

## Synthesis and Characterization of Thiourea-Formaldehyde Coated Fe<sub>3</sub>O<sub>4</sub> (TUF@Fe<sub>3</sub>O<sub>4</sub>) and Its Application for Adsorption of Methylene Blue

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**Abstract :** Thiourea-Formaldehyde Pre-Polymer (TUF) was prepared by the reaction thiourea and formaldehyde in basic medium and used as a coating materials for magnetite Fe<sub>3</sub>O<sub>4</sub>. The synthesized polymer coated microspheres (TUF@Fe<sub>3</sub>O<sub>4</sub>) was characterized using FTIR, TGA SEM and TEM. Its BET surface area was up to 1680 m<sup>2</sup> g<sup>-1</sup>. The adsorption capacity of this ACF product was evaluated in its adsorption of Methylene Blue (MB) in water under different pH values and different temperature. We found that the adsorption process was well described both by the Langmuir and Freundlich isotherm model. The kinetic processes of MB adsorption onto TUF@Fe<sub>3</sub>O<sub>4</sub> were described in order to provide a more clear interpretation of the adsorption rate and uptake mechanism. The overall kinetic data was acceptably explained by a pseudo second-order rate model. Evaluated  $\Delta G_0$  and  $\Delta H_0$  specify the spontaneous and exothermic nature of the reaction. The adsorption takes place with a decrease in entropy ( $\Delta S_0$  is negative). The monolayer capacity for MB was up to 450 mg g<sup>-1</sup> and was one of the highest among similar polymeric products. It was due to its large BET surface area.

**Keywords :** TGA, FTIR, magnetite, thiourea formaldehyde resin, methylene blue, adsorption

**Conference Title :** ICC 2014 : International Conference on Chemistry

**Conference Location :** Paris, France

**Conference Dates :** April 28-29, 2014