Supporting Information

Portable Colorimetric Detection of Copper Based on Enhanced Peroxidase-like Activity of MoO_3 Nanobelts

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Characterization

The scanning electron microscope images of MoO_3 nanobelts were used a Hitachi S-4800 microscope. TEM imaging was obtained by a JEM 2100 instrument (JEOL, Japan) operated at an accelerating voltage of 200 kV. Powder XRD was performed by a D8 Advance X-ray diffractometer (Bruker, Germany). XPS spectra were collected on an Axis Ultra DLD spectrometer (Kratos Analytical, UK) with a monochromatic Al Kα X-ray source (1486.6 eV). UV-vis spectra were obtained by using a UV-2550 UV-vis spectrophotometer (Shimadzu, Japan). Fourier-transform infrared (FT-IR) spectra were obtained by a Vetex70 (Bruker Corp, Germany) using the KBr wafer technique at room temperature over the range of 400-4000 cm^{-1}. Absorbance at 652 nm was recorded by a Multiskan MK3 microplate reader (Thermo Fisher Scientific, USA).

Enzyme Kinetic Testing

Steady-state kinetic assays were conducted by fixing the concentration of H_2O_2 and varying that of TMB, or vice versa. The absorbance at 652 nm was monitored every 7.5 seconds using the microplate reader. The kinetic parameters (K_m, v_{max}) are important indicators of Cu^{2+} to enhance the peroxidase-like activity of MoO_3 nanobelts by the equation $v = v_{max}$ [S]/ (K_m+ [S]), where v, v_{max}, [S], and K_m is the reaction rate, maximum reaction velocity, concentration of the substrate, and Michaelis constant, respectively.

Inductively Coupled Plasma-mass Spectrometry (ICP-MS) Sample Preparation Protocol

Firstly, 1 mL of the sample was transferred to an ablution tube and added about 1 mL of nitric acid, 1 mL of perchloric acid, 0.2 mL of hydrogen peroxide to each sample digestion tube. Because all the above acids were volatile, this process and all of the following processes need to be carried out in a ventilated kitchen, keeping for 15 minutes. There were the sample tube heater in the heating of the digested sample, and the digestion temperature of 100 degrees. The digestion time was about 80 min until the digestion solution was clear and transparent, indicating that the sample had been eliminated. After the digestion was completed, to the next sample to stop heating, such as the sample cooled to room temperature, with the deionized water to the 10 mL

volumetric flask. Then on the machine for testin.

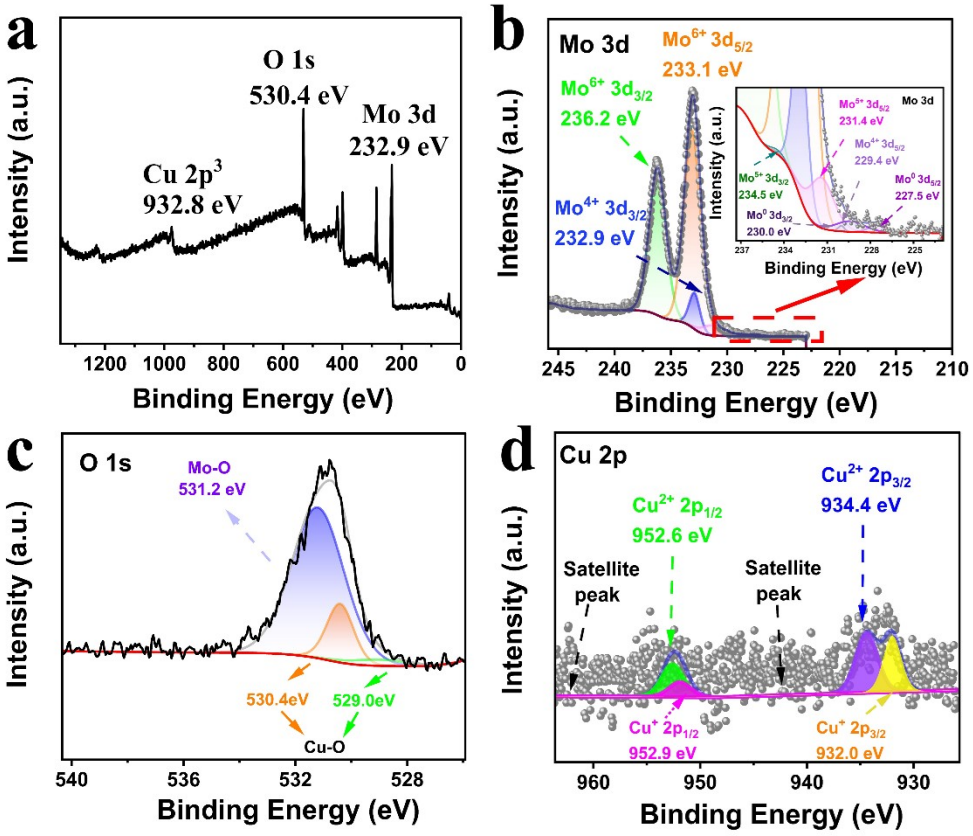

Fig. S1 High resolution XPS spectra of full spectra (**a**), Mo 3d and the enlarged view of Mo 3d (**b**), O 1s (**c**) and Cu 2p (**d**).

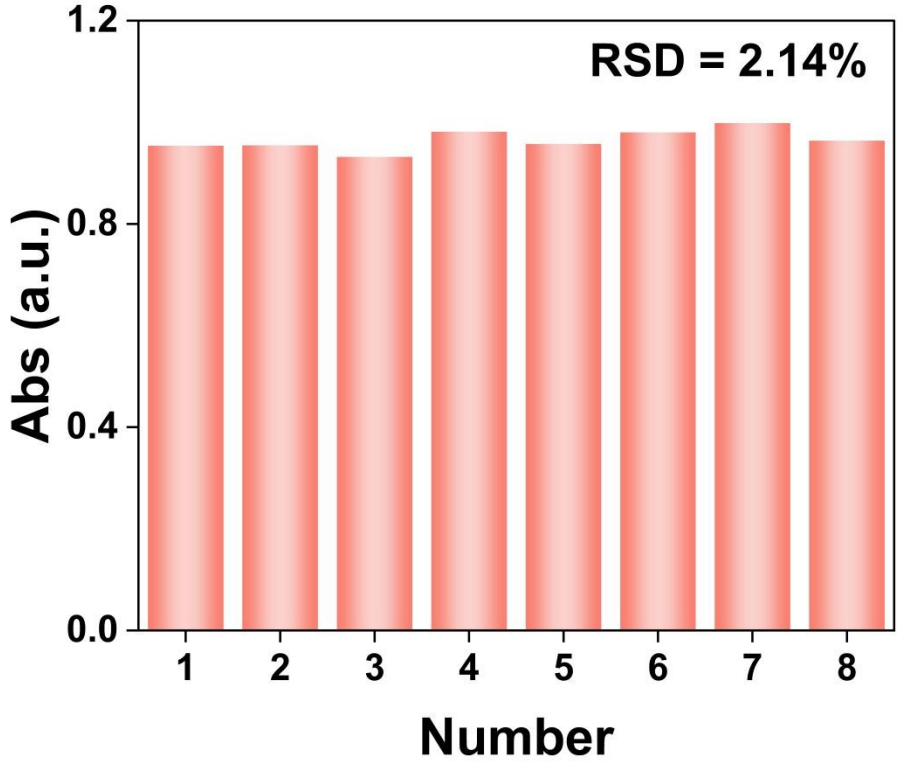

Fig. S2 Reproducibility of MoO_3 nanobelts for eight samples.

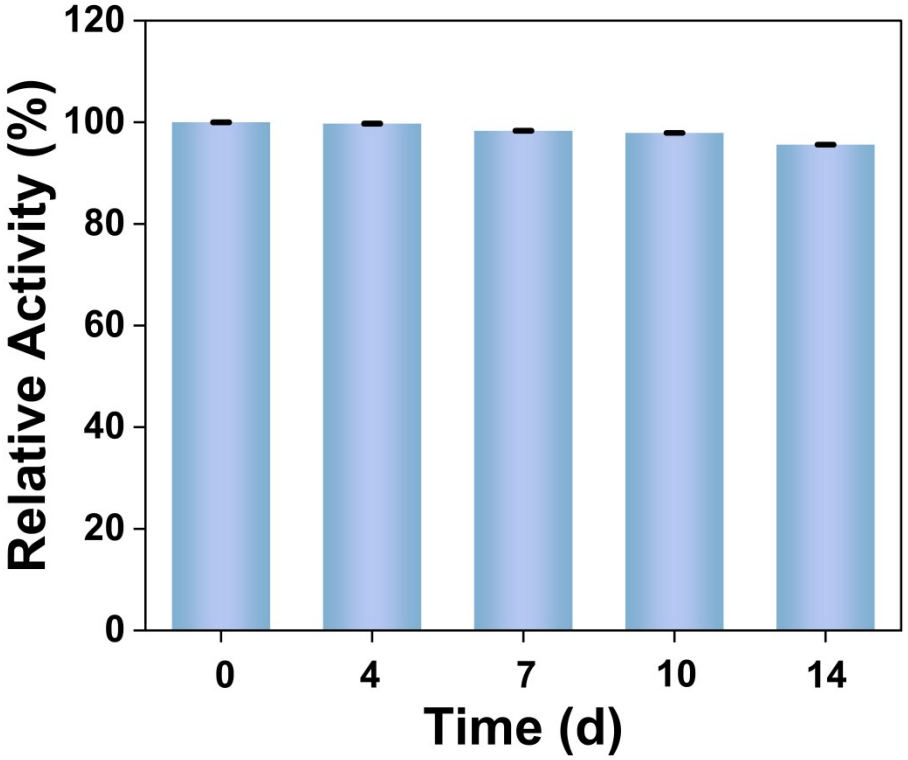

Fig. S3 Long-term stability of MoO_3 nanobelts stored at room temperature.

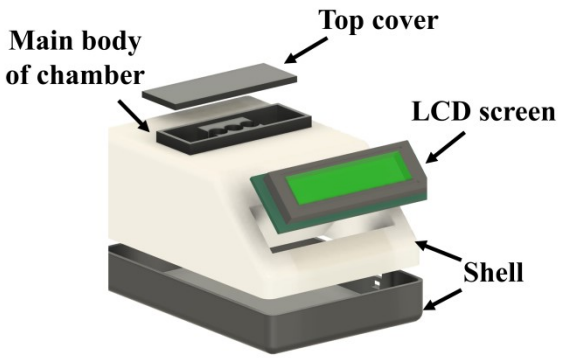

Fig.S4 Schematic diagram of the portable device's structure.

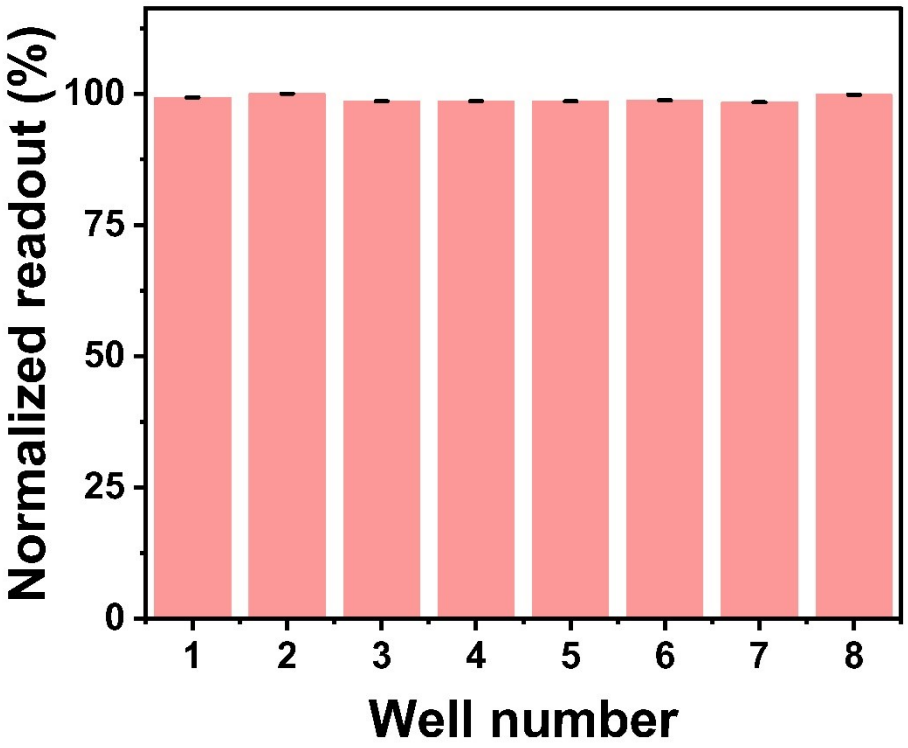

Fig. S5 Stability test of the multi-channel detection system with an ELISA plate strips (n=3).

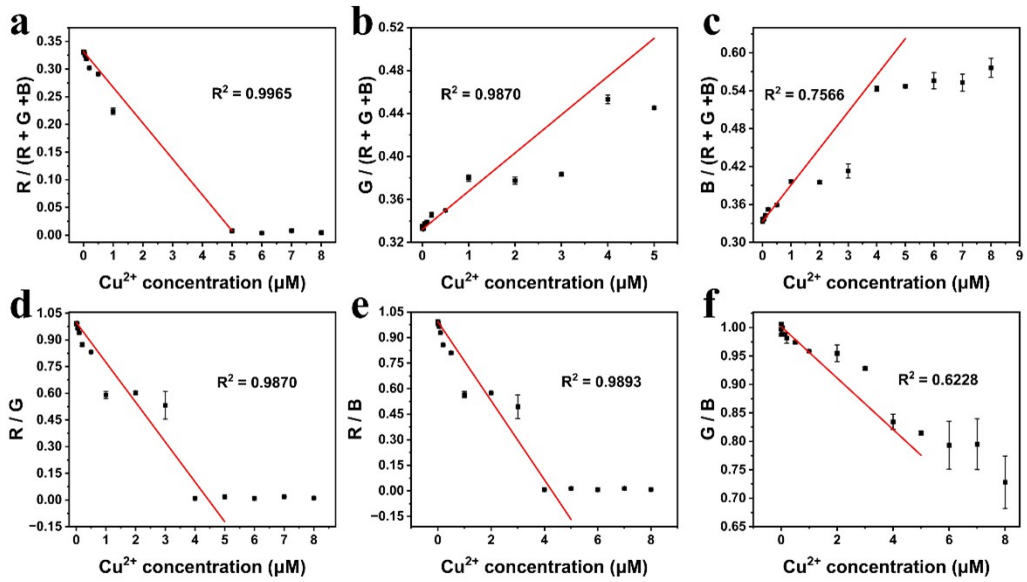

Fig. S6 The ratio of R/(R+G+B) (**a**), G/(R+G+B) (**b**), B/(R+G+B) (**c**), R/G (**d**), R/B (**e**), and G/B (**f**) versus Cu^{2+} concentration in the range of 0.05 - 8.00 μM.

Table S1 Comparison of the kinetic parameters of MoO_3 nanobelts and previously reported nanozymes

Catalyst	Michael's constant K_m		Maximum reaction rate v_{max} (10^{-8} M•s^{-1})		Reference
	TMB	H_2O_2	TMB	H_2O_2	
HRP	0.43	3.70	10.00	8.71	[1]
DNA/MoS_2 NSs	0.65	0.03	10.55	5.89	[2]
Fe-ATP-MoS_2	1.60	0.07	73.21	36.53	[3]
Zn/Mo DSAC-SMA	0.43	40.32	3.84	33.33	[4]
Mo_{SA}-N_3-C	0.79	-	-	37.00	[5]
Mo_5N_6 NSs	1.50	0.08	6.00	0.90	[6]
Mo-Pt/CeO_2	0.05	5.17	11.69	34.16	[7]
Fe-MoS_2	2.81	0.63	72.89	8.06	[8]
MoO_3 nanobelts	0.32	0.22	4.98	3.75	This work

Table S2 Comparison of different nanomaterials for determination of Cu^{2+}

Catalyst	Limit of detection (LOD) (nM)	Reference
E-ChlCu/ZnO	24.00	[9]
$CoMoO_4$	24.00	[10]
CeO_2/Pal	9800.00	[11]
CDs	4140.00	[12]
PEI@$NaYF_4$:Eu^{3+}	41.54	[13]
Ala-Ser-Arg-His-NH_2	50.2	[14]
RSH-Ag Nanobelts	80.00	[15]
MoO_3 Nanobelts	4.61 (Colorimetry) 6.35 (Portable device) 9.91 (RGB)	This work

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