Abstract

In the present study, *Zea mays* tassel which is a zero-value agricultural waste was used to produce a low-cost activated carbon using phosphoric acid as the activating agent. The prepared *Z. mays* tassel activated carbon (ZMTAC) was characterized by Fourier transform infrared spectroscopy (FTIR) and X-ray diffraction (XRD). The adsorbent was applied for adsorption of an emerging contaminant, metformin hydrochloride (MH) from pharmaceutical effluent. The effects of solution pH, contact time, adsorbent dosage, and initial MH concentration and their interactions were investigated using a response surface methodology following a central composite experimental design (CCD). The optimum experimental conditions were as follows: pH 9.5, contact time 67.50 min, dosage 0.5750 g, and MH concentration 152.50 mg/L. The isotherm data followed Langmuir isotherm model (R^2 = 0.979; sum of square deviation, SSD = 0.321). The saturation adsorption capacity of ZMTAC was 44.84 mg/g at 20 °C. MH adsorption process followed pseudo-second-order kinetics (higher R^2 and smaller SSD values). The thermodynamic properties obtained showed that the adsorption process was feasible, endothermic and spontaneous. Consequently, the study demonstrated that *Z. mays* tassel is a potential precursor for preparation of adsorbents for the removal of the MH from pharmaceutical effluent.