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Supporting Information

Removal Performance and Mechanism of Benzo[*b*]Fluorathene Using MnO_2 Nanoflower/Graphene Oxide Composites

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Text S1:

Natural graphite powder (100 mesh, Alfa Aesar) was used to synthesize graphene oxide based on a modified Hummers' method. [1] Briefly, graphite power (0.5 g) and sodium nitrate (0.5 g) were first mixed with sulfuric acid (23 mL, 98%) at 0 °C followed by slow addition of 3 g potassium permanganate with constant stirring. Then, the mixture was kept at 35 °C for 1 h in a thermostat water bath. After that, the suspension was mixed with 40 mL deionized water and heated at 90 °C for 30 min. Subsequently, deionized water (100 mL) and hydroperoxide (5 mL, 30%) were added to terminate the reaction. Finally, the precipitate was separated by centrifugation at 5000 rpm for 15 min and washed with deionized water to neutral and dried at 60 ◦C for 12 h to get prepared graphene oxide (GO) for further use.

Text S2:

The morphology of as-prepared MnO_2 NF and MnO_2 NF/GO composite were observed by field emission scanning electron microscopy (JEOL 7800 FESEM/SEM, Freising, Germany) and microstructures were identified by high-resolution transmission electron microscopy (HRTEM, Zeiss Libra 200, Tokyo, Japan). [2-4] The HAADF (High-Angle Annular Dark Field)-STEM, elemental mapping, and EDX of composites were carried out using a Tecnai G2 F20 instrument at an accelerating voltage of 200 kV (Hillsboro, OR, USA. The crystallographic structure of as-synthesized powders was determined by X-ray diffraction (XRD, D/max-1200X, Cu Kα radiation (λ = 1.5406 Å) operating at 30 kV and 100 mA). The textural parameters including specific surface area, total pore volume, and N_2 adsorption/desorption isotherms were determined by Brunauer-Emmett-Teller (BET) (Quanta Chrome Corporation, Boynton Beach, FL, USA). The surface chemical properties (element composition and electronic valence) were investigated by X-ray photoelectron spectroscopy (XPS, Nico-let-460, Thermo Fisher, Zagreb, Croatia) and XPS data corresponding to C 1s, O 1s, and Mn 2p spectra were fitted using the software *Casa*XPS.

Table S1. Shimadzu GCMS-QP 2010 method parameters for BbF concentration determination.

GC	Inlet temperature	250 ℃	
	Sampling method	Unsplit stream sampling	
	Sample size	2.0 μL	
	Carrier gas	He, 1.5 mL/min	
	Temperature programming	Initial column temperature	60 ℃, held for 5 min
		Final column temperature	290 ℃, held for 2 min
		Heating rate	10℃/min
	Retention time	35 min	
MS	Ion source	EI	
	Ion source temperature	225 ℃	
	Ionization Energy	70 eV	
	Data acquisition and analysis	SIM (selected ion monitoring) mode	
	Transfer line temperature	280 ℃	
	Electron multiplier voltage	Consistent with a tuning voltage	

BbF-d12 standard (1000 mg/L, dissolved in CH2Cl2), Custom Semivolatile Mix of 2-Fluorobiphenyl, and P-Terphenyl-d14 (2000 mg/L, dissolved in acetone-hexane 1:1) used for the preparation of GC-MS samples were purchased from o2si smart solutions (made in the Shimadzu, USA).

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