows that deposits and sediments in some parts of central zone of eastern Alborz, located at 54° 33' – 55° 15' E and 36° 15' - 36° 48' N in north

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