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Ultrathin manganese dioxide nanosheets for formaldehyde removal and regeneration performance

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Abstract: Ultrathin manganese dioxide (MnO₂) nanosheets with the thickness of 1-2 nm were synthesized by chemical oxidation of Mn²⁺ ions in the presence of tetramethylammonium cations in an aqueous solution. The composite material MnO₂/PET (polyethylene terephthalate) was prepared by impregnating PET into MnO₂ nanosheets colloid. The impregnation time has a great influence on HCHO adsorption and removal efficiency. When the PET was impregnated in nanosheets colloid for 1 h at room temperature, the concentration of HCHO decreased quickly within initial 10 min and finally reached about 81% removal efficiency with an initial HCHO concentration of ~200 ppm. Moreover, the used MnO₂/PET can be simply regenerated by heating at 105°C without any rinse treatment. Based on *in-situ* DRIFTS and TG-MS studies, the mechanism of formaldehyde removal and regeneration was proposed. All the results showed that as-synthesized MnO₂/PET can be used as an effective, affordable, and recyclable materials to removal and oxide toxic HCHO in indoor air.

Keywords: Ultrathin manganese dioxide nanosheets; Formaldehyde removal; Regeneration

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