**(153)**

# Laboratory Waste Hexanes and Chloroform Recovery by a Cost Effective and Sustainable Physicochemical Treatment Process

**Fernando C., Karunarathne M.***

*Department of Chemistry, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*
**mck@sjp.ac.lk*

## Abstract

Solvent in general is a liquid chemical substance that dissolves solute chemicals without performing chemical reactions. Therefore, in the chemical industry and academia, solvents play vital roles as washing media, reaction media, extraction media and analysis media. Thus, solvents are often used in large quantities. Waste water generated in chemical laboratories are cleaned and discarded to environment. However, toxic, hazardous, and/or carcinogenic nature of organic solution wastes makes them a major environmental threat when discarded. The acquisition of solvent waste recovery systems by industries and institutions is largely prevented by high costs of establishment and maintenance. Thus, the development of a simple, low cost, and self-sustainable physicochemical treatment processes is a timely need. However, the treatment process must be custom developed based on the solvent properties, impurities, impurity levels. According to United States Environmental Health and Safety (US-EHS), hexanes and chloroform are classified as non-recommended solvents on the basis of environmental perspectives and human health standpoints. Waste organic solvents and aqueous reagents used in the liquid-liquid extraction processes were collected in large quantities from undergraduate laboratories of the Department of Chemistry, University of Sri Jayewardenepura. Waste hexanes contaminated with dichloromethane ($CH_2C_{l2}$), o-nitroaniline, and p-nitroaniline was extracted with hydrochloric acid (HCl) whereas three types of waste chloroform samples each contaminated with iodine ($I_2$), salicylic acid, and ammonia ($NH_3$) were extracted with sodium thiosulfate ($Na_2S_2O_3$), sodium hydroxide (NaOH), and sulfuric acid ($H_2SO_4$), respectively. The impurities were identified and quantified using titrimetric and colorimetric techniques before and after the purification process. According to the analytical data obtained for waste samples a series of representative samples similar to the wastes and representative reagents were prepared and the extractions were performed in order to facilitate further analysis of recovered solvents using UV-vis, ATR-FTIR and GC-MS. The removal of the impurities in the range of 96-100% was achieved. Furthermore, the reusability of the recovered chloroform was demonstrated by performing the laboratory experiments and getting acceptable results. Over 75% of the amount of solvents required for the undergraduate experiments under the current investigation can be fulfilled by recovered solvents. The contaminants extracted into aqueous media are further treated separately and discarded. Taking the environmental benefits and economic advantage into account, proposed solvent recovery methods were approved by the Chemistry Department and soon will be implemented. The concept of solvent recovery and reuse is being extended to additional solvents and impurity types with our ongoing research.

***Keywords:*** Solvent waste, Solvent-recovery, Liquid-liquid extraction