Equilibrium Isotherm Analysis of Methylene Blue Adsorption by Natural Sri Lankan Ball Clay

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Synthetic dyes are used in the textile industry production as raw materials. Excess and dye-containing wastewater are released to the environment without proper treatments. Consequently, textile wastewater creates environmental hazards. In Sri Lanka, textile industry cannot release their wastewater without treating upto industrial discharge limits stipulated by Central Environmental Authority. The main objective of this study was to Sri Lankan ball clay has been investigated as low cost and eco-friendly adsorbent for the removal methylene blue from aqueous solution. The powder X-ray diffraction (XRD) analysis was carried out to find the structure and the type of clay mineral present in the bulk clay sample. Batch system experiments were carried observing an effect of the adsorbent dosage, contact time and initial concentration. Equilibrium isotherm of the clay materials was studied Freundlich and Langmuir model. According to the results of the influence of adsorbent dose, the removal percentage and adsorption capacity almost became constant at the dose of 6.8 g/100 ml. Therefore, it was considered the best dosage of adsorbent. As a result of contact time, it was found that the adsorption tends to attain the equilibrium in near 270 min (4.5 h). It was considered the saturation time. The results indicated that increasing adsorption capacity with increasing concentration. The equilibrium of the ball clay was found the Freundlich isotherm model was more suitable than the Langmuir model. Since the high value of the Freundlich correction coefficient (R^2 = 0.9730) than the Langmuir correction coefficient (R^2 = 0.9266). A conclusion is Sri Lankan ball clay can be employed as the low-cost alternative for removing the dye from industrial wastewater.

Keywords: Adsorption, Methylene blue, Ball clay, Freundlich, Langmuir