

Supplementary Materials

Gradient porous structured MnO₂-nonwoven composite: A binder-free polymeric air filter for effective room-temperature formaldehyde removal

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Figure S1. Washing step to remove PVA and unbonded MnO₂ crystals.

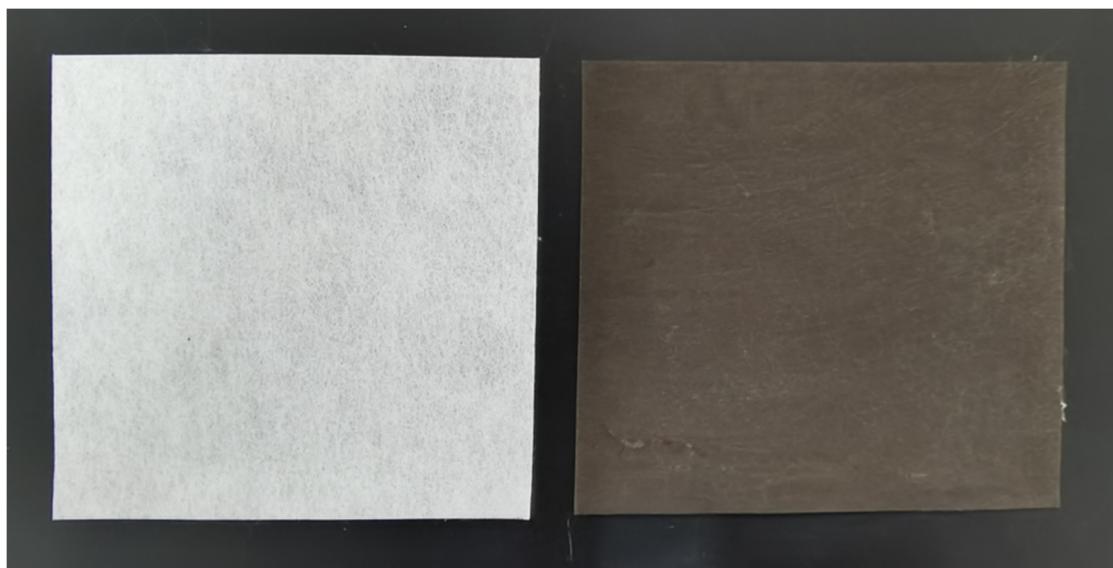
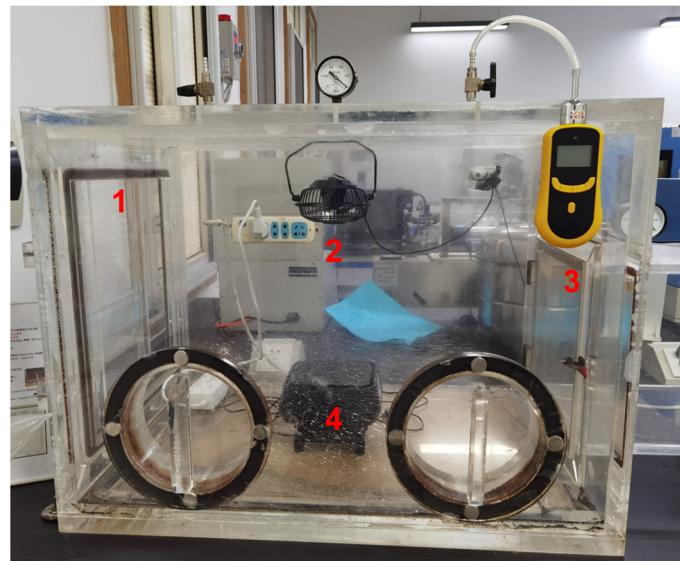


Figure S2. Optical photograph of bico-polyolefin nonwovens and 15%MnO₂@Polyolefin.



1-Acrylic reactor; 2-Fan; 3-Portable gas detector; 4-Car air purifier

Figure S3. Lab-scale setup for formaldehyde removal testing.

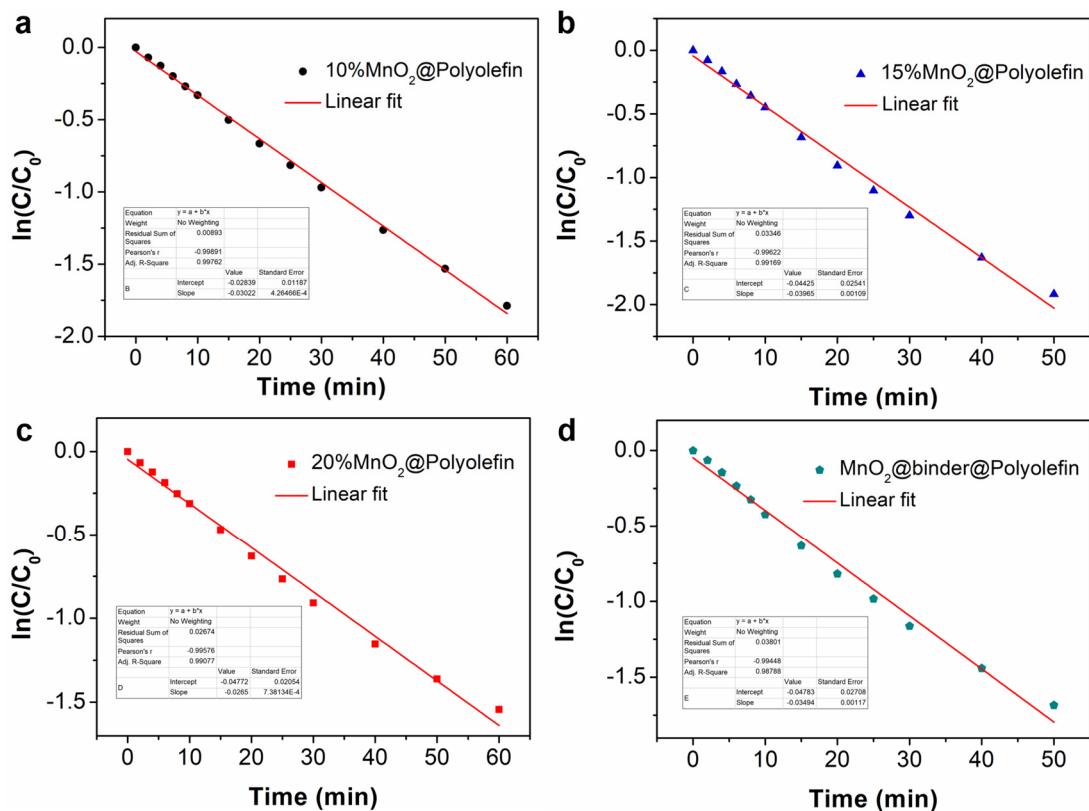


Figure S4. Linear fitting of the reaction kinetic curves.

Table S1 Summary of HCHO removal performance over selected catalyst.

Catalyst	Condition	Reaction rate constant (k)	Reference
BiOCl/Clinoptilolite composite	50 mg ³ HCHO; 1g catalyst Chamber volume = 60L Light intensity is 50mW/cm ²	0.0166 min ⁻¹	[1]
Bi ₂ MoO ₆ /attapulgite	50 mg ³ HCHO; 1g sample Chamber volume didn't report 150 W visible light source	0.0109 min ⁻¹	[2]
gold-assisted ZnSn(OH) ₆ microcubes	1ppm HCHO 0.1g sample Chamber volume didn't report 300 W Xenon lamp	~0.25 min ⁻¹	[3]
TiO ₂ -BiOBr-sepiolite composite	80ppm HCHO; 1g sample Chamber volume didn't report 150 W visible light source	0.01574 min ⁻¹	[4]
10%MnO ₂ @Polyolefin	0.89 ppm HCHO ~0.75 g catalyst Chamber volume = 0.232 m ³ ;	0.03 min ⁻¹	This work
15%MnO ₂ @Polyolefin	0.89 ppm HCHO ~0.6 g catalyst Chamber volume = 0.232 m ³ ;	0.04 min ⁻¹	This work

Reference

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2. Tan, Y.; Yin, C.; Zheng, S.; Di, Y.; Sun, Z.; Li, C., Design and controllable preparation of Bi₂MoO₆/attapulgite photocatalyst for the removal of tetracycline and formaldehyde. *Applied Clay Science* **2021**, 215, 106319.
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