Electronic Supplementary Information

Experimental section

Materials: Ammonium heptamolybdate ($(NH_4)_6Mo_7O_{24}\cdot 4H_2O$), aniline, magnesium chloride ($MgCl_2$), sodium chloride (NaCl) and potassium chloride (KCl) were purchased from Beijing Chemical Corp. Commercial Mo_2C and Nafion® peruorinated ion-exchange resin solution (5% w/w) were purchased from Sigma-Aldrich. All chemically synthesized oligonucleotides were purchased from Shanghai Sangon Biotechnology Co. Ltd. (Shanghai, China). The water used throughout all experiments was purified through a Millipore system.

Preparation of nanoporous molybdenum carbide nanowires (Mo_2C NWs): In a typical synthesis, the Mo_2C NWs were prepared according to previously reported method[1] with modifications. Typically, 2.48 g of ammonium heptamolybdate and 1.60 g of aniline were added to 40 mL of distilled water and aqueous HCl (1 M) was added drop-wise, with magnetic stirring at room temperature, until a white precipitate was obtained at pH 4. After stirring at 50 ºC for 6 h, the product was filtered, washed with ethanol and dried at 60 ºC for a further 10 h. After expelling air for 2 h at room temperature using argon, the obtained products were calcined at 800 ºC for 5 h in argon flow and finally stored in a vacuum desiccator.

Characterizations: Powder X-ray diffraction (XRD) datum was recorded on a RigakuD/MAX 2550 diffractometer. Scanning electron microscopy (SEM)

measurements were made on a XL30 ESEM FEG scanning electron microscope at an accelerating voltage of 20 kV. Transmission electron microscopy (TEM) measurements were made on a HITACHI H-8100 electron microscopy (Hitachi, Tokyo, Japan) with an accelerating voltage of 200 kV. The Brunauer-Emmett-Teller (BET) surface area and pore volume were measured on a Quantachrome NOVA 1000 system at liquid N_2 temperature. Fluorescent emission spectra were recorded on a PerkinElmer LS55 Luminescence Spectrometer (PerkinElmer Instruments, U.K.).

Fluorescence sensing assays: The fluorescent DNA sensing was performed at room temperature in 10 mM Tris-HCl buffer (pH 7.4, containing 100 nM NaCl, 5 mM KCl and 5 mM $MgCl_2$). The photoluminescence emission spectra were recorded after reaction for 10 min at room temperature. The fluorescent probe P_{HIV} (50 nM) was hybridized with different amounts of target for 10 min in 300-μL buffer solution. Then Mo_2C NWs suspension (5 μl, 5 mg/ml) was added. The final target concentration ranged from 50 pM to 300 nM. For kinetic study of fluorescence quenching, fluorescence spectra were recorded immediately after addition of Mo_2C NWs. Excitation was at 480 nm, emission was monitored at 518 nm.

Oligonucleotide sequences used are listed below (mismatch underlined):

P_{HIV} (FAM dye-labeled ssDNA):

5'-FAM-AGT CAG TGT GGA AAA TCT CTA GC-3'

T_1 (complementary target):

5'-GCT AGA GAT TTT CCA CAC TGA CT-3'

T_2 (single-base mismatched target):

5’-GCT AGA GAT TGT CCA CAC TGA CT-3’

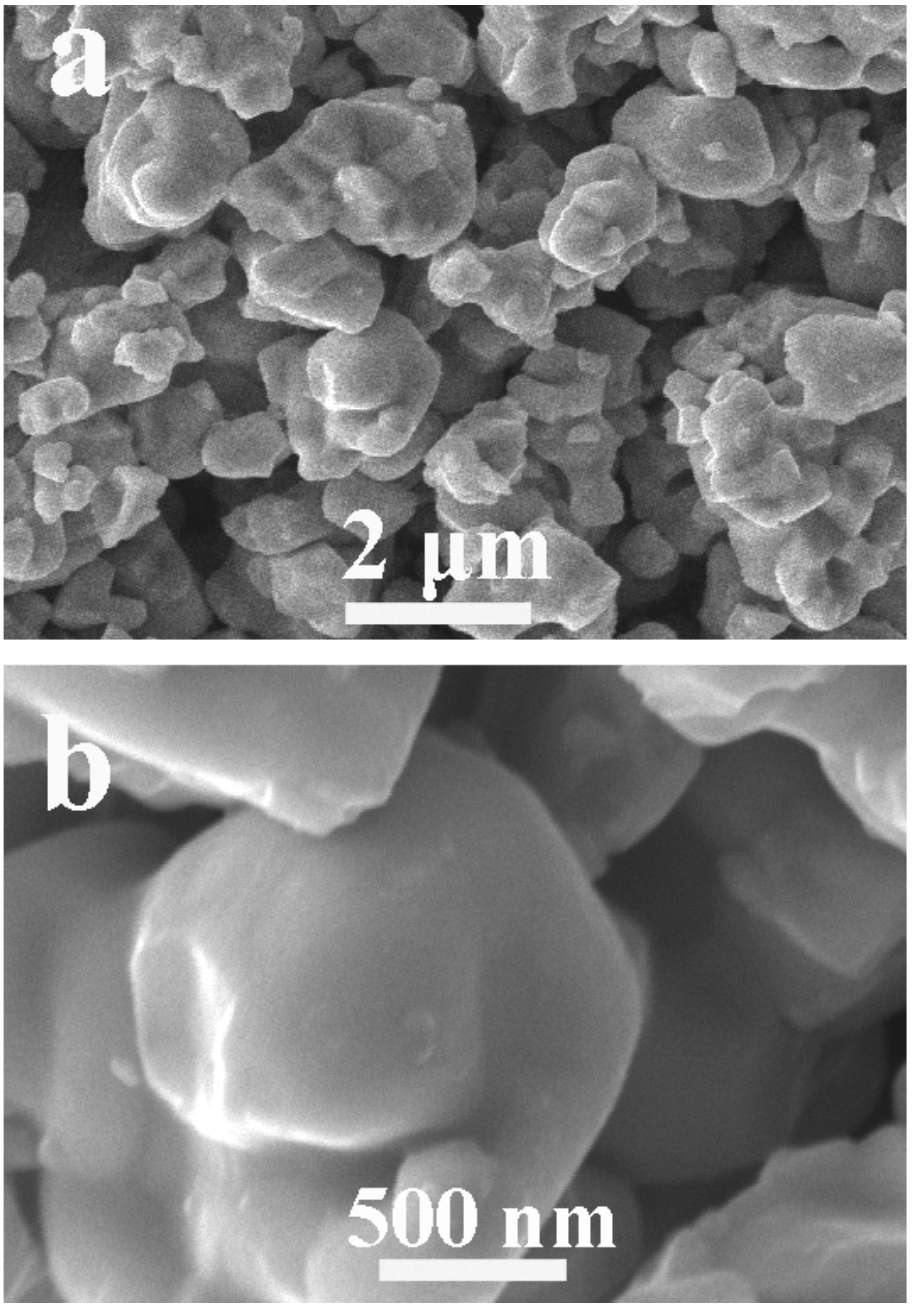

Fig. S1 SEM images of the commercial Mo_2C particles.

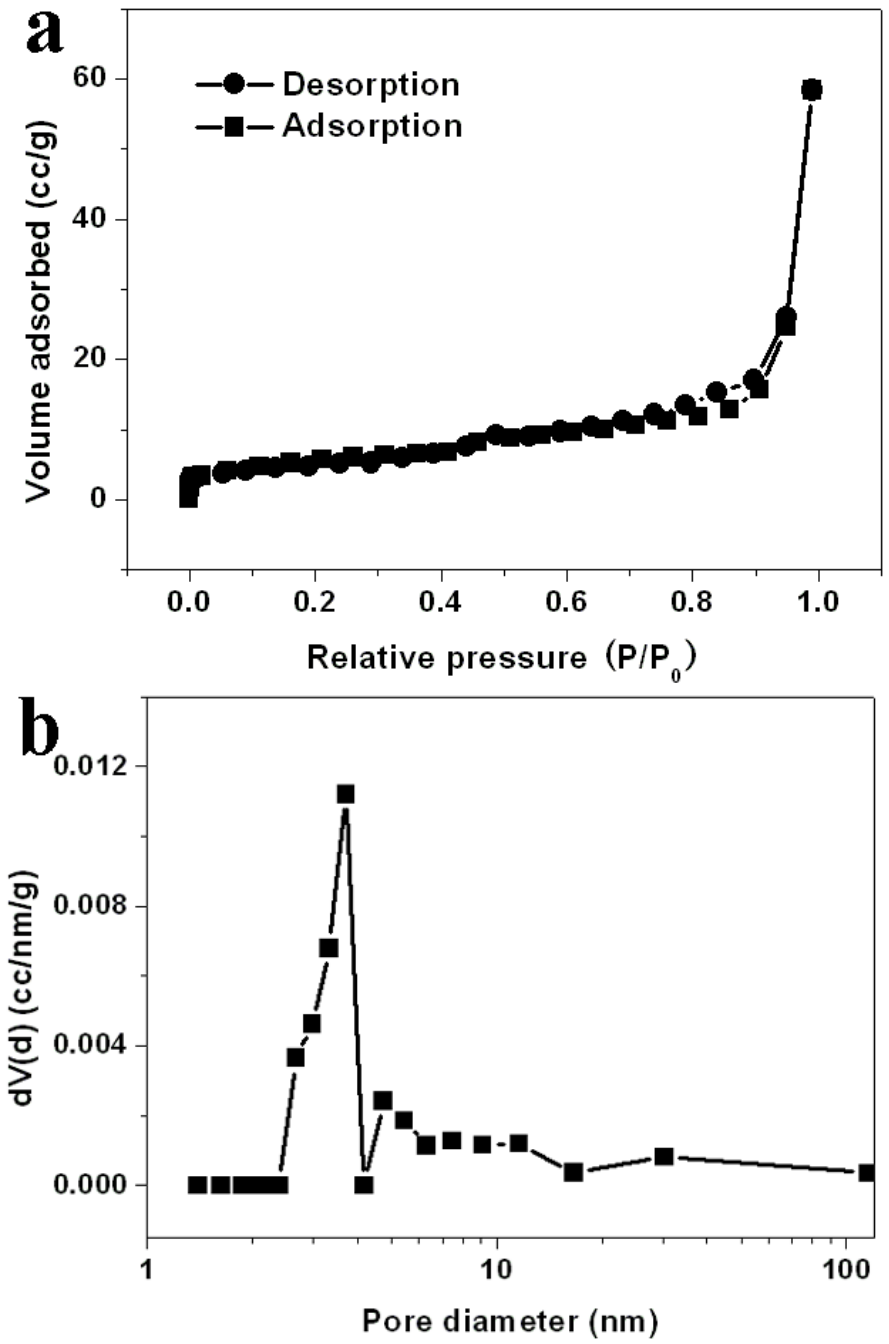

Fig. S2 (a) N_2 adsorption-desorption isotherm and (b) pore size distribution of Mo_2C NWs.

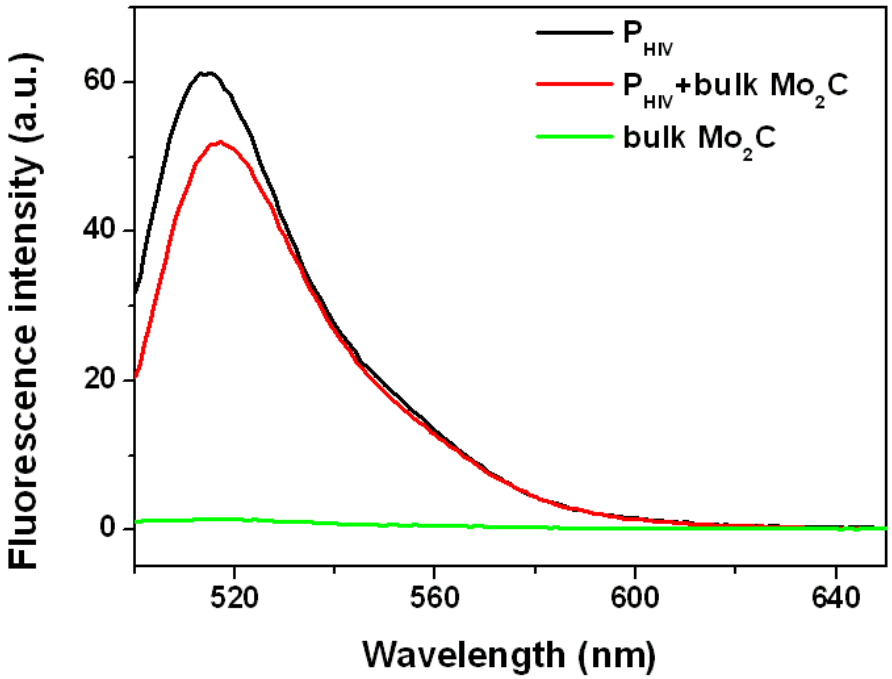

Fig. S3 Fluorescence spectra of P_{HIV} (50 nM) at different conditions: P_{HIV}, P_{HIV} + bulk Mo_2C and bulk Mo_2C.

Reference

1. Q. Gao, C. Zhang, S. Xie, W. Hua, Y. Zhang, N. Ren, H. Xu and Y. Tang, *Chem. Mater.*, 2009, **21**, 5560.