

Supporting information

Preparation and Evaluation of CuMnOx-Modified Activated Carbon Fibers for Indoor VOCs Removals

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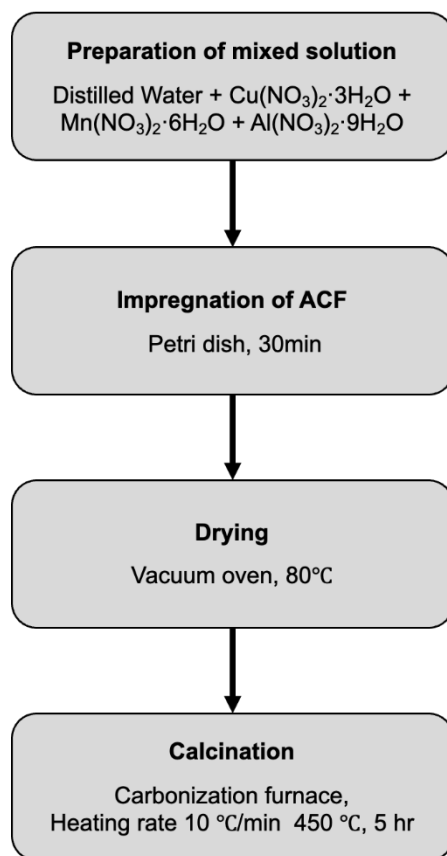


Figure S1. Preparation process of CuMnOx-impregnated ACF

Table S1. ACF weigh by sample and CuMnOx catalyst precursor content used

Sample name	ACF weight (g)	Amount of CuMOx catalyst precursors used (g)		
		$\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$	$\text{Mn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$	$\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$
Raw	0.46	-	-	-
ACF-0.1	0.67	0.1	0.11	0.098
ACF-0.3	0.89	0.3	0.33	0.294
ACF-0.45	1.06	0.45	0.495	0.441
ACF-0.6	1.42	0.6	0.66	0.588

Table S2. Preparation conditions of oxygen plasma-treated activated carbon fibers

High-purity gas flow rate	50 sccm	
Applied power condition	200 W	
Applied frequency condition	50 kHz	
Reaction time and sample name	1 min	ACF-O1
	2 min	ACF-O2
	3 min	ACF-O3
	4 min	ACF-O4
	5 min	ACF-O5

Table S3. Test gases, experimental methods, and conditions for VOCs removal efficiency

Types and concentrations of VOC gases	Formaldehyde: 15 ppm
	Acetaldehyde: 14 ppm
	Benzene: 20 ppm
Evaluation method for VOCs removal	Gas detection tube method
Sample size for testing	10 cm X 10 cm
Plastic bag Volume	5 L
Injected VOC gas volume	3 L
Test samples	Raw: Activated carbon fiber (ACF)
	ACF-0.1: CuMnOx - impregnated activated carbon fiber
	ACF-O5: Oxygen plasma-treated activated carbon fiber

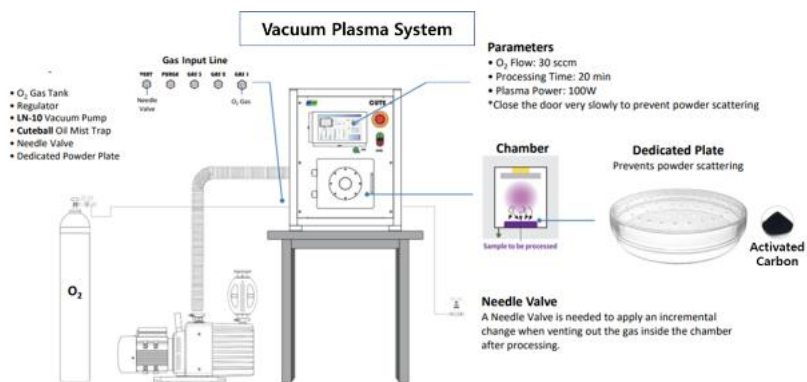


Figure S2. Schematic diagram of the high-purity oxygen plasma surface treatment apparatus

	EDX images and spectra	
Raw		
ACF-P-0.1		
ACF-0.3		
ACF-0.45		
ACF-0.6		

Figure S3. EDX analysis of CuMnOx-impregnated ACF under different preparation conditions

Table S4. ICP analysis results of CuMnOx-impregnated activated carbon fiber

Sample	Cu (ppm)	Mn (ppm)
Raw	17.99	17.20
ACF-P-0.1	232,426	171,311

Table S5. XPS elemental analysis results of CuMnOx-impregnated activated carbon fiber

Sample	C1s (atom%)	O1s (atom%)	Cu2p (atom%)	Mn2p (atom%)
Raw	91.33	6.72	-	-
ACF-P-0.1	34.55	43.07	5.98	4.19