
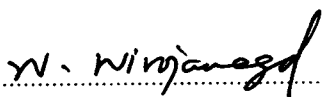
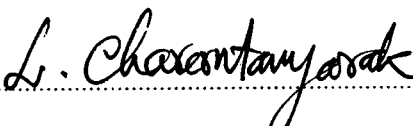


THESIS TITLE : CHARACTERISTICS OF CHEMICAL LABORATORY WASTEWATER,  
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## ABSTRACT

Laboratory wastewater of various units in the university mostly do not have an appropriate management. If it is discharged, it will contaminate to environment. The objective of this study is to determine the characteristic of the laboratory wastewater in order to quantity of toxic substances and heavy metals and to recommend the guideline for laboratory wastewater management. Laboratory wastewater from the chemistry laboratory Department of Chemistry, Faculty of Science, Khon Kaen University was used for this study. The study methodology of cross-sectional descriptive study was appropriated. The chemistry laboratory wastewater samples were collected 11 weeks of the second semester 1997, The laboratory wastewater included 2 types. The first type was chemical liquid from the laboratory experiment of 5 subjects including General Chemistry Laboratory II (312 104), General Chemistry Laboratory (312 106), Analytical Chemistry Laboratory (313 142), Analytical Chemistry Laboratory I (312 243) and Inorganic Chemistry Laboratory I (313 322). The second type was washing wastewater that was collected

from the laboratory wastewater sump. Each type was analyzed for toxic substances and heavy metals.

The content of toxic substances and heavy metals in the chemical liquid from the laboratory were high and very various. pH was mostly acid. The toxic substances were found : phosphorus 0.00 - 2.45 mg/L (mean  $0.59 \pm 0.89$  mg/L) and cyanide 0.00 - 49.10 mg/L (mean  $25.03 \pm 22.18$  mg/L). The heavy metals were indicated by the content of mercury 0.00 - 357 mg/L (mean  $54.45 \pm 106.41$  mg/L), lead 1.16 - 415.10 mg/L (mean  $117.58 \pm 129.49$  mg/L), copper 0.60 - 294.12 mg/L (mean  $73.83 \pm 78.74$  mg/L), chromium 0.16 - 149 mg/L (mean  $79.88 \pm 44.23$  mg/L), cadmium 0.10 - 214.22 mg/L (mean  $71.12 \pm 77.78$  mg/L), zinc 0.28 - 274.10 mg/L (mean  $118.52 \pm 108.75$  mg/L) and manganese 0.06 - 265 mg/L (mean  $88.32 \pm 78.91$  mg/L). The content of toxic substances and heavy metals in the washing wastewater were low and were not much various as shown by the average. pH was mostly neutral. The toxic substance was found : phosphorus 0.12 - 3.20 mg/L (mean 0.79 mg/L). The heavy metals were indicated by the content of lead 0.10 - 0.66 mg/L (mean 0.29 mg/L), copper 0.26 - 4.40 mg/L (mean 0.96 mg/L), chromium 0.07 - 0.51 mg/L (mean 0.22 mg/L), cadmium <0.02 - 0.65 mg/L (mean 0.21 mg/L), zinc 0.30 - 11.1 mg/L (mean 1.89 mg/L) and manganese 0.05 - 0.46 mg/L (mean 0.18 mg/L).

The treatment of the laboratory wastewater containing inorganic substance can be considered by classifying the wastewater into 3 types ; (1) heavy metal, (2) heavy metal and cyanide and (3) heavy metal, cyanide and mercury contaminated wastewaters. The guideline for treatment is the first step removal of mercury in the heavy metals, cyanide and mercury contaminated wastewater ; the second step by combining the residual of the first step to the heavy metals and cyanide contaminated wastewater. then removal of cyanide ; the third step by combining the second step with the heavy metals contaminated wastewater and removal of heavy metals ; and the last step by neutralization of the wastewater of the third step prior to discharge to the drain.