Supplementary Information

Enhanced Oxidase/peroxidase-like Activities of Aptamer Conjugated MoS_2/PtCu Nanocomposites and Their Biosensing Application

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Materials

Molybdenum (IV) sulfide (MoS_2, 99%), chloroplatinic acid, copper acetate, 2,2'-azino-bis(3-ethylbenzo-thiazoline-6-sulfonic acid) diammonium salt (ABTS), 3,3,5,5-tetramethylbenzidine (TMB), *o*-phenylenediamine (OPD) and HRP were purchased from Alfa Aesar. Chitosan was purchased from J&K Chemical Ltd. (Beijing, China). Sodium borohydride ($NaBH_4$) and H_2O_2 were purchased from Sinopharm Chemical Reagent Co., Ltd. (Beijing, China). Streptavidin and DNA were purchased from Sangon biotechnology Co., Ltd. (Shanghai, China). All the chemicals were of analytical grade and used as received without further purification. Milli-Q water (18 MΩ·cm) was used for all solution preparation.

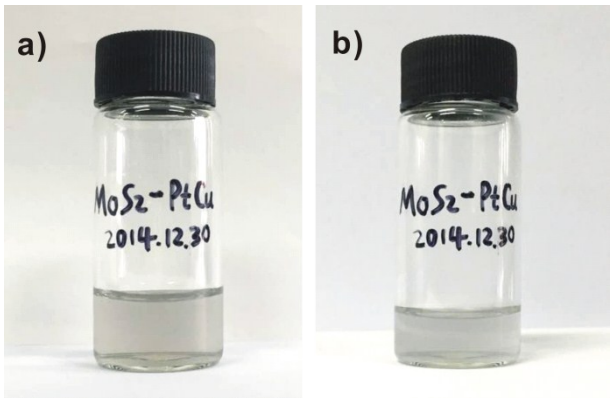

Fig. S1 The freshly prepared sample solution of MoS_2/PtCu nanocomposites (a) and sample solution stored for over a year (b).

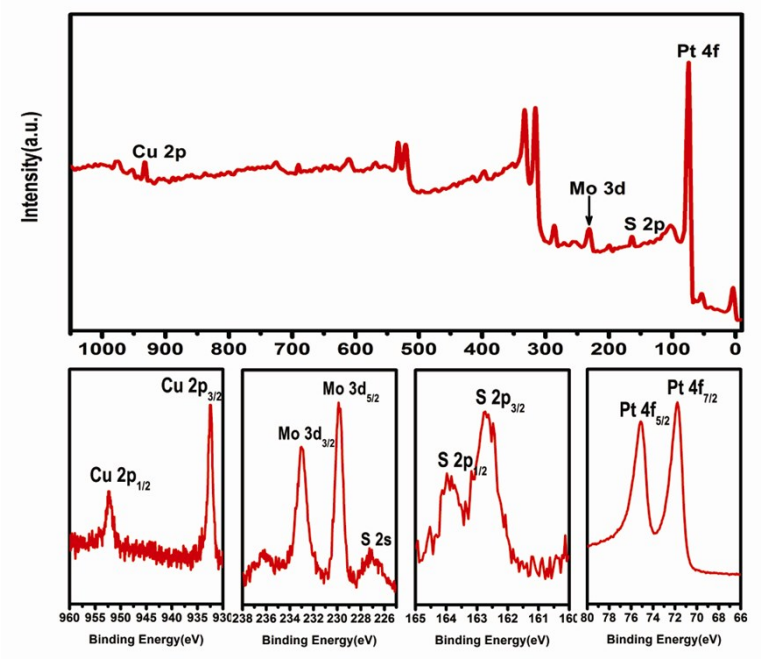

Fig. S2 XPS spectra of as-prepared MoS_2/PtCu nanocomposites.

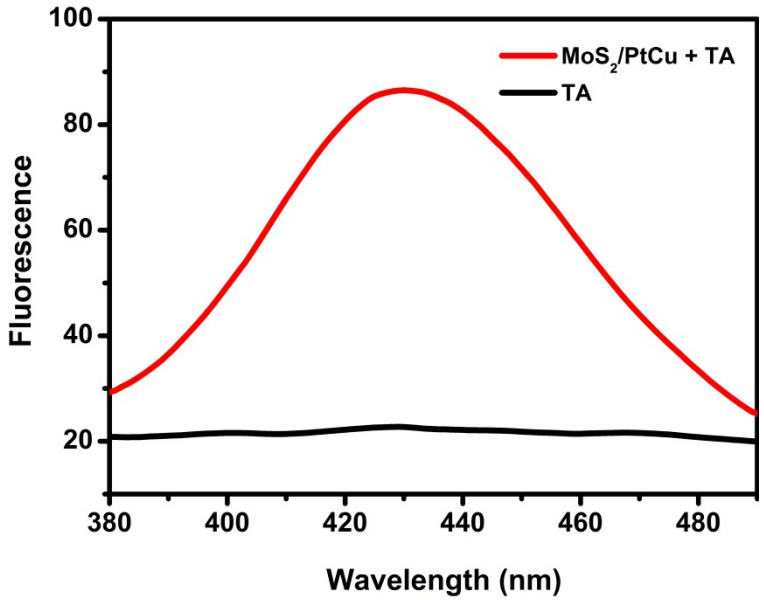

Fig. S3 The fluorescence spectra of TA (black line) and MoS_2/PtCu nanocomposites +TA (red line). E_X=315 nm.

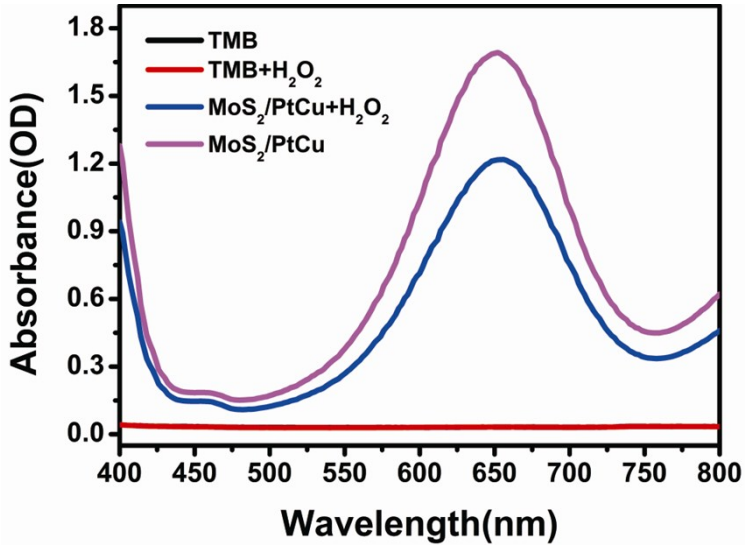

Fig. S4 The oxidase- and peroxidase-like activities of as-prepared MoS_2/PtCu nanocomposites.

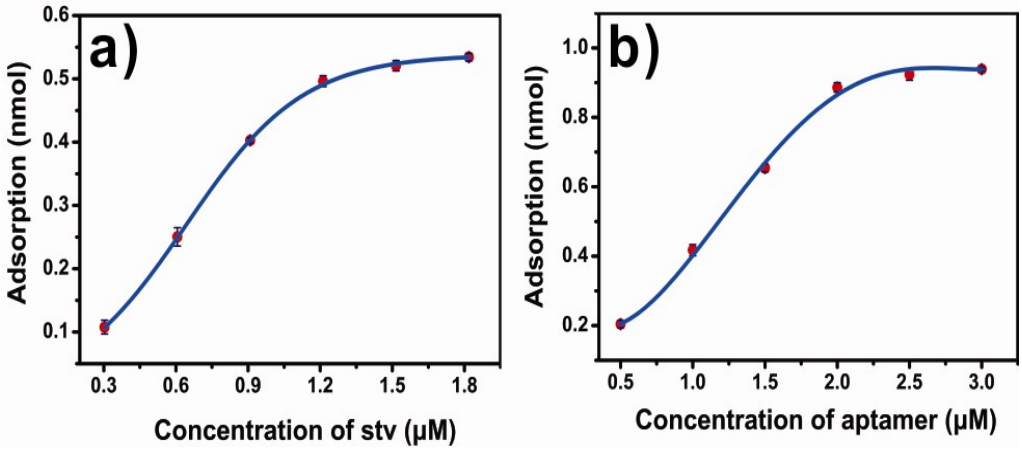

Fig. S5 The evaluation of adsorption of streptavidin (a) and aptamer S2.2 (b) on MoS_2/PtCu nanocomposites.

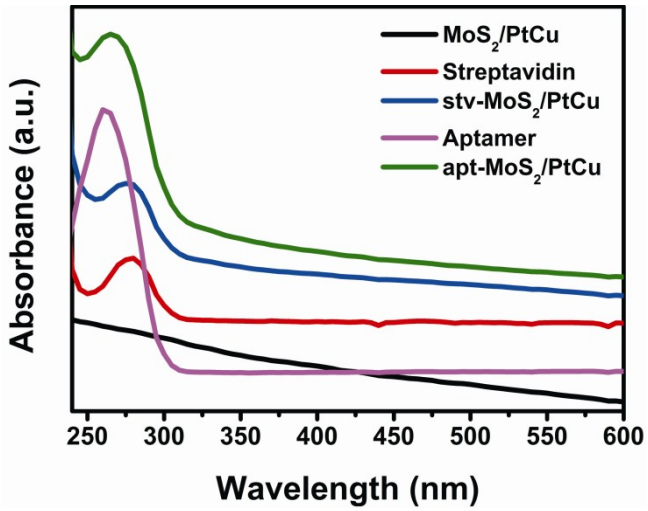

Fig. S6 UV-Vis spectra of MoS_2/PtCu, streptavidin, stv-MoS_2/PtCu, aptamer and apt-MoS_2/PtCu.

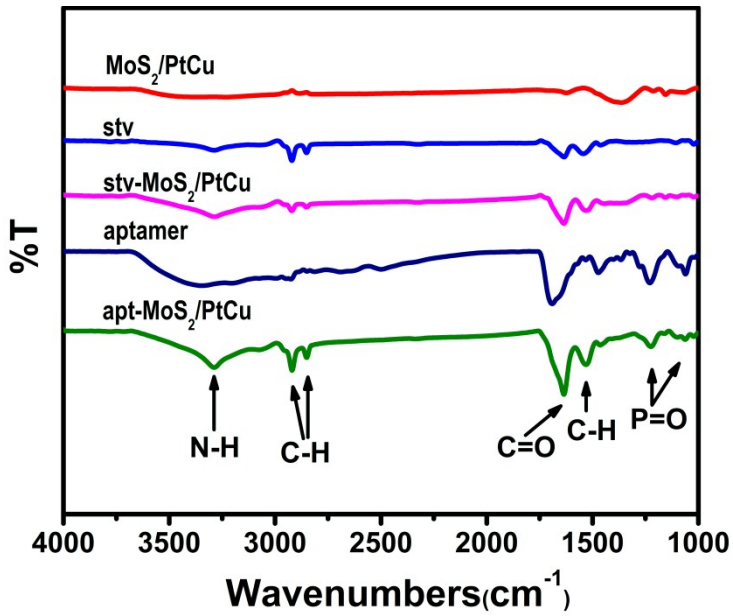

Fig. S7 FT-IR spectra of MoS_2/PtCu, streptavidin, stv-MoS_2/PtCu, aptamer and apt-MoS_2/PtCu.

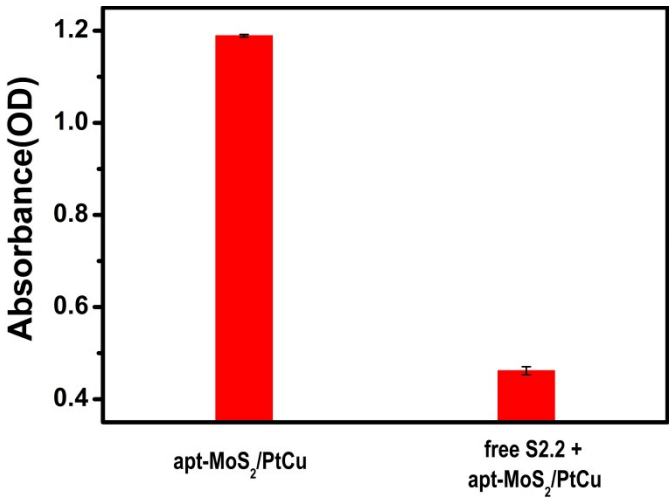

Fig. S8 Binding abilities of apt-MoS_2/PtCu to MCF-7 cells with and without free S2.2 aptamers.

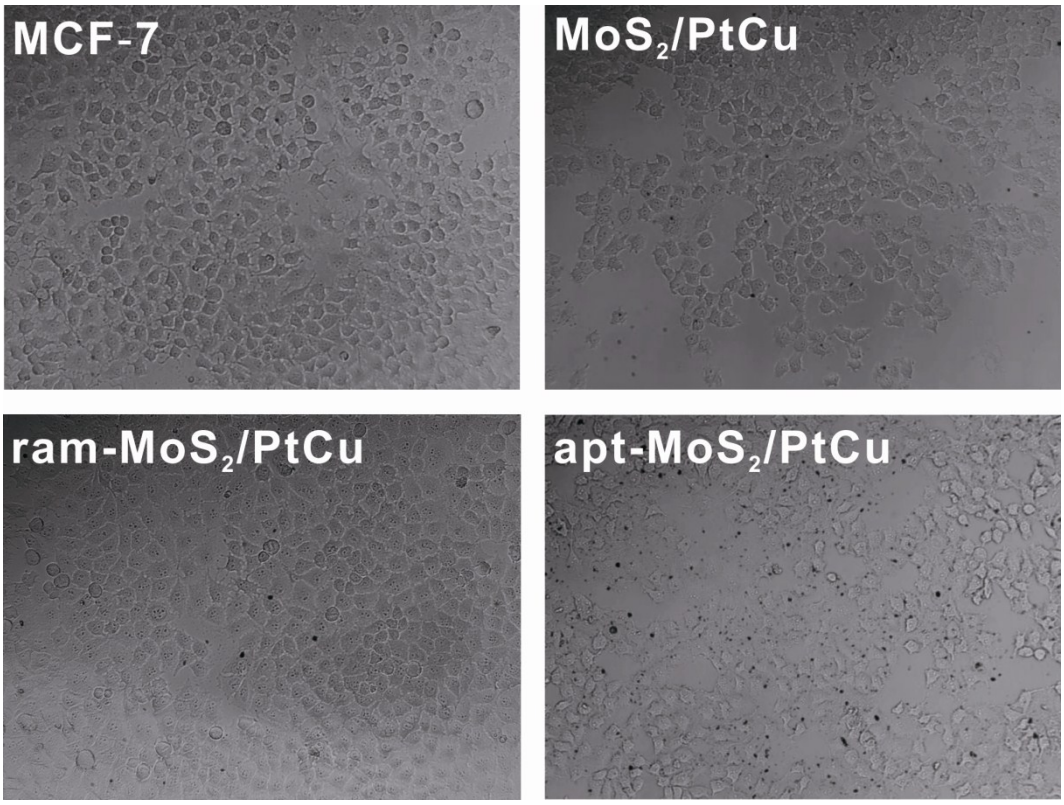

Fig. S9 Optical microscopic images of MCF-7 cells alone and MCF-7 cells after incubation with MoS_2/PtCu, ram-MoS_2/PtCu and apt-MoS_2/PtCu.

Table S1. Apparent kinetic parameters[a] of MoS_2/PtCu nanocomposite as peroxidase mimic and HRP. K_m is the Michaelis constant and V_{max} is the maximal reaction velocity.

Enzyme	Substrate	K_m (mM)	V_{max} (mol L^{-1} / s)
MoS_2/PtCu	H_2O_2	0.801	14.7 X 10^{-8}
MoS_2/PtCu	TMB	0.220	9.25 X 10^{-8}
HRP	H_2O_2	0.678	10.8 X 10^{-8}
HRP	TMB	0.545	23.5 X 10^{-8}

[a]Conditions: at 30^{o}C in a pH 3.5 PB (0.02M) buffer.

Table S2. Zeta potential of the as-prepared MoS_2/PtCu, stv-MoS_2/PtCu and apt-MoS_2/PtCu in water at 25 ^oC.

Composition	Zeta potential (mV)
MoS_2/PtCu	- 29.7 ± 1.3
stv-MoS_2/PtCu	31.9 ± 1.0
apt-MoS_2/PtCu	- 35.7 ± 0.8