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Effect of pH, Dosage and Concentration on the Adsorption of Congo Red onto Untreated and Treated Aluminium Dross

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Abstract. The adsorption of congo red onto aluminium dross was studied in batch process. The objective of this study is to adsorption capacity between untreated and treated aluminium dross in the removal of congo red. Aluminium dross was leached with 250 ml of 1% of NaOH and and precipitated with 30% H_2O_2. The treated aluminium dross being calcined at 600^{O}C for 3 hours. The surface area for untreated and treated aluminium dross was 10.06 m2/g and 79.80 m2/g respectively. Then the adsorption process was carried out on an orbital shaker at 200 rpm for 4 hours. In the effect of pH, it was found that untreated removes more congo red compared to the treated while in the effect of concentration solution and dosage of adsorbent, treated aluminium dross removes more congo red. In conclusion, this adsorbent was found to be effective and economically viable in the removal of congo red in waste water treatment.

1. Introduction

Aluminium dross is a solid waste from aluminium smelting industry. It is an unavoidable by products that formed on the surface of molten aluminium. According to David & Kopac, (2012), dross can be classified into three categories which is based on the metal content. The three categories are white dross, black dross and salt cake. Hwang et al., (2006) stated that white dross contain 15-70% of recoverable metallic aluminium, while black dross contain 12-18% of recoverable metallic aluminium and salt cake contains only 3-5% residual metallic aluminium. According to Sultana et al., (2013) aluminium dross contain Al_2O_3, MgF2, SiO2 and MgO.

According to Petavratzi, (2007), 95% of it usually being disposed of in a landfill. This could create the environmental problems because of landfill will act as a reactor where complex chemical reaction will occur. According to David & Kopac, (2012), when buried aluminium make contact with water with pH greater than 9 in a landfill, it will create an exothermic reaction that can retard the microbial activity in the soil. According to Murayama et al., (2012), some of this waste recycled as a deoxidizer in steel making and Petavratzi, (2007) stated that this waste can be used as a filler in a concrete. Industries looked at this as a problem due to the management cost of this waste and improper management of this waste could create the environmental problem. In this study, aluminium dross will be the raw material as an adsorbent that can remove of congo red dye in waste water.

Dye is a major pollutants that contributes in a wastewater pollution. Industries such as textiles, printing, plastics and food colouring are the common industries that pollutes wastewater with pollution. It was estimated that 106 from 107 kg of dye end up in the effluent streams worldwide Debnath et al., (2014). Liu et al.,(2015)and Namasivayam & Kanchana, (1993) stated that some of dyes hard to treat in wastewater due to the resistance for biological treatment. Mane & Babu, (2013) stated that congo red it is a benzidine based anionic disazo dye with stabile structure that make it hard to biodegrade.