

## Efficient organic dye removal from wastewater by magnetic carbonaceous adsorbent prepared from corn starch

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### Abstract

Herein, we report the low-temperature hydrothermal synthesis of a novel magnetic carbonaceous adsorbent (MCA) from corn starch for the adsorptive removal of methylene violet (MV) from aqueous solutions. Specifically, the carbon precursor hydrothermally synthesized at 453 K was magnetized at the same temperature, and MCA formation was confirmed by structural and morphological analyses based on Fourier transform infrared spectroscopy, X-ray diffraction, and transmission/scanning electron microscopy. The as-prepared MCA was employed for the adsorptive removal of MV from aqueous solutions, with the adsorption process found to follow the Langmuir isotherm model (99% dye removal), exhibiting pseudo-first-order and pseudo-second-order kinetics and featuring contributions from both intraparticle and liquid film diffusion processes. In addition, thermodynamic characterization revealed the endothermic nature and spontaneity of the above adsorption. Importantly, MCA showed an excellent regeneration capacity in acetone and could be successfully re-used in six consecutive adsorption–desorption cycles, thus being an efficient sustainable adsorbent for highly effective cationic dye removal from wastewater.