

Gamage, D.G.C.L.
De Silva, R.C.L.
POSTER

Study of Effluents from University Chemistry Laboratories and Development of Possible Methods to Recover Chromium from Laboratory Effluents

D.G.C.L. Gamage & R.C.L. De Silva, Department of Chemistry, University of Kelaniya

The laboratories of the Department of Chemistry at University of Kelaniya, like any other university chemistry laboratory, generate laboratory effluents daily as a result of their general course of activities. As most of the laboratories are teaching laboratories, the laboratory effluents contain many different types of chemicals (in bulk but known quantities) resulting from the experiments designed for the undergraduate students. These laboratory effluents are discarded through the university drain system without any pre-treatment as the Department does not have a proper disposal mechanism, contributing to environmental pollution. Therefore, paying attention to laboratory waste management strategies has become an important aspect of a healthy lifestyle.

In this study, laboratory effluents of the Department of Chemistry, University of Kelaniya were characterized using the characterization parameters: pH, chemical oxygen demand (COD) and heavy metal ion concentrations which are used frequently. For this, laboratory effluent samples were collected from the laboratory classes conducted by the Department in the academic year 2009/2010.

According to the results, the laboratory effluents had very acidic and basic pH values (ranging from pH 0.9-10), very high COD values (varying from 40-1600 mg O₂/L), and high heavy metal ion concentrations (Cu-298.5 mg/L, Cr-933.6 mg/L, Pb-85.8 mg/L, Ni-3151.0 mg/L). These results suggest that treatment of the laboratory effluents is essential in order to minimize the level of pollutants discharged to the environment by the Department.

This study also makes an effort to develop a simple and cost effective treatment method for the heavy metal chromium which is present in the laboratory effluents of the Department of Chemistry, University of Kelaniya, as a model study. Chromium is considered as a major toxic pollutant and it has many adverse effects on environment and human health. Chromium in waste effluents can be removed using the hydroxide precipitation method. By using this method, chromium present in the laboratory effluents was removed with a removal efficiency of 97% - 98%. Therefore, hydroxide precipitation method can be suggested to be used by the Department for removal of chromium from the laboratory effluents as it would be a simple and cost effective method with high efficiency. In order to recover removed chromium from the laboratory effluents, a further purification step was carried out. In this step, waste chromium was converted into barium chromate which can be reused. This purified form gave a satisfactory yield of 75% chromium content. As a suggestion to reduce the amount of chromium discarded as waste by the Department, the possibility of using low concentrated chemical solutions containing chromium for undergraduate experiments has also been proven in this study.