Adsorption of reactive dye from aqueous solutions by compost

Gordon McKay, Mahdi Hadib, Mohammad Taghi Samadi, Ali Reza Rahmani, Mehri Solaimany Aminabad, Fatemeh Nazemi

Department of Chemical and Biomolecular Engineering, Hong Kong University of Science and Technology, Clearwater Bay, New Territory, Hong Kong, SAR

Environmental Health Research Center, Faculty of Health, Kurdistan University of Medical Sciences, Pasdaran St., Sanandaj, Iran

Department of Environmental Health Engineering, School of Public Health, Center for Health Research, Hamadan University of Medical Sciences, Hamadan, Iran

Received 9 August 2010; Accepted 2 November 2010

ABSTRACT

The adsorption of a reactive dye, Ariazol Scarlet 2G (AS2G) (C.I.: Reactive Red 234), onto compost, from aqueous solutions, was studied in a batch system. The effects of initial dye concentration, initial pH and sorbent mass have been studied. Four two-parameter isotherm models—Langmuir, Freundlich, Temkin and Harkins Jura—were used to fit the experimental data using a nonlinear trial-and-error method. The best fit of the adsorption isotherm data was obtained using the Langmuir model ($X^2 = 1.97E^{-03}$). A comparison of kinetic models applied to the adsorption of AS2G on compost was evaluated using the pseudo-second order, Elovich and Lagergren first-order kinetic models. Results showed that the pseudo-second order kinetic model was found to agree well with the experimental data. An intra-particle diffusion model analysis showed multi-linearity with two steps and a non-zero intercept which indicated the intra-particle diffusion model is not a dominant rate controlling mechanism in the sorption of AS2G by compost.

Keywords: Adsorption; Adsorption isotherms; Reactive dye; Kinetic models; Compost

*Corresponding author.