

Environmental Toxicology 2018: The Treatment of Dye Contaminated Wastewater using Cryptocrystalline Magnesite

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ABSTRACT

Discharging industrial colored wastewaters into aqueous environments can cause adverse effects on aquatic life due to the toxic nature of synthetic dyes. The present study aimed to evaluate the efficiency of using cryptocrystalline magnesite to remove an anionic dye (Methyl Orange - MO) from aqueous systems. To achieve that, several operational factors like residence time, adsorbent dosage, species concentration and temperature were appraised. The batch study proved that cryptocrystalline magnesite is effective in the treatment of MO contaminated water and moreover it performed well in terms of color removal. The removal efficiency of cryptocrystalline magnesite was found to be 85.85% for 30 mg/L of MO solution. Four different kinetic models, viz., pseudo-first-order, pseudo-second-order, intraparticle diffusion and elovich were used to fit the kinetics data. The adsorption kinetics process primarily followed the pseudo-second order model indicating chemisorption. The best-fitted adsorption isotherm models were found to be in the order: Temkin (0.96) > Dubinin Radush Kevich (0.88) > Langmiur (0.81) > Freundlich (0.30). In accordance with the results of this study, it can be concluded that cryptocrystalline magnesite can be used effectively for the adsorption of methyl orange in wastewater and thus can be applied to treat wastewater containing dyes. Boron plays a significant role in plant and animal growth. It inhibits prostaglandins and leukotriene, which are mediators in inflammatory conditions; stimulates production of oestrogen in menopausal woman; reduces the severity of inflammatory conditions associated with rheumatoid arthritis; may inhibit the incidence of prostate cancer; may help prevent post-menopausal osteoporosis; and inhibits enzymatic function to produce anti-inflammatory effects. Ninety-eight percent of the tie-dye entrepreneurs produced wastewater at the rate of not more than

1500 liters per day. All of them lacked tie-dye wastewater treatment systems. Eighty-five percent of tie-dye entrepreneurs agreed that there must be wastewater treatment before release into the environment. From group discussions, it was found that the entrepreneurs realized the wastewater problem and wanted to carry out environment friendly tie-dyeing. Our study demonstrated that the average value of the colour density, chemical oxygen demand (COD), total dissolved solids (TDS) and pH of the wastewater characteristics were 170 SU (space units), 1584 mg/l, 2487 mg/l and 8, respectively.

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