


COMPARISON OF THE METHYLENE BLUE DYE REMOVAL ABILITY OF MAGNETIC MATERIALS SYNTHESIZED FROM VARIOUS TYPES OF FRUIT PEELS

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Abstract. This study involved the synthesis of magnetic materials derived from pomelo peel (PP@Fe₃O₄), durian peel (DP@Fe₃O₄), and banana peel (BP@Fe₃O₄). The characteristics of these materials were examined using SEM, FTIR, XRD, and BET techniques. The adsorption parameters for methylene blue using these magnetic materials, including pH, material concentration, and adsorption duration, were investigated to optimise adsorption efficiency. Results indicated that the most effective material amounts were 0.09 g, 0.18 g, and 0.06 g for PP@Fe₃O₄, DP@Fe₃O₄, and BP@Fe₃O₄, respectively, in 25 mL of methylene blue solution, corresponding to concentrations of 3.6 g/L, 7.2 g/L, and 2.4 g/L. Similarly, the optimal pH values for adsorption were found to be 5.9, 7.7, and 7.4, while the most efficient adsorption times were determined to be 95.3, 42.2, and 128.4 minutes, respectively. Under these conditions, the highest methylene blue adsorption efficiencies achieved were 97.7%, 97%, and 98.9%, respectively. These materials were also employed to assess the chemical oxygen demand index in select water samples.

Keywords: bio-magnetic adsorbent, sustainable technology, fruit peel waste utilisation.

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