UNIVERSITI TEKNOLOGI MARA

REMOVAL OF HEAVY METAL MIXTURES FROM WASTEWATER OF ELECTROPLATING INDUSTRY

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ABSTRACT

Wastewater from electroplating industries caused major hindrance to inland water pollution due to the presence of heavy metals. Current method administered to remove heavy metals content from the solution was hydroxide precipitation with aid of coagulation-flocculation process. This method chosen due to simplicity of treatment process and low operational cost. The present investigations only deal with removal of single metal because of simple treatment control and easily to achieve high removal. Therefore, this investigation only cope to remove multi-metals (Copper, cadmium, zinc) from synthetic wastewater which prepared according to the real wastewater from electroplating industries. Jar test was conducted on two different parameters which were initial pH of wastewater and coagulant dose. Results obtained from this study shows that highest removal (Cu = 99.99%, Cd = 99.73%, Zn = 99.89%) at pH 10 with coagulant dosage of 140 mg/L. The industrial treatment method was performed to compare the optimum condition between both methods. The result shows the optimum condition for removal was at pH 12 with dosage of $FeCl_3$ at 970 mg/L (Cu = 99.97%, Cd = 99.98%, Zn = 99.87%). The selected data obtained was fitted using multilinear regression via Excel Software. The regression analysis shows adjusted *R2* obtained indicates best fitting of data. The ANOVA analysis proved that the mathematical expression can be used to predict removal of multi-metals from an aqueous solution.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Water contamination and inadequate sources of water are becoming major environmental adversity which is caused by the demolition of natural inland water. This signifies in the decrement of advancement of socioeconomic position as well as individual and environmental sustain perspective (Carolin, Kumar, Saravanan, Joshiba, & Naushad, 2017). With the fast emergence of industries, for instance, metal coating manufacturing, manure production industries, paper industries, and others have indicated a variety of toxic substances released to the environment that can cause severe complication (Fu & Wang, 2011). Carolin *et al.*, (2017) reported that there are several categories of pollutants that are toxically generated in the industrial effluent including organic and inorganic pollutant which differ in the range of toxic level. Heavy metal is one of the toxicants released from developing industrial sectors.

Heavy metal species such as chromium (Cr), nickel (Ni) and zinc (Zn) normally discharged in wastewater that came from automobile coating industries (Xiong, Cao, Yang, Lai, & Yang, 2017). In manufacturing of mirror, silver (Ag) is used as a coating material and subsequent residual majorly discharged in drained spray solution which later causes emission (Folens, Huysman, Van Hulle, & Du Laing, 2017). Zhao, Chen, Shen, Kang, Qu, Wang, 2017 stated that cadmium (Cd) commonly found in battery processing industries, stabilizers, and alloy industries. Meanwhile, Cr usually generated from latter industries, tanning and electroplating industries (Carolin *et al.*, 2017, Zhao *et al.*, 2017). Mercury (Hg) currently used as additional material in pulp and paper industries and also pharmaceutical industries (Ahmad, Wong, Teng, & Zuhairi, 2007). All the heavy metals listed can cause pollution which resulting in illness if they are consumed even at low concentration, and each of them gave significant effects to the healthiness of individual and cleanliness of the environment.

Due to the existence of resistance properties of the heavy metals (Carolin *et al.*, 2017), various studies suggested alternative solutions required for the removal of heavy metals. Many research conducted to evaluate an advisable option to eliminate the heavy metals from