Supporting Information

Multi-MXene assisted large-scale manufacturing of electrochemical biosensor based on enzyme-nanoflowers enhanced electrodes for detection of H_2O_2 secreted from live cancer cells

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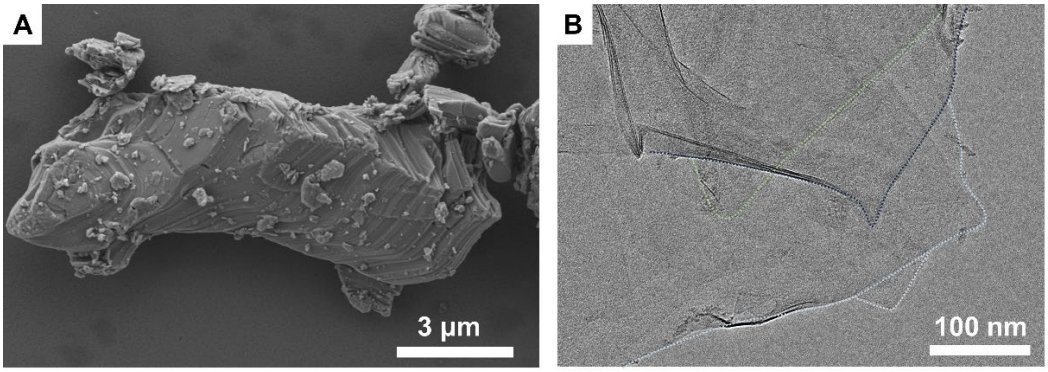

Fig. S1. SEM image of un-etched MAX phase (A) and TEM image of s-MXene after etching (B). These delaminated nanosheets appear transparent to the electron beam, underlining their ultrathin nature.

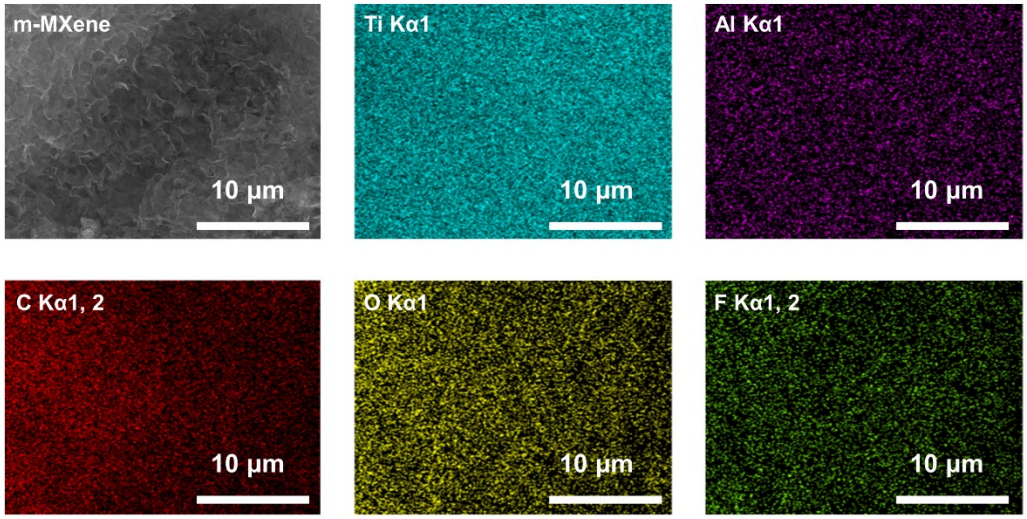

Fig. S2. Elemental distribution mappings of m-MXene nanosheets by energy dispersion spectrometer (EDS).

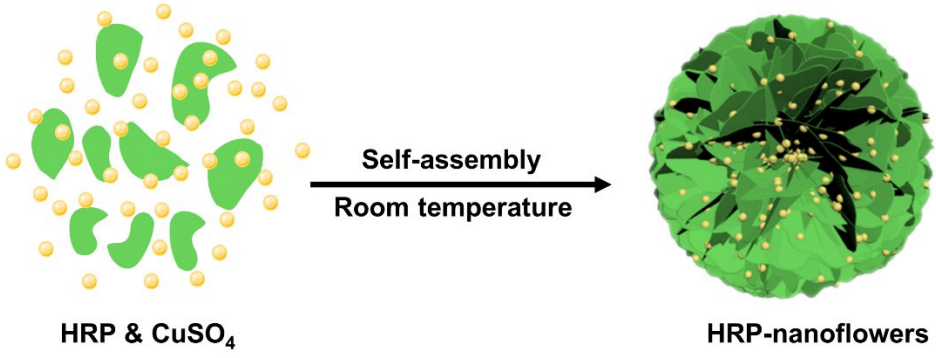

Fig. S3. Schematic diagram of the self-assembly process of HRP nanoflowers.

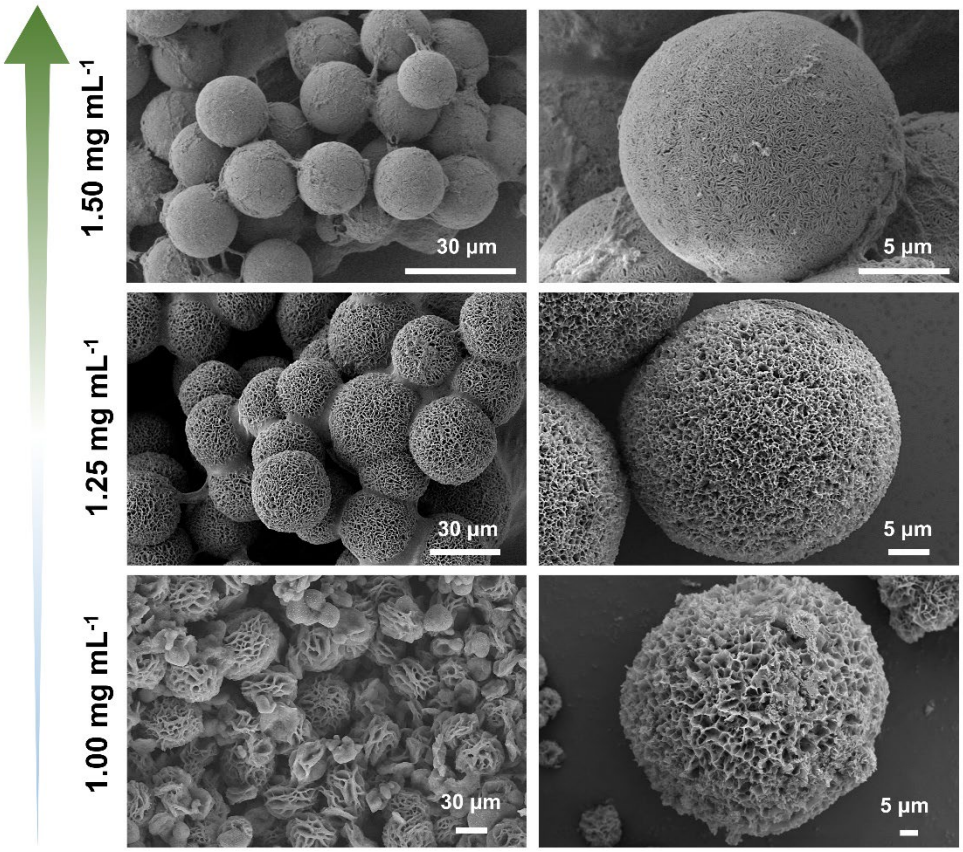

Fig. S4. SEM images of HRP nanoflowers with different morphologies and dimensions under different concentrations of HRP.

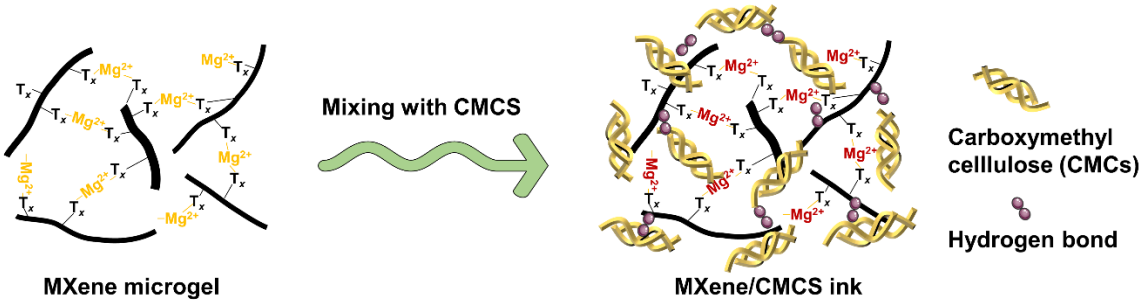

Fig. S5. Schematic diagram of preparation of the MXene-based ink.

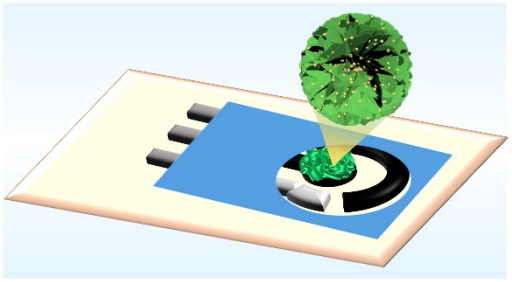

Fig. S6. Schematic diagram of electrochemical biosensors with work electrode modified by HRP nanoflowers.

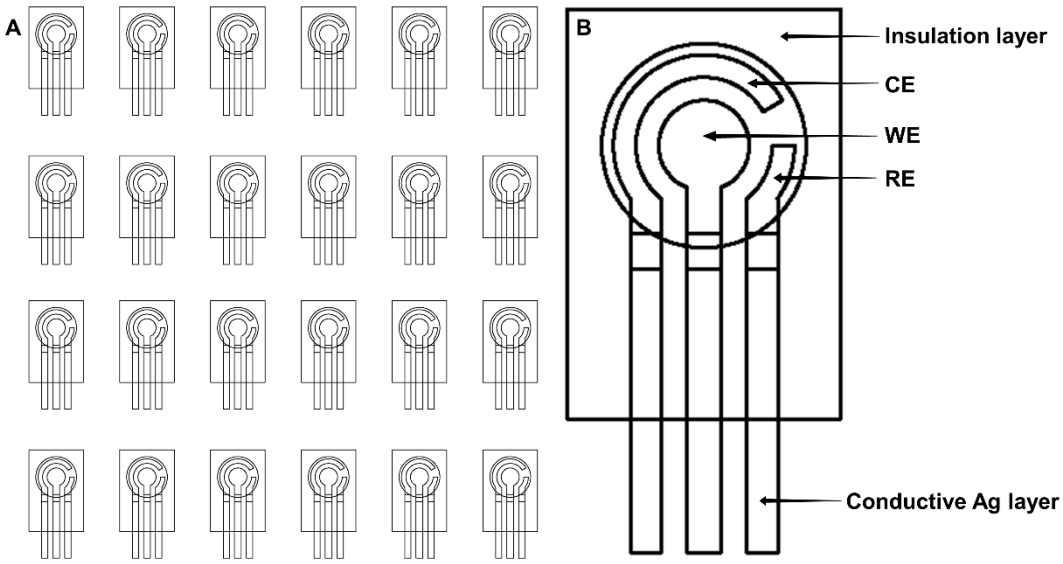

Fig. S7. A set of designed Nylon mesh boards of three-electrode system employed in screen-printing procedures (A) and configuration of individual MXene-based electrode (B).

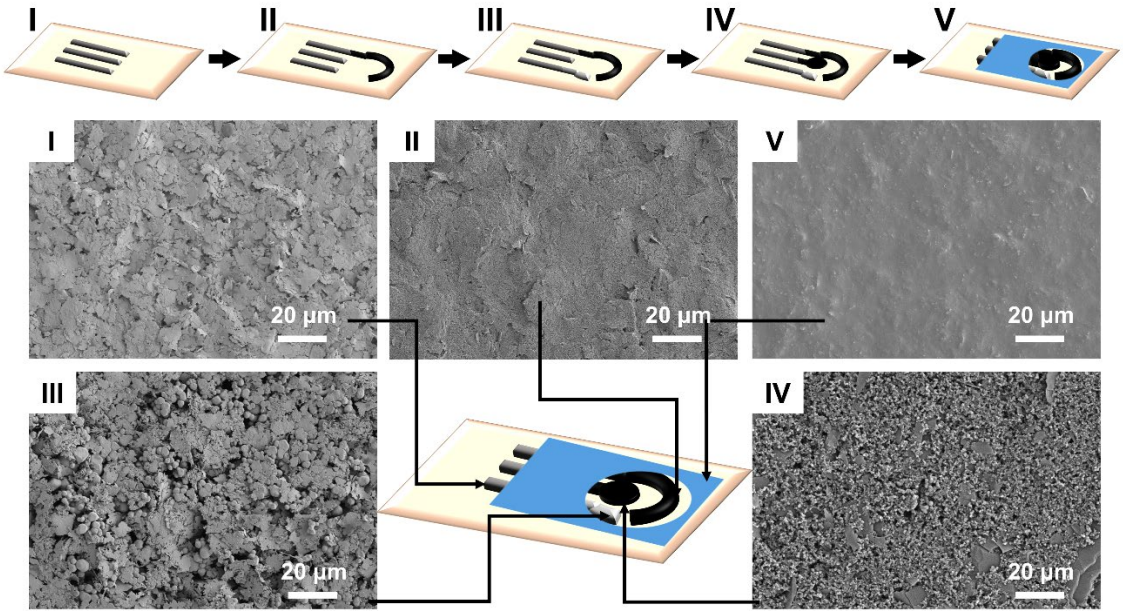

Fig. S8. Scheme of the screen-printing procedures and corresponding SEM images of the Ag ink (I), graphite ink (II), Ag/AgCl ink (III), MXene/CMCS ink (IV) and insulation ink (V) printed on PET.

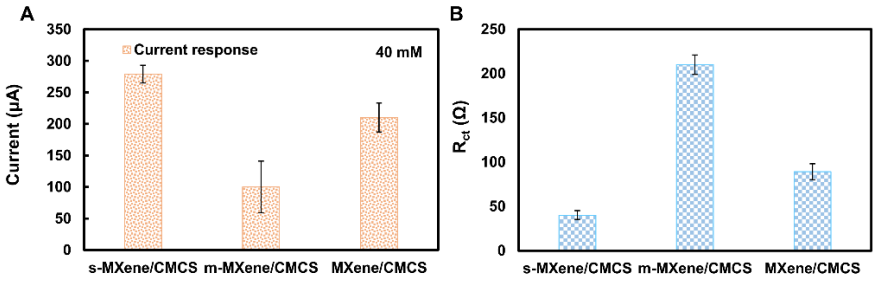

Fig. S9. Comparison of the current response (A) and impedance (B) of the sensing electrodes when employed as an H_2O_2 electrochemical biosensor.

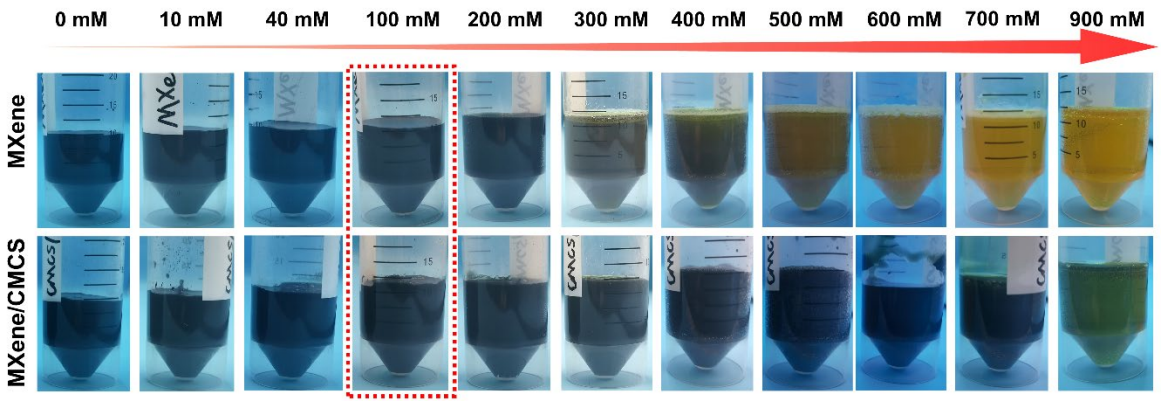

Fig. S10. CMCS mitigated the MXene degradation in H_2O_2 solution and protected the MXene from oxidation.

The s-MXene disperser (5 mg mL^{-1}) was oxidized (the production of bubbles) when containing 100 mM of H_2O_2. Continuously increasing the concentration of H_2O_2 (300 mM), the black color of solution became brown gradually, indicating an obvious oxidation of MXene. In contrast, MXene/CMCS exhibited an enhanced antioxidant capacity when utilized for the detection of cell secretion of H_2O_2.

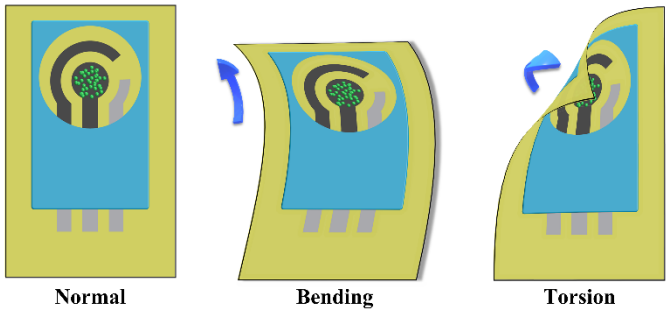

Fig. S11. Schematic view of the current response stability at different states including normal, bending and torsion.

Table S1. A summary of different biosensors for H_2O_2 detection.

Electroactive material *Base	Methods	Linearity (μM)	Sensitivity (μA mM^{-1} cm^{-2})	LOD (μM)	References
Anti-CEA/AuNPs/PB-MXene*ITO	Electrochemistry	1-500	/	0.57	[1]
G/PtAuNC-$C6_{His16}$*Paper	Electrochemistry	50-10000	32.3	0.6	[2]
Cells/GelMA/CNF/MNO_2NW/AuNPs*GCE	Electrochemistry	5-100	/	0.02	[3]
NBP-CNW-NTAs/CF*Pt	Electrochemistry	1-15920	61.8	0.50	[4]
AuNFs/$(PEI/PAA)_{10}$/GR*GCE	Electrochemistry	5-5000	507.5	4.5	[5]
AuNFs/Fe_3O_4-ZIF-8-MoS_2*GCE	Electrochemistry	5-120000	/	0.9	[6]
CS/CuO/BP*GCE	Electrochemistry	0.2-99.8	138.0	0.112	[7]
rGO/AuNPs*ITO-PET	Electrochemistry	25-3000	64.1	6.55	[8]
PtNP/rGO-CNT/ PtNP*SPCE	Electrochemistry	25-1000	206	4.3	[9]
AuNPs-rGO*ITO-PET	Electrochemistry	25-5000	64	6.55	[10]
AgNPs* GCE	Electrochemistry	1-300	/	0.5	[11]
$CuFeS_2$	Fluorescence	50-90000	/	22	[12]
ox-BNS	Fluorescence	0-10	/	0.1	[13]
GPF-mGOx@MOF	Fluorescence	200-11000	/	9	[14]
GDY QDs	Colorimetric	0.5–10	/	0.13	[15]
HFPQ@ALB	Colorimetric	0-50	/	3.5	[16]
$Ni_{0.75}Co_{0.25}Se$	Colorimetric	5-200000	/	2	[17]
MXene/CMCS@HRP*PET	Electrochemistry	0.5-40000	56.45	0.29	This work

Reference

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