

Supplementary Materials

Facile Synthesis and Environmental Applications of Noble Metal-Based Catalytic Membrane Reactors

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Supplementary Materials: 10 figures and 2 tables.

Table S1. Comparison of the 4-NP reduction performance of proposed system with reported catalytic membrane reactor systems.

Catalysts	Concentration of 4-NP (mM)	Flow rate (mL/min)	TOF (h ⁻¹)	References
Au NP/paper	0.05	0.05	440	[56]
Au/CNCS	15	-	191	[57]
Au-Pd/CeO ₂	1	10	240	[58]
HNT@Au	0.1	4	416	[59]
MCF/Au	0.5	6	15.3	[60]
Au NPs/sugarcane	20	600	16.2	[43]
CNT-MoS₂@Au	0.1	2	609	This work

Note: The turn over frequency (TOF) indicated the products that can be generated in a catalytic reaction by per molar amount of catalyst.

Table S2. The k values related to bromate reduction under different applied potential according to pseudo-first order kinetic model.

Applied potential (V)	k_1 (min ⁻¹)	R ²
-0.5	0.0537	0.925
-1.0	0.0406	0.969
-1.5	0.0450	0.964
-2.0	0.0382	0.995

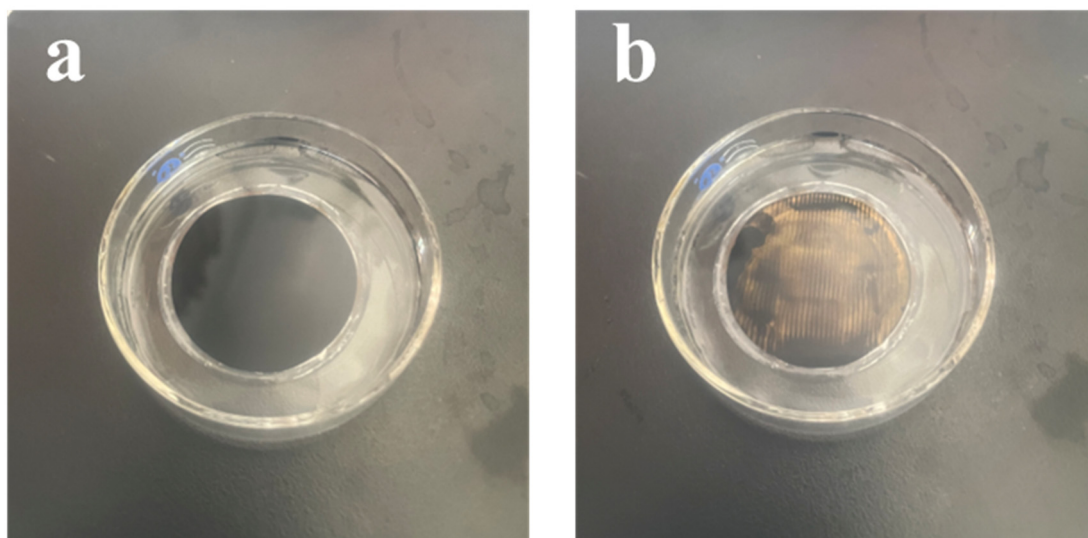


Figure S1. Electronic photos of (a) the CNT-MoS₂ membrane and (b) the CNT-MoS₂@Au membrane.

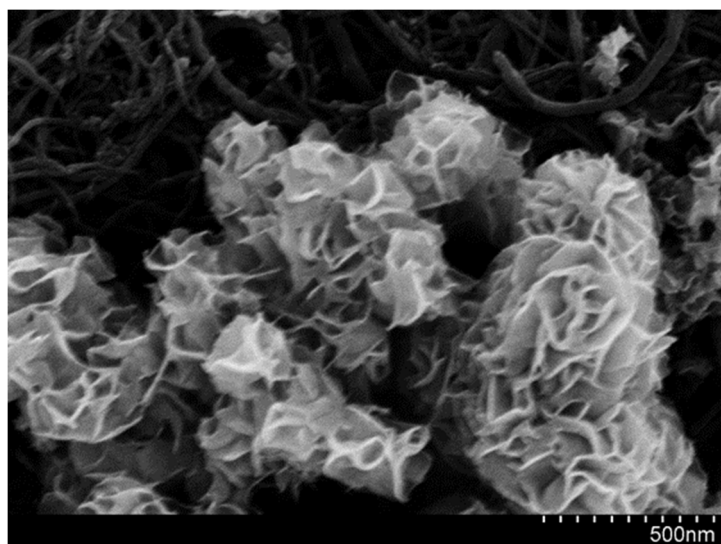
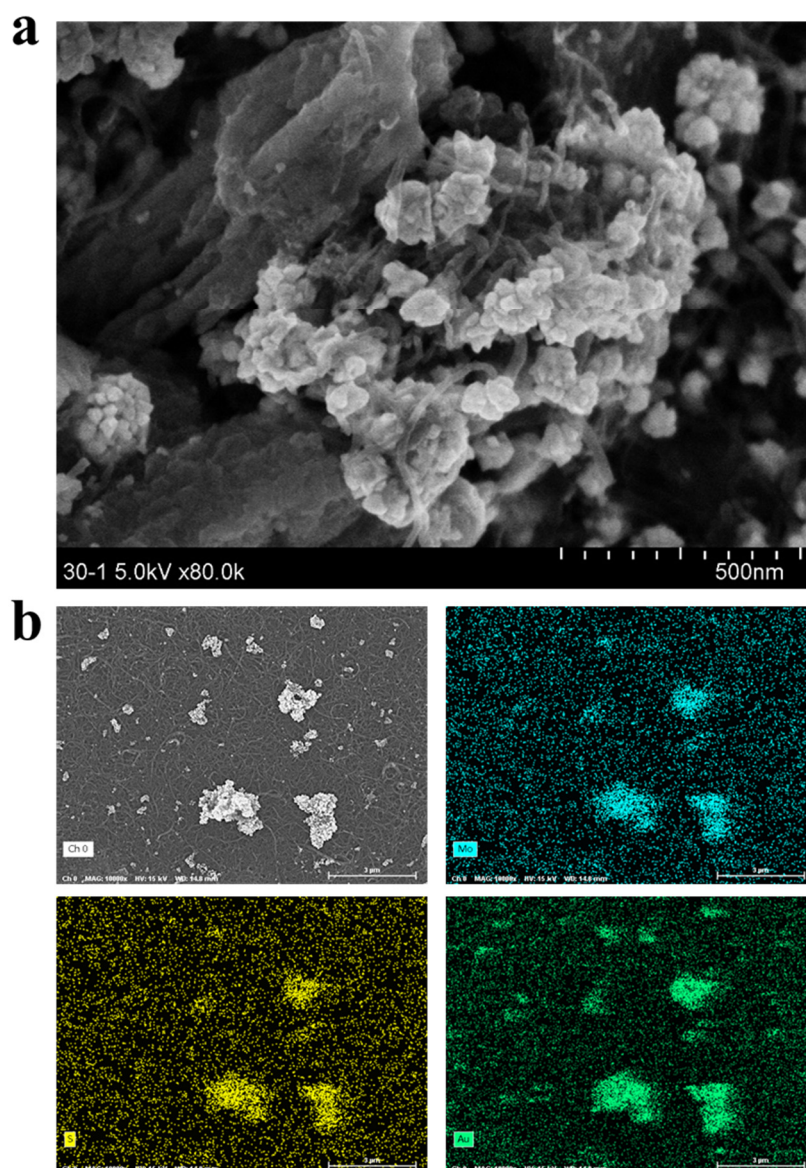


Figure S2. FESEM image of CNT-MoS₂ membrane.



Elements	C	O	Mo	S	Au
Atomic concentration (%)	98.06	1.30	0.09	0.06	0.49

Figure S3. (a) FESEM and (b) FESEM-EDS mapping images of CNT-MoS₂@Au-30 membrane (Au loading time, 30 min).

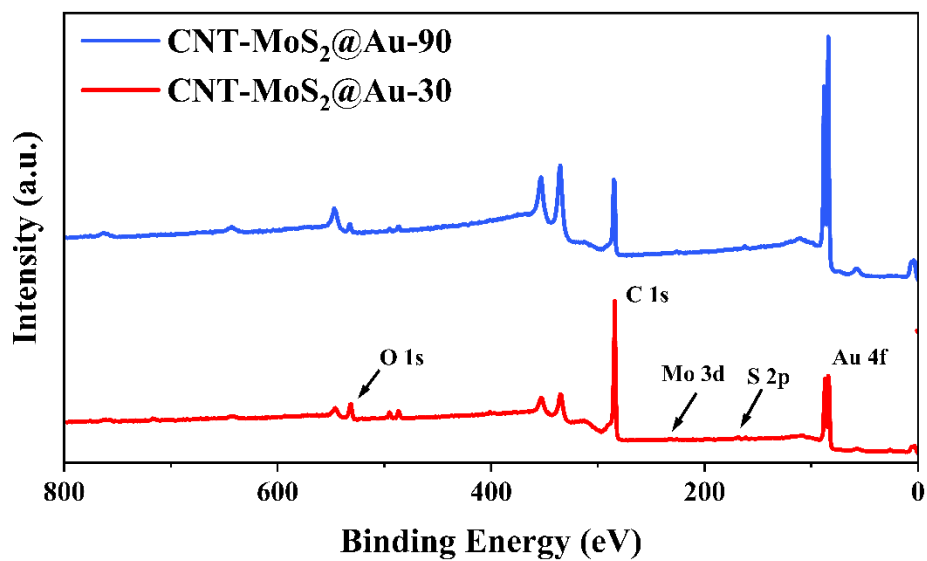


Figure S4. Comparison of the XPS survey spectrums of CNT-MoS₂@Au catalytic membrane with different Au loading time (30 and 90 min).

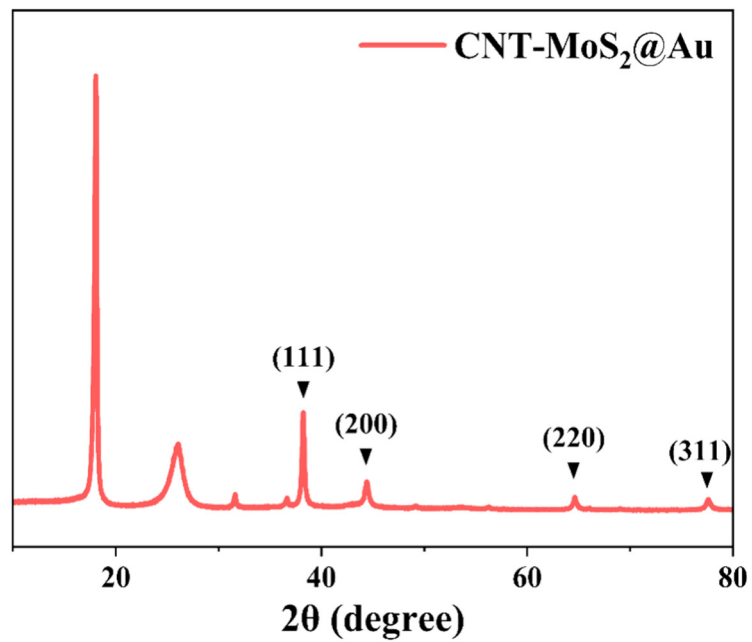


Figure S5. The XRD pattern of the CNT-MoS₂@Au catalytic membrane.

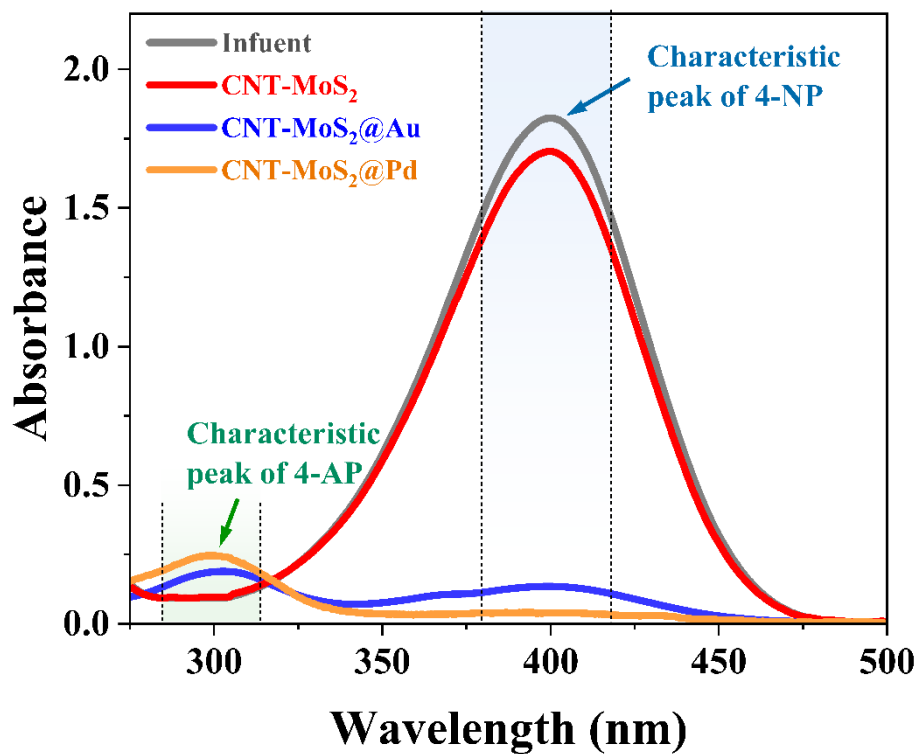


Figure S6. Degradation efficiency of 4-NP by using CNT-MoS₂ membrane, CNT-MoS₂@Au membrane and CNT-MoS₂@Pd membrane. Experimental conditions: [4-NP]₀ = 0.1 mM, flow rate = 2.0 mL/min and pH₀ = 8.0.

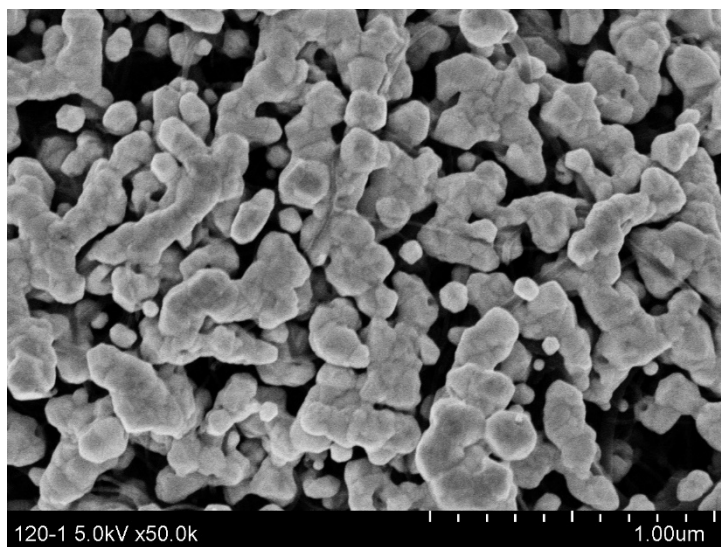


Figure S7. FESEM image of CNT-MoS₂@Au-120 membrane (Au loading time, 120 min).

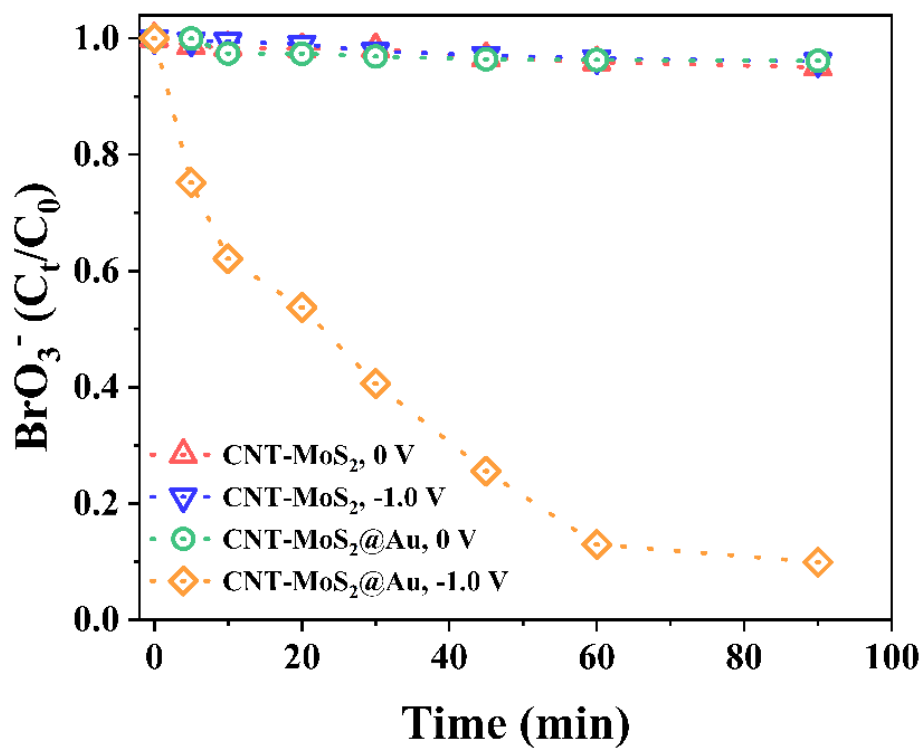


Figure S8. Degradation efficiency of bromate by using CNT-MoS₂ membrane and CNT-MoS₂@Au membrane before and after applying potential. Experimental conditions: [BrO₃⁻]₀ = 0.1 mM, flow rate = 2.0 mL/min and pH₀ = 4.0.

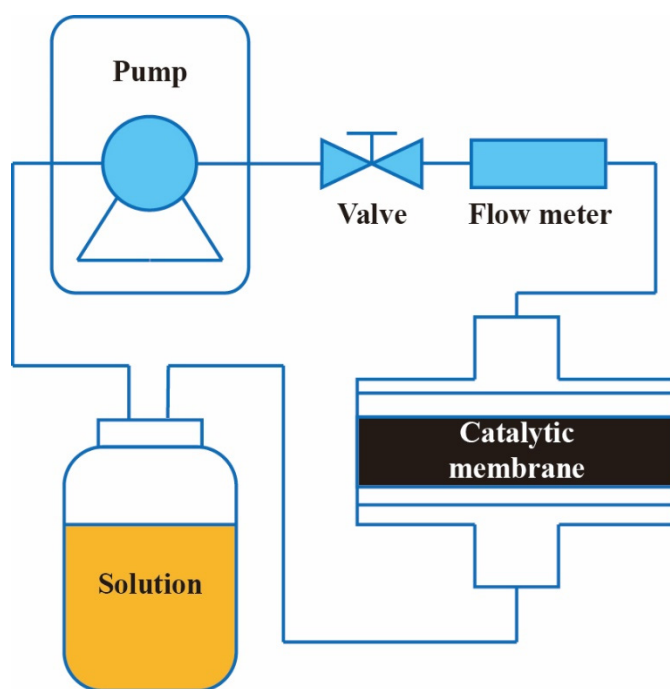


Figure S9. Schematic illustration of the flow-through electrocatalytic filtration system.

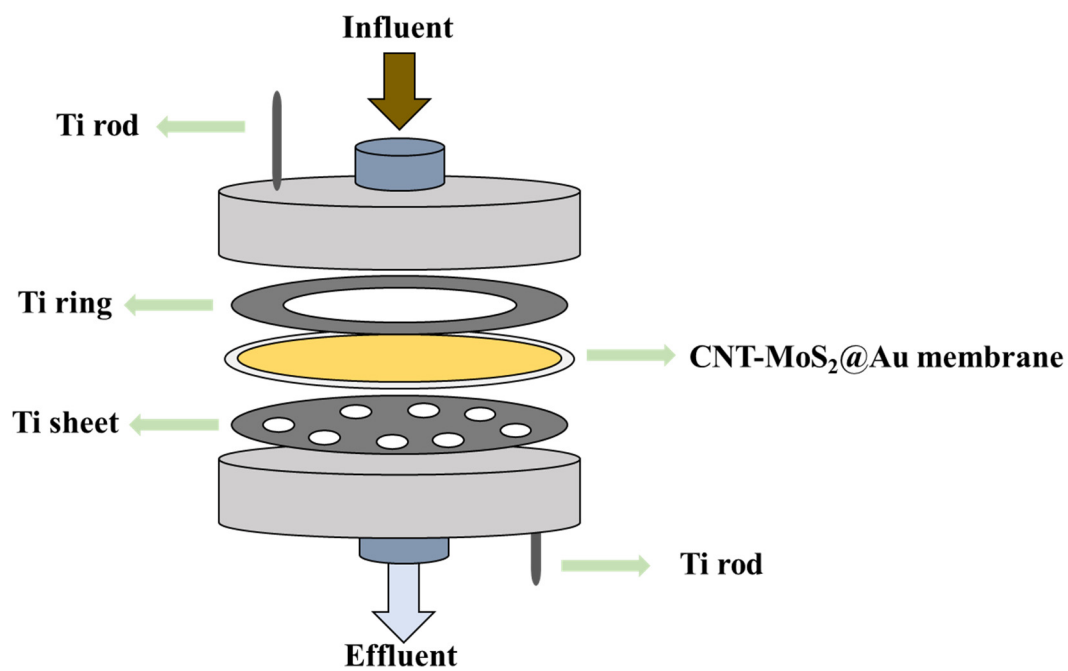


Figure S10. Schematic diagram of electrochemistry-modified Whatman polycarbonate filtration casing.