UNIVERSITI TEKNOLOGI MARA

REMOVAL OF CHROMIUM (VI) FROM AQUEOUS SOLUTION USING SURFACTANT IMPREGNATED ACTIVATED CARBON

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ABSTRACT

Adsorption process using Surfactant Impregnated Activated Carbon (SIAC) was studied to remove chromium (VI) from aqueous solution. Objective of this study was to investigate the effect of anionic surfactant on the adsorption of hexavalent chromium onto activated carbon by using Sodium Lauryl Sulfoacetate (SLSA) as surfactant. Different surfactant concentrations impregnated onto the activated carbon was studied on the removal of hexavalent chromium in aqueous solution. Surfactant impregnated activated carbon was prepared at temperature 60 ºC and 130 rpm placed in incubator shaker for 24 hours. For this study, several analyses were conducted using Brunauer-Emmett-Teller (BET), Fourier Transform Infrared (FTIR) and also Atomic Adsorption Spectrophotometer (AAS). Based on the result of this study, it shows that the removal of Cr (VI) using Surfactant Impregnated Activated Carbon (SIAC) decreases as concentration of surfactant increases due to the electrostatic repulsion of hexavalent chromium that exists as dichromate ($Cr_2O_7^{2-}$) ions with the surface functional group of SIAC. Anionic surfactant has proven not effective for the removal of Cr (VI) ions as the percent removal for 2 mg/L of surfactant is at 45.65% compare to percent removal for 35 mg/L of surfactant is at 36.53%. From this study, Langmuir 3 (Eadie-Hofstee) has been chosen as the best adsorption isotherm model that explained the adsorption behavior as homogeneous.

Keywords: Sodium Lauryl Sulfoacetate (SLSA), Surfactant Impregnated Activated Carbon (SIAC), Hexavalent Chromium, Brunauer-Emmett-Teller (BET), Fourier Transform Infrared (FTIR), Atomic Adsorption Spectrophotometer (AAS), dichromate ions ($Cr_2O_7^{2-}$).

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

1.1.1 Water Pollution

Water is essential to all forms of life and it is widely used in industry. Water can be considered as polluted if there is presence of substances or conditions that makes the water cannot be used for specific purposes. Water pollution may be caused by industrial wastes, agricultural wastes, human daily activities and also transportation. Sewage is the major pollutant that may affect fresh water when it is being discharged into fresh water source. Wastewater discharged from cooling engines in industries is also one source of water pollution. This is due to the high temperature wastewater that will lower the metabolic rate of organisms and hence will increase their oxygen demand. Water pollution is a serious problem that may pose risk to life because water is the source of drinking and domestic purposes for humans. Water pollution may affect not only lives but also environment. Therefore, there are many ways that could be used to control and manage water pollution.

1.1.2 Wastewater from Electroplating Industry

Electroplating is a plating process in which metal ions are used to coat an electrode by an electric field. Electroplating is a process of coating by electrolysis process to improve the characteristics of a surface for improving the appearance of the products. Every manufactured or fabricated product that is made of metal or consist of metal components will feature some types of metal finishing process. There are many electroplating process industries such as car manufacturing industries. Besides, there are other industrial processes that generate liquid wastes containing toxic heavy metals such as chemical manufacturing and also in coal and ore mining.