

**An investigation of the adsorption of dye (Bromothymol Blue) by Sri Lankan montmorillonite clay**

**W. A. P. J. Premaratne\* and V. M. Perera**

*Department of Chemistry, Faculty of Science, University of Kelaniya, Sri Lanka*  
*jeewa@kln.ac.lk*

Textile industries use dyes and pigments to color their products and thus produce wastewater containing organics with a strong color. However most of the synthetic dyes used in textile industry usually composed of aromatic structure, which makes them carcinogenic and mutagenic and non-biodegradable when discharged into waste streams. The removal of such colored agents from aqueous effluents is of significant environmental, technical and commercial importance. Clay has been accepted as one of the appropriate low cost adsorbents for removal of dyes from wastewater. Among the clay types montmorillonite has received considerable recognition because of its high adsorption capacity due to their lamellar structure which provides higher specific surface area and possibility to adsorb ions and other polar organic molecules on particle external site and in interlayer positions. In this study the adsorption of basic dye: Bromothymol blue (BTB) from aqueous solution by Sri Lankan montmorillonite was investigated. Montmorillonite clay used in this investigation was obtained from Murunkan clay deposit in Sri Lanka. Montmorillonite clay was examined for its performance as an adsorbent for the BTB removal. The effect of key operational parameters, such as contact time, initial dye concentration, adsorbent dosage, stirring rate and temperature were experimentally studied. Adsorption of BTB onto montmorillonite samples was studied by batch adsorption technique at  $30 \pm 1$  °C using UV-Visible spectrophotometric method. For the BTB initial concentration of 70 ppm with the use of only 20 g/L of montmorillonite clay, the dye removal efficiency was found to be 63%. The equilibrium data was analyzed using Langmuir and Freundlich adsorption isotherms. Langmuir isotherm provided a better fit to the data. Characterization of clay before and after the adsorption was carried out by using X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM) methods. XRD, FTIR and SEM data revealed that the dye did not penetrate in to the interlayer space of clay fully, but rather adsorbed on external surface by forming hydrogen bonding with the dye molecules creating a void free film on the clay surface. Experimental results confirmed that the Sri Lankan montmorillonite clay is an efficient adsorbent for basic dye removal. Therefore, Sri Lankan montmorillonite can be used as a promising low cost alternative adsorbent for removing basic dyes from dye wastewater.

**Keywords:** Textile dyes, Bromothymol blue, Adsorption, Montmorillonite, Sri Lanka