

Removal of Dyes from Aqueous Solution by Sorption with Coal Fly Ash

Katsutoshi Yamada¹, Kensaku Haraguchi¹, Carmel C. Gacho², Bussakorn P. Wongsiri³ and Mary L. Pena⁴

¹National Institute of Advanced Industrial Science and Technology, Sapporo 062-8517, Japan; ²Industrial Technology Development Institute, Manila, Philippines; ³Electricity Generating Authority, Bangkok, Thailand; ⁴Institute for Geo- scientific, Mining- Environmental and Nuclear Research, Santa Fe de Bogota, Colombia

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ABSTRACT

The use of coal fly ash (FA), a massive byproduct of coal-fired power plants, for removal of dyes, methylene blue (MB) and rhodamine B (RB), from aqueous solution has been studied. Eight different types of FAs obtained from power plants utilizing Australian, Chinese, Colombian, Indonesian, Philippine and Thailand coals were employed as adsorbent materials of the dyes. Batch experiments were performed by contacting 1.0 g of FA and 50 ml of MB or RB aqueous solution of desired concentration with continuous stirring at various pH and temperature of 25 °C. The effects of contact time, pH of solution, and concentration of dye on the adsorption of MB and RB were studied. The adsorption equilibrium was established within a few minutes in both MB and RB adsorption with most FA used. However, more than 20 hrs required for attainment of the adsorption equilibrium for both dyes with some FAs such as Philippine and Indonesian FA. The adsorption of MB increased slightly and linearly with increasing the solution pH. In the RB adsorption, the maximum adsorption was observed around pH 4.5. The adsorption capacity depends significantly on the chemical and/or physical characteristics of individual FA. This study demonstrates that FA is an effective adsorbent for the removal of dyes from aqueous solution.