Supporting Information

Magnetic-Field-Assisted Cascade Electrocatalysis: Simultaneous H_2O_2 Generation and ·OH Radical Production for Coupled Hydrogen Evolution and Water Disinfection

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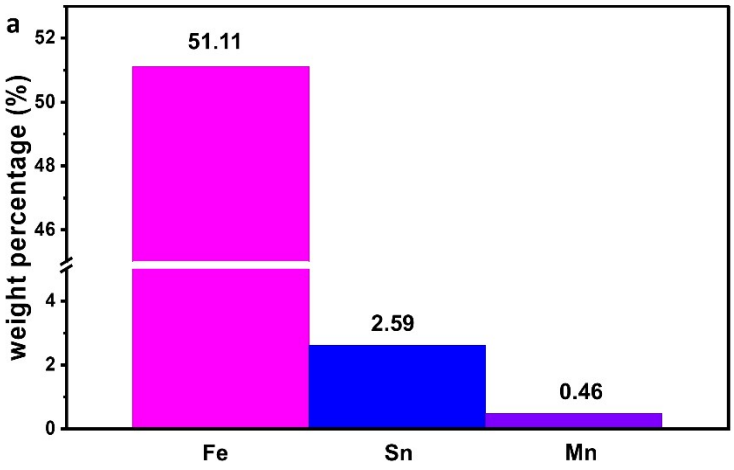

Fig. S1 The atomic weight percentage of (a) MTOFO.

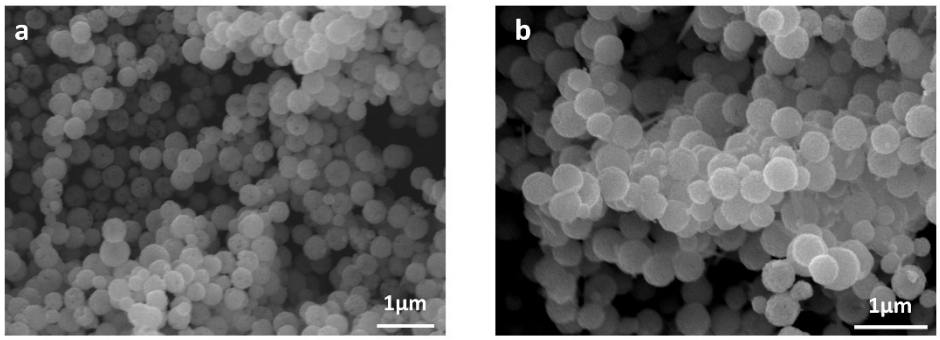

Fig. S2 SEM images of (a) Fe_3O_4 and (b) TOFO.

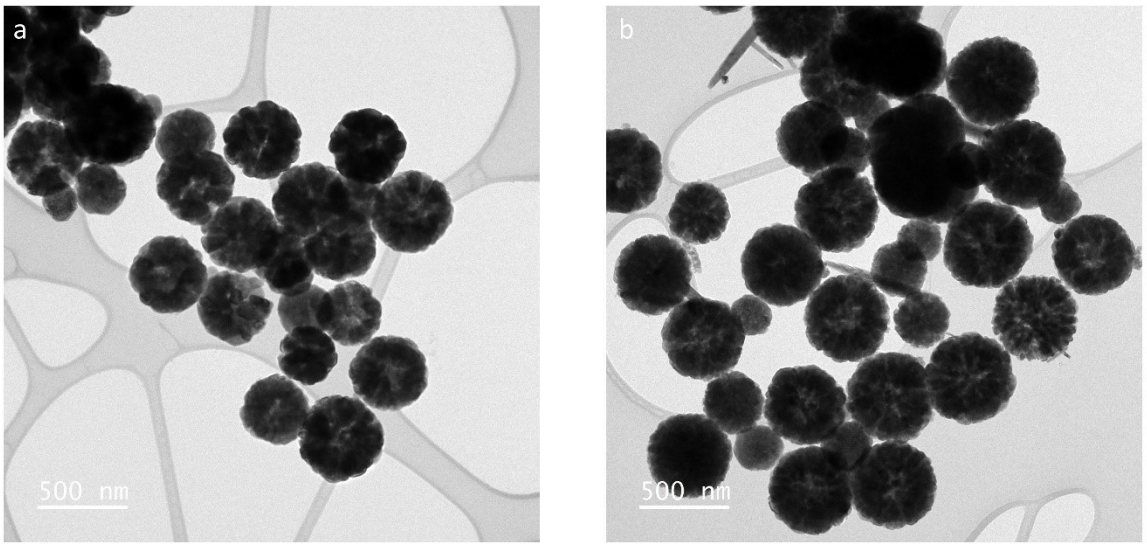

Fig. S3 Low-magnification TEM images of (a) TOFO and (b) MTOFO.

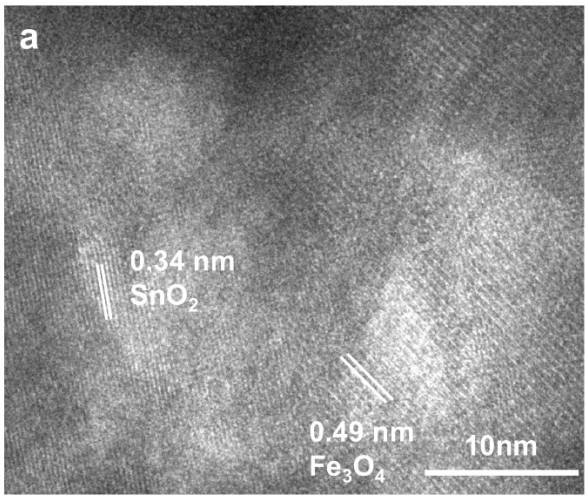

Fig. S4 (a) HR-TEM image of TOFO.

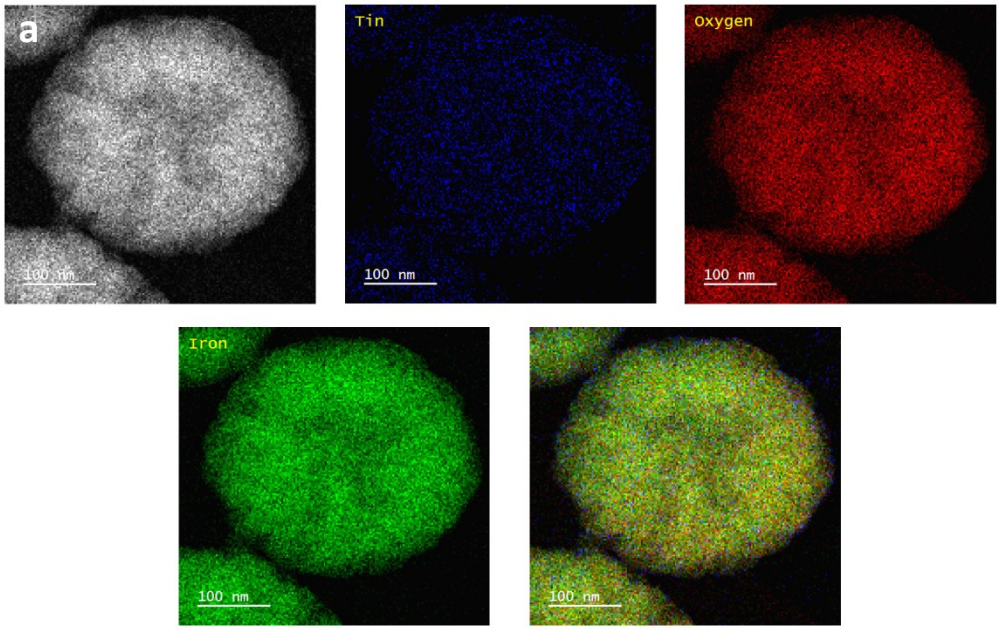

Fig. S5 HAADF-STEM images of TOFO and EDS corresponding elemental and mixed mapping.

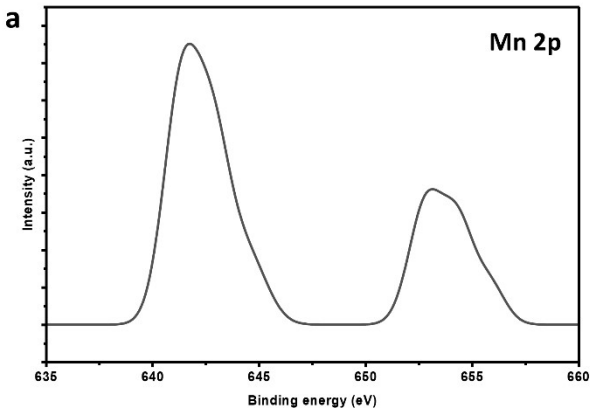

Fig. S6 (a) Mn 2p XPS of MTOFO.

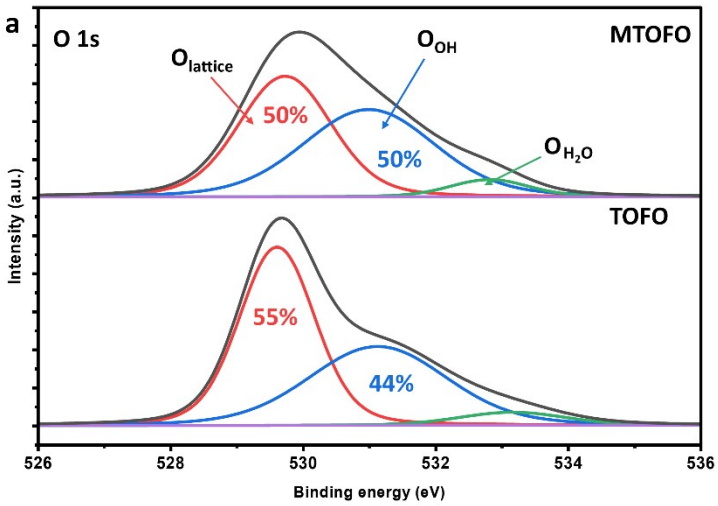

Fig. S7 O 1s XPS of (a) MTOFO and (b) TOFO.

Fig. S8 Electrochemical cell set up with magnet.

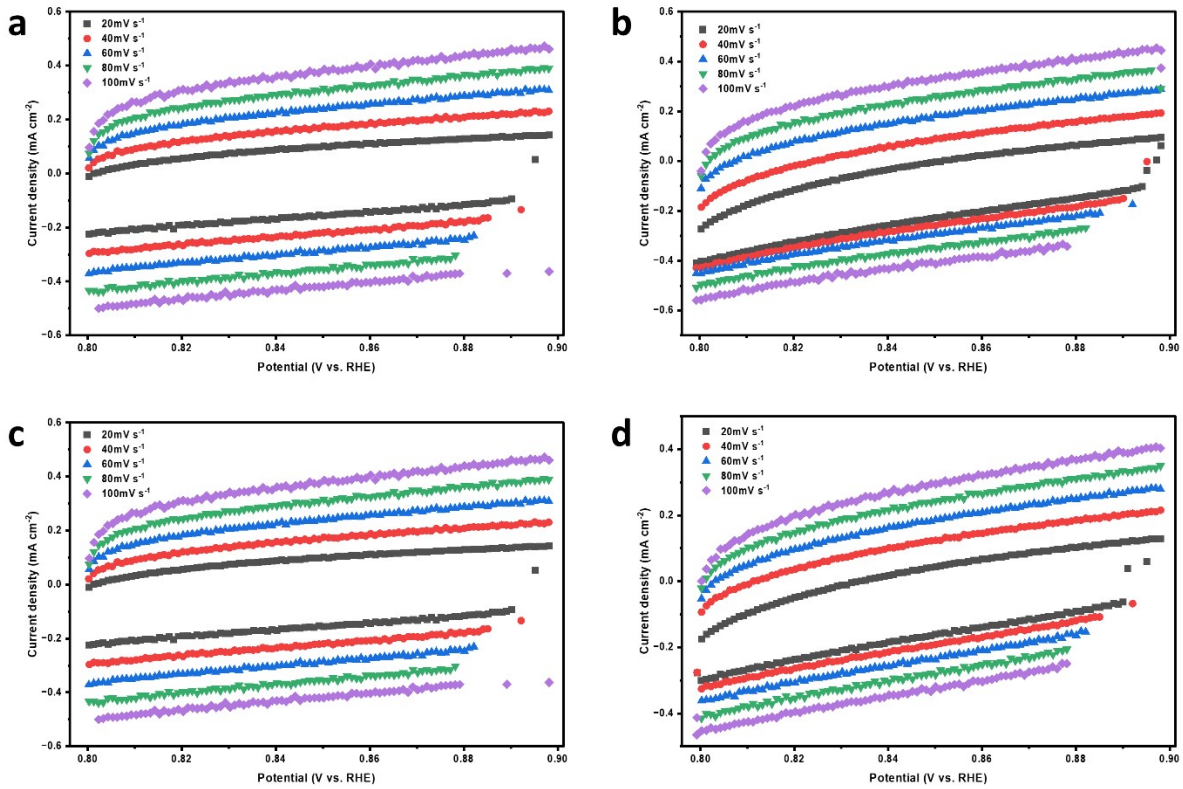

Fig. S9 Various scan rate CV of (a) TOFO without magnet, (b) with magnet, (c) MTOFO without magnet, and (d) with magnet.

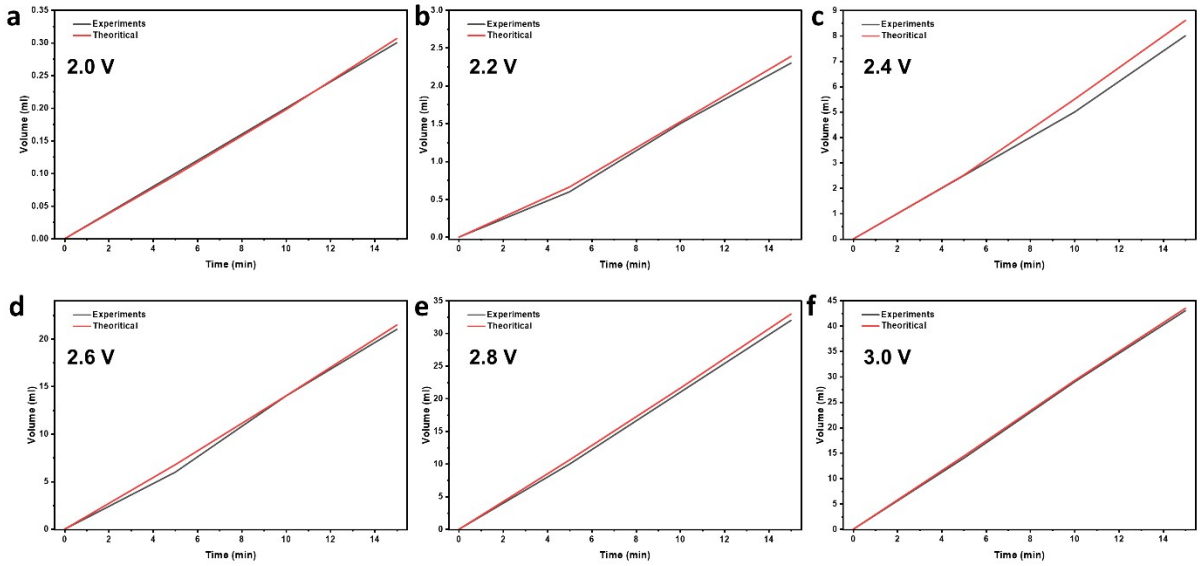

Fig. S10 The amount of hydrogen production at each potential (a) - (f).

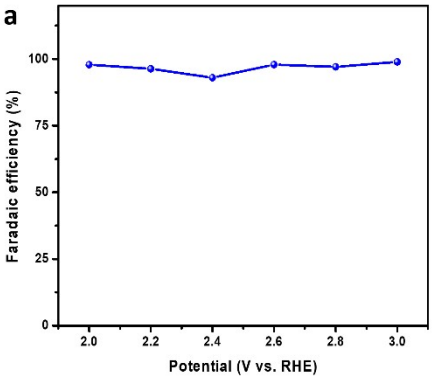

Fig. S11 The faradaic efficiency of hydrogen at each potential.

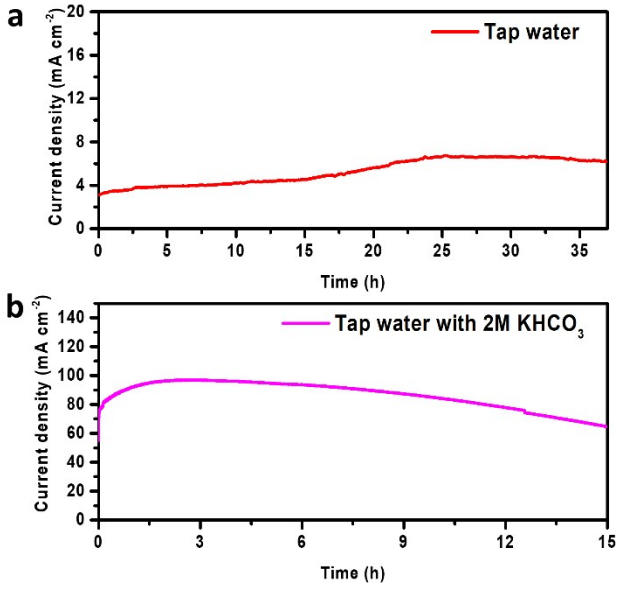

Fig. S12 The Stability of MTOFO at 2.6 V vs. RHE in (a) tap water and (b) tap water with 2M $KHCO_3$.

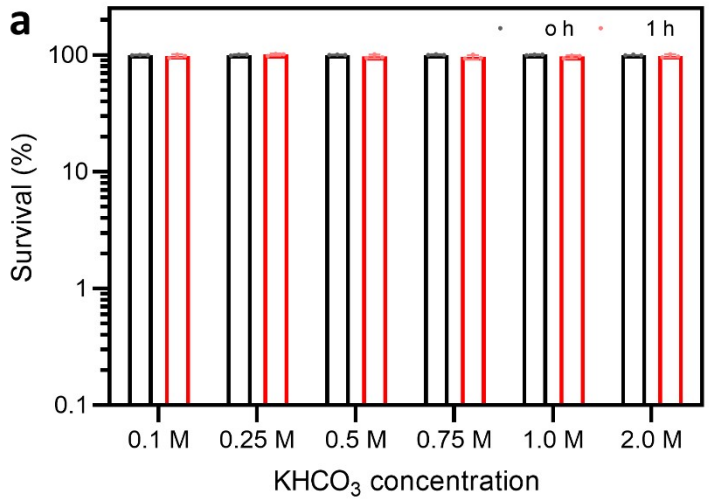

Fig. S13 Viability of *E. coli* depending on $KHCO_3$ concentration (n = 3 independent experiments per bacterial concentration).

Table. S1 Comparison table of 2-electron WOR performance.

Electrodes (catalysts)	Solution	E vs. RHE	Production rate $\mu mol\ min^{-1}\ cm^{-2}$	Reference
Mn-SnO_2@Fe_3O_4	**2M $KHCO_3$**	**2.6 V**	**60.2**	**This work**
$BiVO_4$	1M $NaHCO_3$	3.1 V	5.9	[1]
$CaSnO_3$	2M $KHCO_3$	3.2 V	4.7	[2]
Gd-$BiVO_4$	2M $KHCO_3$	3.2 V	10.6	[3]
PTFE/CPF	1M Na_2CO_3	2.4 V	23.4	[4]
BDD	2M $KHCO_3$	3.5 V	19.7	[5]
Bi_2WO_6: Mo	2M $KHCO_3$	3.2 V	300	[6]
$F_{0.4}$-WO_3	1M H_2SO_4	3.4 V	79.92	[7]
SnO_2	1M $NaHCO_3$	3.1 V	1.6	[8]
$CuWO_4$/CC	2M $KHCO_3$	3.0 V	11.8	[9]
TiO_2	1M $NaHCO_3$	3.3 V	1	[10]
$MgSnO_3$@NF	2M $KHCO_3$	2.6 V	46.07	[11]
$Mg_{1-x}SnWO_{6-x}$700	2M $KHCO_3$	2.6 V	68.07	[12]

Table. S2 Comparison table of catalytic disinfection performance.

Electrodes (catalysts)	**Solution**	**Time**	**Operate condition**	**Performance**	**Reference**
Mn-SnO_2@Fe_3O_4	**2M $KHCO_3$**	**60m**	**2.6 V vs. RHE**	**99.9% at 2 × 10^6 CFU mL^{-1} E. coli**	**This work**
Cathode: Reticulated vitreous carbon Anode: Ti/RuO_2	250mg L^{-1} Na_2SO_4	150 min	32 mA	99.99% at 10^6 CFU mL^{-1} E. coli	[13]
Pt-coated titanium electrodes	Tap water	45 min	6 V	99.999% at 2 × 10^2 CFU mL^{-1} Legionella	[14]
Nitrogen-doped reduced graphene oxide	Tap water	15 min	5.8 mA cm^{-2}	99.999% at 10^6 CFU mL^{-1} E. coli	[15]
Co_3O_4	5mM NaCl	160 min	2.5 V	99.9999% at 5*10^6 CFU mL^{-1} E. coli	[16]
CuO	9.0 g L^{-1} sodium chloride	960 min	6 V	99.9999% at 10^7 CFU mL^{-1} E. coli)	[17]
Cu_3P	DI water	720 min	1 V	99.9999% at 10^7 CFU mL^{-1} E. coli and S. aureus	[18]
Ag_1/CN (Ag single atom/C_3N_4)	DI water	240 min	Xe lamp (<400nm, 300W)	99.9% at 10^5 CFU mL^{-1} E. coli, S. aureus, MRSA and KREC	[19]
h^3-FNCs (Fe single atom/NC)	DI water	240 min	Oxidase-like Activity	>90% and 99% at 10^8 CFU mL^{-1} P. aeruginosa and S. aureus	[20]
Cu Sazyme (Cu single-atom nanozyme)		240 min (white ligh for 30 min and NIR for 10min)	Dual-light activation (808nm, 1.0W cm^{-2} NIR + 400-700 nm 5mW cm^{-2} White light)	97% at 10^6 CFU mL^{-1} E. coli, MDRPA, S. aureus and MRSA	[21]

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