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Development of organic inorganic hybrid water purification system

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Water is one of the essential resources on earth. It is very important to protect water for the survival of all living beings. Textile industry is one of the most chemically intensive industries and a major polluter of drinking water. It generates huge quantities of complex synthetic dyes. A variety of methods have been developed for the treatment of textile waste water over recent years. However, colour removal from textile waste water by means of low cost and efficient technologies is still a major challenge. In this study, a novel organic-inorganic hybrid material was synthesized using polyacrylamide (PAM) and diatomite for efficient water purification system. Both PAM and diatomite have been studied extensively for waste water treatment separately. Series of polyacrylamide-diatomite composites (PAD) were successfully prepared through aqueous solution polymerization. The synthesized PAD composites were characterized by infrared spectroscopy, thermogravimetric analysis and scanning electron microscopy. Furthermore, the influence of PAM and diatomite content on the composite formation was investigated. The flocculation performance of PAD composite was studied in synthetic Rhodamine B dye water samples to evaluate the dye removal capacity. Among the studied compositions of PAD composites, the maximum dye removal was achieved for the PAD-4-4 which had the ratio of PAM and diatomite content of 80 wt. %:20 wt. %. The novel composite flocculant exhibited a significant capability of removing Rhodamine B than that by PAM alone. The optimum dosage of PAD composite that could make the transmittance of treated Rhodamine B dye water sample (50 cm^3, 0.6 ppm) exceed 90%, was ranged from 0.2 g to 0.3 g, which was more than 25% increment of the transmittance, than that of untreated dye water sample. The dye removal by PAD composite at optimum composition can be due to the combined mechanism of two components; flocculation by PAM and adsorption on to nano-sized pores of diatomite.

Keywords: Diatomaceous earth, Polyacrylamide, Composite flocculant, Textile dye