THESIS TITLE : HEAVY METALS PRECIPITATION OF LABORATORY HAZARDOUS WASTES. KHON KAEN UNIVERSITY

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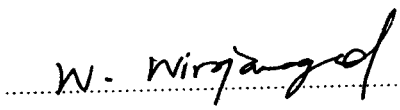

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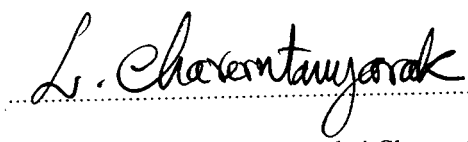

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ABSTRACT

Laboratory is one of the hazardous waste generating souces, containing various types heavy metals.It is necessary to remove such heavy metals to the level within the effluent standard prior to discharging to the natural water source. The objective of this study is to remove heavy metals of laboratory waste using chemical precipitation method. Heavy metals will be precipitated in the form of hydroxide compound. Laboratory waste generated as liquid after chemical reation from the Chemistry Laboratory, Department of Chemistry, Faculty of Science : the Pharmaceutical Chemistry Laboratory, Department of Pharmaceutical Chemistry, Faculty of Pharmaceutical Science; Environmental Engineering Laboratory, Department of Environmental Engineering, Faculty of Engineering were used for the experimental study.

The characteristics of the laboratory waste of Chemistry Laboratory were pH of 2.28 and the conten of Hg, Cr, Mn, Pb, Zn, Cu and Cd were 53.0, 27.0, 32.9, 14.5, 44.8, 25.5 and 19.5 mg/l, respectively. The laboratory waste of the Pharmaceutical Chemistry Laboratory contained pH 2.73 and Hg, Mn, Zn, and Cr were 43.0, 23.8, 65.4 and 0.05 mg/l, respectively. The laboratory waste of thr Environmental Engineering Laboratory contained pH -0.32, Hg, Cr and Fe 1,420, 245 and 780 mg/l, respectively. The composited laboratory waste of 3 laboratories contained pH 0.79 and Hg, Cr, Mn, Pb, Zn, Cu, Cd and Fe of 50.0, 27.0, 31.0, 9.02, 53.0, 16.4, 12.4 and 64.0 mg/l, respectively.

The range of pH (pH8.5-11.0) with using $Ca(OH)_2$ or NaOH were determined by jar test experiments. It was found that using NaOH was achieved for the removal of heavy metal contaminated waste of the Chemistry Laboratory and waste of the Environmental Engineering Laboratory was resulted. $Ca(OH)_2$ was achieve the removal of heavy metals contaminated waste of Phamaceutical Chemistry Laboratory and composited waste.

The experiment study at the optimum pH resulted from the jar test experiments were carried out in the batch reactor. At pH 12.0 using NaOH for the laboratory waste of Chemical laboratory, the content of Hg, Cr, Mn and Pb could be decreased to the level within the effluent standard with the removal of 99.99 %, 98.44%, 99.57% and 98.90% respectively. While it could not decrease the contents of Zn, Cu and Cd to the level of the effluent standard; the removal of these substances were 62.5%, 22.35% and 22.56%, respectively. At pH 11.0 using NaOH for the laboratory waste of Environmental Engineering Laboratory, the content of Cr and Fe could be decreased to the level within the effluent standard with the equal removal of 99.98%. The removal of Hg was about 99.95%. but is not pertinent to Wastewater Standard. The optimum pH for waste from Department of Pharmaceutical Chemistry, Faculty of Pharmaceutical Science by $Ca(OH)_2$ is 12.0, which can decrease Hg and Mn pertinent to Wastewater Standard, removal about 99.99% and 98.61%, respectively, but Zn is not pertinent to Wastewater Standard, removal about 91.02%. The optimum pH for waste from all (3 Department) by $Ca(OH)_2$ is 12.0, which can decrease Hg. Mn and Zn pertinent to Wastewater Standard, removal about 99.99%, 99.45% and 99.45%, respectively, but Cr, Pb, Cu, Cd and Fe are not pertinent to Wastewater Standard, removal about 94.74% 78.49%, 50.0%, 99.52% and 80.47%, respectively.

Cost of chemical material of optimum pH and chemical material in the model, waste from Department of Chemistry, Faculty of Science is 3.88 Baht/l, waste from Department of Pharmaceutical Chemistry, Faculty of Pharmaceutical Science is 2.39 Baht/l , waste from Department of Environmental Engineering, Faculty of Engineering is 108.34 Baht/l and waste from all is 3.56 Baht/l.