

POST-CONSUMER POLY(ETHYLENE TEREPHTHALATE)/CASSAVA STARCH-BASED ELECTROSPUN FIBRE MATS FOR REMOVAL OF METHYL VIOLET FROM AQUEOUS SOLUTIONS

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Poly(ethylene terephthalate) (PET) products are a common waste material and have low biodegradability. This study focused on the development and characterisation of electrospun fibre mats from post-consumer PET and cassava starch for the removal of methyl violet from aqueous solutions. The research addresses the low adsorption capacity of methyl violet onto conventional PET fibre mats and its biodegradability by incorporating with a biopolymer, cassava starch. The study presents a systematic approach that includes extracting cassava starch, optimising the composition of solvents to dissolve cassava starch and PET, preparing PET/cassava starch-based fibre mats using the electrospinning technique, and conducting batch adsorption studies for removal of methyl violet by fibre mats prepared. Experimental results revealed that PET was completely dissolved in 1:1 ratio of trichloroacetic acid and dichloromethane, while cassava starch was completely dissolved in trichloroacetic acid alone. The optimised instrumental and solution parameters to prepare fibre mats were 3.5 mL h⁻¹ of flow rate, 700 – 702 rps of drum speed, 10.0 cm of distance between the needle tip and the collector, 23 – 24 kV of applied voltage and 34% (w/v) of total polymer concentration respectively. The FTIR data revealed the presence of absorption bands corresponding to functional groups present in PET and cassava starch. The SEM images confirmed the fibrous nature of the mats. Optimised parameters of methyl violet adsorption from water using fibre mats were found as follows. A shaking time of 90 min, 13 min of settling time, pH 9 and adsorbent dosage of 2.0×10⁻² g. Adsorption kinetics data confirmed the pseudo-second order model ($R^2 = 0.98$) and equilibrium data were consistent with the Langmuir isotherm model ($R^2 = 0.98$) indicating that monolayer adsorption of methyl violet occurs on the fibre surface. Further, fibre mat showed a removal efficiency of 35.22 % under gravity filtration.

Keywords: Cassava starch, Electrospinning, Methyl violet, Poly(ethylene terephthalate)