

Thesis Title	Removal of Heavy Metal from Laboratory Wastewater by Coagulation
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Abstract

The purpose of this research is to study the heavy metal removal from wastewater generated from CHM 161 laboratory by coagulation process. Sodium hydroxide, calcium hydroxide and sodium hydrogen sulfide were used to precipitate heavy metals as metal hydroxide and metal sulfide. Four types of wastewater used in this study were the wastewater from the analysis of group I cation (Ag^+ , Cr^{3+} , Cr^{6+} , Hg_2^{2+} , Pb^{2+}), group II cation (Bi^{3+} , Cd^{2+} , Cu^{2+} , Fe^{3+} , Hg^{2+} , Pb^{2+}), group III cation (Al^{3+} , Co^{2+} , Mn^{2+} , Ni^{2+} , Zn^{2+}) and mixed heavy metals (Ag^+ , Al^{3+} , As^{3+} , Cd^{2+} , Co^{2+} , Cr^{3+} , Cr^{6+} , Cu^{2+} , Fe^{3+} , Mn^{2+} , Ni^{2+} , Pb^{2+} , Zn^{2+}).

The experiment was divided into 3 parts, first part was to determine the quantities and characteristics of collected wastewater. The second part was to determine the optimum pH and the effectiveness of coagulation in removing heavy metal ions from the wastewater. The third part was the use of anionic polymer to increase the settling efficiency and to determine the suitable settling time to precipitate heavy metal ions.

The quantities and volume of wastewater found in each experiment was less than 20 cubic decimeters, solution were acidic with initial ions concentration in the range of 0-943 ppm.

For group I wastewater, the optimum precipitated pH as metal hydroxide by using calcium hydroxide was 11, excepted for Ag^+ ion, which could be precipitated as metal sulfide at the same pH. The optimum precipitated pH of group II wastewater as metal sulfide was 11, excepted for Hg^{2+} ion, which could be precipitated as metal hydroxide at pH 7. The optimum precipitated pH of group III wastewater as metal hydroxide was 9 and precipitated as metal sulfide was 11. The optimum precipitated pH for mixed heavy metal wastewater as

metal hydroxide was either 8 or 11 and to precipitated as metal sulfide was either 8 and 12. However, the residual metal concentration of As^{3+} and Hg_2^{2+} were not meet the Ministry of Industrials standard.

The optimum precipitated pH of group III cation using sodium hydroxide and calcium hydroxide was 10, and by sodium hydrogen sulfide was 11 with anionic polymer as the coagulant aid. The suitable settling time of metal hydroxide and metal sulfide were 30 minutes and 4 hours respectively.

Keywords: Metal hydroxide / Metal sulfide / Anionic polymer / Ministry of Industrials standard.