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## Green synthesis of MIL 53(Fe) and its use as an effective adsorbent of cationic dyes

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<sup>4</sup>Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka Contamination of the aqueous environment with textile dyes adversely affects human health and aquatic life. In developing countries, the major source of contamination are small industries for whom conventional decontamination techniques are expensive. Adsorption techniques are cost-effective, simple and efficient for decontamination. In this study, a relatively new branch of material science is presented. We investigated a metal organic framework, MIL 53(Fe), synthesised using a microwave-assisted hydrothermal process - a green chemical method – to serve as an adsorbent for methylene blue dye.

1,4-Benzene dicarboxylic acid (30.0 mmol) and FeCl<sub>3</sub>.7H<sub>2</sub>O (30 mmol) were dissolved separately in 50 mL of Dimethylformamide (DMF) and stirred for 1 h. Thereafter, the two solutions were mixed and heated by microwave for 30 min. The synthesised MIL 53(Fe) was washed with DMF and finally with ethanol and dried in an oven at 80 °C.

A dose of 2.0 g L<sup>-1</sup> was mixed with 25 mL of methylene blue (MB) solution at pH 5.0 and shaken in an orbital shaker (100 rpm) at 27 °C. Suspensions were removed at predetermined time intervals and analysed for residual MB concentration. The effect of pH, initial concentration and dosage of the adsorbent was determined by varying one parameter at a time.

After reaching equilibrium in 150 min the adsorbent removed 85% (2.37 mg g<sup>-1</sup>) of MB. The kinetic data agreed with pseudo second-order kinetic model and the isotherm data was compatible with Langmuir-Freundlich isotherm with adsorption capacity of 11.97 mg g<sup>-1</sup>. The dye molecules are adsorbed by the MIL 53(Fe) through pore diffusion followed by adsorption of dye onto the pores.

This study shows that MIL 53(Fe) synthesised by microwave-assisted hydrothermal method can be used as an adsorbent to remove cationic dyes from the aqueous environment.

Keywords: Methylene blue, Microwave synthesis, MIL 53(Fe), Remediation