

Preparation of poly(methyl methacrylate)–grafted *Hyparrhenia hirta* for methyl red removal from colored solutions

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Abstract

Poly(methyl methacrylate)–grafted *Hyparrhenia hirta* (PMMA-g-Hh) biopolymer was prepared through radical polymerization using potassium persulfate (KPS) and applied in adsorption of methyl red from colored solutions. Solvent amount, initiator concentration, monomer concentration, temperature, and reaction time were the reaction parameters investigated for grafting. The biopolymer was characterized by scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), and x-ray diffraction spectroscopy (XRD). The adsorption process was investigated with respect to pH, contact time, initial concentration, adsorbent dosage, and temperature. The optimum adsorption parameters were pH 6, contact time 90 min, adsorbent dosage 0.6 g, and initial concentration 50 mg/L. The Langmuir adsorption model best fitted the adsorption process, with maximum adsorption capacities of 19.95, 6.89, and 4.02 mg/g at adsorbent dosages of 0.2, 0.6, and 1.0 g, respectively. The pseudo-second-order model described the kinetics data better. The adsorption process was physical, spontaneous, and endothermic. The adsorbent was still active after 10 adsorption-desorption cycles, showing its suitability for use in colored solutions treatment