Direct Synthesis of CdS Nanodots Embedded in Bovine Serum Albumin without External Sulfur Source for Cell Imaging

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METHODS

Chemicals and materials: Chemicals were obtained from Sigma-Aldrich unless otherwise mentioned. Ultrapure Millipore water (Milli-Q, 18.2 MΩ) was used in all experiments. Cell culture mediums were purchased from Hyclone. All glassware was washed with aqua regia (3:1 conc. HCl: conc. HNO_3) and then rinsed with ultrapure water and ethanol.

BSA bio-mineralized cadmium nanodots (CND-1 and CND-2):

In a typical experiment, aqueous $CdCl_2$ (0.1M, 25 μL) was slowly introduced into a solution of BSA (10mg/ml, 1 mL) in a 5 mL vial under vigorous stirring. NaOH (0.5 M, 200 μL) was added within 30 seconds to adjust the final pH to above12. The sample was sealed in dark and 80℃ water bath for 5 hours with durative stirring. The as-synthesized mixture was dialyzed for 24 hours (Dialysis Tube MWCO: 500) to remove any free reagents. green emitting CND-1 were obtained.

To prepare the CND-2, an analogous procedure was used except $CdCl_2$ (0.1M, 100 μL) was added, and then dialyzed as above.

Characters of CNDs-1 and CNDs-2.

UV–vis spectra were obtained on a UV5800 Spectrophotometer. XPS analysis was carried out on an ESCALAB MK II X-ray photoelectron spectrometer using Mg as the exciting source. TEM measurements were performed on a HITACHI H-8100 electron microscopy (Hitachi, Tokyo, Japan) with an accelerating voltage of 100 kV. The sample for TEM characterization was prepared by placing a drop of colloidal solution on carbon-coated copper grid and dried at room temperature. Fluorescent emission spectra were recorded on a RF-5301PC spectrofluorometer (Shimadzu, Japan). The mass concentration of cadmium in dry samples was measured by ICP-MS (Thermo Elemental X7, USA).

Cell culture and staining

Hela (human cervical cancer cell line) cells were used for CNDs cellular staining studies. Hela cells were seeded in glass bottom culture dishes and grown in DMEM/high glucose (1×) medium supplemented with 10% (v/v) fetal bovine serum. All cells were cultured in a humid incubator at 37 °C, under an atmosphere containing 5% CO_2. Exponentially growing cells were dissociated with 0.25% Trypsin-EDTA (1×) cell dissociation medium (GIBCO).

The cell staining of CNDs-1 was carried out as follows. A solution containing 1×10^4 cells/mL was plated in a glass bottomed culture dish (Mat Tek) and precultured for 24h. After removal of the culture medium and rinse twice with PBS (pH 7.3), cells were incubated with culture medium solution containing CNDs-1 for 24h at cell culture incubator. Before fluorescent imaging observation, the cells was washed twice with PBS and then fixed with 3.7% paraformaldehyde (Sigma) in mini-Q solution at 4 °C for 30 min to fix the state of cells, after that the fixed cells were washed once with PBS. Cells were imaged using an NIKON TE2000 inverted fluorescence microscope system.

Sequence of BSA.[1]

1 dthkseiahr fkdlgeehfk glvliafsqy lqqcpfdehv klvneltefa ktcvadesha
61 gcekslhtlf gdelckvasl retygdmadc cekqeperne cflshkddsp dlpklkpdpn
121 tlcdefkade kkfwgkylye iarrhpyfya pellyyanky ngvfqeccqa edkgacllpk
181 ietmrekvlt ssarqrlrca siqkfgeral kawsvarlsq kfpkaefvev tklvtdltkv
241 hkecchgdll ecaddradla kyicdnqdti ssklkeccdk plleckshcia evekdaipen
301 lppltadfae dkdvcknyqe akdaflgsfl yeysrrhpey avsvllrlak eyeatleecc
361 akddphacys tvfdklkhlv depqnlikqn cdqfeklgey gfqnalivry trkvpqvstp
421 tlvevsrslg kvgtrcctkp esermpcted ylslilnrlc vlhektpvse kvtkcctesl
481 vnrrpcfsal tpdetyvpka fdeklftfha dictlpdtek qikkqtalve llkhkpkate
541 eqlktvmenf vafvdkccaa ddkeacfave gpklvvstqt ala

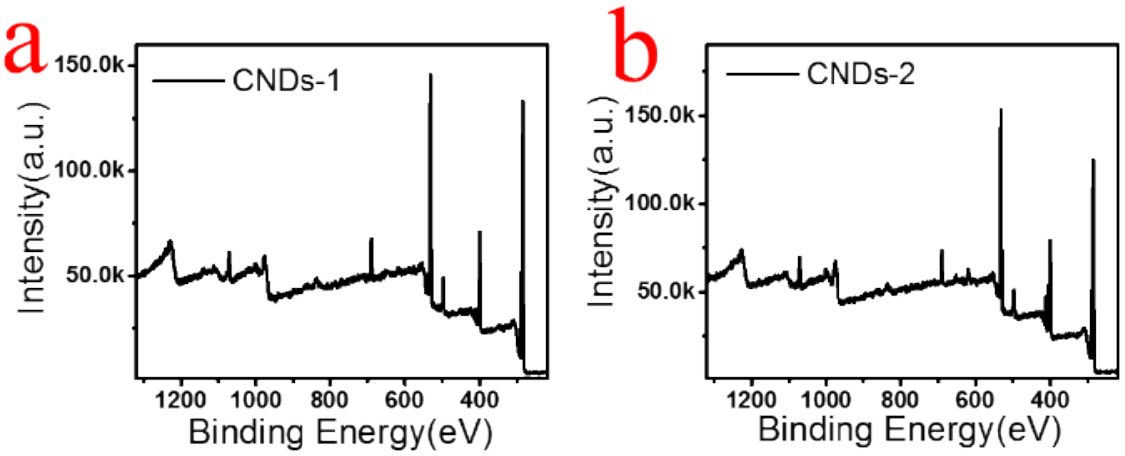

Figure S1. XPS survey scan of CNDs. The general scan XPS spectra of CNDs-1 a) and CNDs-2 b).

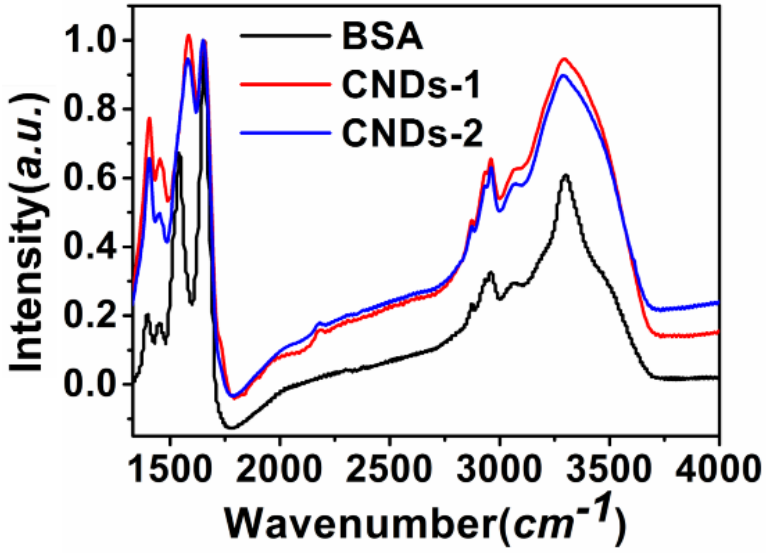

Figure S2. The FT-IR spectra for the BSA (black line), CNDs-1 (red line) and CNDs-2 (blue line)

Figure S3: Photographs of different CNDs under room light: 1, CNDs-1; 2, CNDs-1-Cys; 3, CNDs-1-Na_2S.

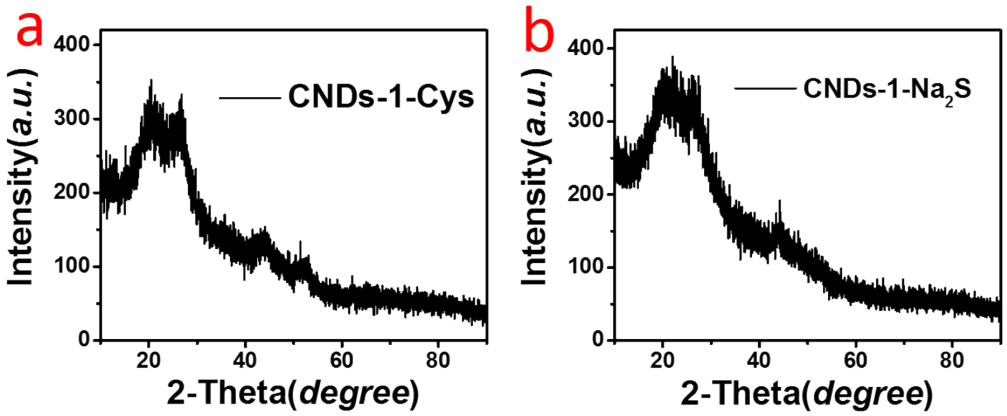

Figure S4: XRD patterns of the CNDs. a), CNDs-1-Cys; b), CNDs-1-Na_2S.

1 A. Bujacz, *Acta Crystallogr. D*, 2012, **68**, 1278.