



## Pomegranate peels collected from fresh juice shop as a renewable precursor for high surface area activated carbon with potential application for methylene blue adsorption

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### ABSTRACT

Pomegranate (*Punica Granatum*) peels were utilized as precursors to prepare mesoporous activated carbon (PPAC) via  $H_3PO_4$ -activation method. The surface characterization of PPAC was achieved using Fourier Transform Infrared (FTIR), Scanning Electron Microscopy (SEM),  $N_2$  adsorption/desorption, X-Ray Diffraction (XRD), and the point of zero charge ( $pH_{pzc}$ ) method. It was found that PPAC a large surface area and total pore volume corresponded to 1280.45  $m^2/g$  and 1.343  $cm^3/g$ , respectively. The adsorption properties of PPAC with methylene blue (MB) was conducted at different adsorbent dose (0.2–3 g/L), solution pH (3–11), initial dye concentrations (50 mg/L–400 mg/L), contact time (0–135 min) using batch mode operation. The kinetic uptake profiles are well described by the pseudo-second-order model, while the Langmuir model describes the adsorption behaviour at equilibrium. The maximum adsorption capacity of PPAC with methylene blue was 384.61 mg/g at 303 K. Various thermodynamic parameters such as standard enthalpy ( $\Delta H^\circ$ ), standard entropy ( $\Delta S^\circ$ ) and standard free energy ( $\Delta G^\circ$ ) showed that the adsorption of MB onto PPAC was favourable and endothermic in nature.

**Keywords:** Pomegranate peel; Activated carbon; Adsorption; Methylene blue; Phosphoric acid

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