EXTRACTION OF METHYLENE BLUE AND CRYSTAL VIOLET DYE FROM AQUEOUS SOLUTION USING GREEN ORGANIC SOLVENT THROUGH SOLVENT EXTRACTION SYSTEM

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ABSTRACT

Textile dyeing has become the second largest cause of global water pollution. Textile industries release wastewater of dyes mixed with various types of other contaminants including undesirable dyes effluent. The dye fixation on the textile materials particularly during the dyeing process is not complete as around 50% of the amount of dye used will end up in the wastewater. Dyes derived from organic or inorganic compounds are classified as toxic and hazardous chemicals. Hence, the removal of dye from the wastewater is very important for environmental protection and other living well-being. Solvent extraction is one of the promising methods used for dye removal. However, the conventional organic phase formulation consists of extractant, diluent, and modifier which are derived from petroleum-based chemicals such as hexane, kerosene, toluene, TBP, D2EHPA, and Cyanex. These solvents are considered very toxic, non–biodegradable and non–renewable. Thus, in this study, a sole green organic solvent i.e. Palm Kernel Fatty Acid Distillate (PKFAD), Jatropha Oil (JO), and Waste Cooking Oil (WCO) were proposed to extract Methylene Blue (MB) and Crystal Violet (CV) dye from an aqueous solution without the addition of extractant, diluent, and modifier. These green organic solvents are considered non–toxic, biodegradable, and renewable, which eliminates the use of the hazardous chemical solvent in the solvent extraction system. This study aimed to determine the best operating condition (pH equilibrium) for green organic solvent (PKFAD, JO, WCO) for the dye extraction of MB and CV from the aqueous solution. On top of that, the stripping of MB and CV from the organic phase using HCl as the stripping agent at the optimum pH was also discussed in this study. The extraction process was done by the agitation of the organic and aqueous phase in an incubator shaker and the sample was analyzed using the UV-Vis spectrophotometer at the dye's respective maximum wavelength. The results indicated the optimum pH equilibrium to extract MB dye is 5.5 (88%), 7.0 (12%), and 4.2 (19%) for PKFAD, JO, and WCO respectively. On the other hand, the optimum pH equilibrium for the extraction of CV dye is 2.1 (95%), 6.3 (95%), and 5.9 (98%) for PKFAD, JO, and WCO respectively. The stripping was able to achieve a high percentage of removal for both MB and CV dyes with 93% and 99% respectively.