Removal of hexavalent Chromium from Drinking Water Samples by Using the Chemical Compounds

Abstract: Hexavalent Chromium is a priority pollutant and has been documented to be harmful to fauna; flora, human beings and water containing Chromium are hazardous. Chromium species are present in waste water during the refinery processing and in petrochemical industries. Chromium is present in two valences, Chromium (+III) and Chromium (+VI). Chromium does not occur freely in nature. The main Chromium mineral is chromate and dichromate. The element and its compounds can be discharged in surface water through various industries. It is applied for example for metal surface refinery and alloys. Two special methods were applied for measuring hexavalent Chromium, A.S.T.M UV Visible spectrophotometric D7196A and atomic absorption FAAS D7195 methods were used for the determination of hexavalent Chromium in each sample. The levels of the hexavalent chromium were high for samples adjacent to the petrochemical industries plants in the past years. In 2004 the World Health Organization proved that the maximum level of total chromium was 0.05 ppm. Over this level, it is toxic in drinking water. Moreover, the amount of hexavalent Chromium in drinking water samples was higher in areas adjacent to the petrochemical industries plants. Four different chemical compounds were used: 1- aluminum oxide 2- silicon oxide 3- mercaptans and 4- carboxylic group. These chemicals can be used as adsorbents to remove hexavalent chromium.

Keywords: Hexavalent Chromium, D7196A, petrochemical industries.

INTRODUCTION

Chromium is the main environmental pollutant and has been documented to the fauna, flora, and human beings; the World Health Organization considers Chromium in drinking water more than 0.05 ppm as a major risk to human health and has issued limits that are defined differently in the laws of individual states (Mahmoud Elsallay, 1986).

Chromium is used in chemical industries as electropolating, leather, tanning, and petrochemical industries, and it has the potential to contaminate drinking water sources (Sharma, Y. C. 2001).

Chromium contamination of water originates from a number of natural and industrial sources.

The major sources of Chromium are the petrochemical industries and cement industries (John, M. et al., 1982).

The chemical and petrochemical industries are the main activates of the Libyan economy. These activates make Chromium one of the most hazardous pollutant that threaten the Libyan environment (John, M. et al., 1982).

In the last decades, different methods of Chromium adsorption using the chemical compounds such as 1- aluminum oxide 2- silicon oxide 3- mercaptans and 4- carboxylic group have received more attention because they are more promising not dangers comparing to other chemical compounds and alternative methods such as I on exchange and high performance liquid and gas chromatography. Pollution being a global problem necessitates the cooperation of all nations through change of experience and transfer of technologies related to pollution control (Abadi, V., & Popa, Anal. 1955).

The expansion of industrialization, over population, urbanization and the change of style of life stand behind pollution problems. The emission from industrial plants to water before careful treatment lowers the quality of water and the emission to air without using filters and precipitators raise the concentration of solid particulates and poisonous gases and tremendously affect the air quality. Agricultural activities may also act as a source of pollution when chemical fertilizers are applied in large amounts than those required for the plants (Achari, V.S., & Anirudhan, T.S. 1955).

Ground water is an important source of water supply throughout the world. Its demand for agriculture, industries, municipalities and rural homes continues to increase (Maheer J. M. 1982).
MATERIAL AND METHODS
The standard solution of Chromium was prepared as the following:

The stock solution of chromium (100mg/L) was prepared, several different concentration were taken from the stock solution solution. In order to determine the total chromium in each investigated water samples. Two special methods were performed: A.S.T.M, which is Atomic absorption method used to determine the total chromium and UV visible spectrophotometer for the determination of hexavalent chromium. Different water samples were collected from different places which are near to the chemical and petro chemical complexes.

RESULT AND DISCUSSION
The chromium removal was studied under different condition for examples the of ph value and mass.

Effect of pH
The ph of the aqueous solution is an significant parameter that affects the adsorption of chromium on a chemical compounds surface.

The effect of ph on the adsorption efficiency of Chromium was studied in different ph values range 1-7 (fig.1). The results indicated that adsorption of Chromium was influenced by the ph of the solution.

Fig.1: Percentage of removal of Cr (VI) at different pH by using one grame of adsorbent

Effect of mass
Effect of the mass the effect of the adsorbent load on the removal of hexavalent chromium has been shown in figure 2. All the experiment were done at room temperature and normal atmospheric pressure. The results shown in figure 2 that the percentage of removal of hexavalent chromium increase gradually with the increasing in adsorbent load, and the maximum removal was reached at 1.0 gram of the chemical compounds.

Fig 2: Relation between the mass and the concentration chemical compounds.
In the figures 3 shows the amount of removal of hexavalent Chromium by using different chemical compounds as aluminum oxide and silicon oxide and mercaptans and carboxylic group, these chemicals is used as chemical adsorbent. I can say that one kind of these chemical compounds as aluminum oxide gives good results and the others silicon oxide also gives about 15% of removal but the last two chemicals mercaptans and carboxylic group gives not much of removal comparing with aluminum oxide , by this chemical compounds we can remove amount of hexavalent Chromium also we can save our drinking water from the toxicity of heavy metals.

**CONCLUSION**

The present study of adsorption of hexavalent chromium characterized prosopisspicegera as an efficient chemical compounds adsorbent for the removal of toxic hexavalent chromium from the drinking water the adsorption of hexavalent chromium was found to be dependent on the pH value and the amount of adsorbent, am find the maximum of removal of hexavalent chromium was observed at pH 2 and the mass was in 1 gram of adsorbent .The chemical compound as silicon oxide giving about 15% of removal. Also another chemical compound were used as aluminum oxide, mercaptan and carboxylic group for the removal of hexavalent chromium the aluminum oxide is the best one for removal and gives more than 50% of removal the others as mercaptan and carboxylic group do not gives much of removal it is about 5% of removal, we can use the aluminum oxide as the best chemical compound to used as good chemical adsorbent. Th at means the chemical compounds we can used to remove big amount of hexavalent chromium,from the drinking water to keep it safer from the heavy metals.

**REFERENCES**