

The Sonication Treatment of CdTe/CdS Semiconductor Nanocrystals and their Bio-Application

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Complete experimental procedures

Materials

Cadmium nitrate tetrahydrate ($\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$, 98%) were purchased from Kanto, Tellurium (Te powder, 200mesh, 99.8%), trioctylphosphine (TOP, Technical grade) were purchased from Aldrich, Dodecylamine ($\text{CH}_3(\text{CH}_2)_{11}\text{NH}_2$, EP grade), sulfur (S powder, EP grade) were purchased from Junsei, Thioglycolic acid (HSCH_2COOH , 98%) were purchased from Acros Organics.

Synthesis of CdTe/CdS core/shell

The synthetic method of CdTe/CdS, core/shell structure were modified other reports. The CdTe core was prepared by the following process. It was synthesized that $\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ (0.4535 g) was dissolved in mixed solution, dodecylamine (10 g) and trioctylphosphine (7 mL). This solution was heated to 50°C and trioctylphosphine (7 mL) was added. This solution was heated to 110°C and then Te powder (0.1 g) was added. This solution heated for 3 h at same temperature. Residual solution was removed by wash and centrifuge with chloroform and methanol for several times. The CdS shell was synthesized onto the CdTe core. The core was dispersed into dodecylamine (10 g) and heated to 100°C . Dissolved solutions, composed of $\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ (0.4535 g) and S powder (0.099 g) into trioctylphosphine (3 g), were put into dispersed core solution and heated for 1h. The core/shell powder was obtained by washing and centrifuge.

Synthesis of water-soluble TGA-capped CdTe/CdS

The synthesized CdTe/CdS was treated for dispersing in water by appropriate amounts of the pH controlled thioglycolic acid with KOH. Prepared core/shell, CdTe/CdS was spread in chloroform. Thioglycolic acid in methanol was controlled pH over 13 with KOH. This solution was drop in chloroform. Some water added this solution and then this was separated two parts, one is water which was contained CdTe/CdS, othe is chloroform. Only water part was decoupled from this solution.

Analysis of the cell cytotoxicity

Cell cytotoxicity test was assessed by MTT assay. Confluent cells grown in 96-well microplates (at 3-4 days after seeding) were added with the 100 μ l of the QDs diluted with DMEM/2% FBS. After incubation for 24 h, the residual QDs were removed and a MTT solution at the concentration of 2.5 mg/ml in PBS(-) was added to each well and incubated in a humidified CO₂ incubator at 37 °C for 1.5 h. Then, 100 μ l of acidified isopropanol/10% Triton X-100 solution was added and the plates were shaken to dissolve the formazan products. The absorbances at dual wavelength (540 nm as main and 690 nm as reference) were measured with a microplate reader (Thermomix, Molecular Devices, Sunnyvale, CA). The cell survival in the control wells without QD solutions was considered as 100% cell survival. The 50% cytotoxic concentration (CC₅₀) was defined as the concentration of compound that reduced the absorbance of the control samples by 50%.

Laser Scanning Confocal Microscopy Imaging

Virus-infected HeLa cells in 4-well chamber slides (Nunc, Roskilde, Denmark) were washed twice with PBS(-) and fixed with 4% phosphate-buffered paraformaldehyde at RT for 10 min. The cells were rinsed with PBS(-) and permeabilized by absolute methanol at -20 for 20 min. After washing with PBS(-) twice, blocking was performed with 0.4% bovine serum albumin (BSA) (Sigma) in PBS(-) at RT for 30 min. QD-conjugated laboratory-derived rabbit anti-vTK antibody [1:100 diluted with 10 μ g/ml of BSA in PBS(-)] was added to the cells, which were then kept at RT for 1 h before being washed 3 times with PBS(-). The nuclei of cells were stained with Propidium iodide solution and mounted in glycerol buffer. All the fluorescence images were recorded using a Zeiss LSM 510 confocal microscope (Carl Zeiss AG, Germany) with an excitation wavelength of 488 nm and an emission wavelength of >505 nm.

Statistical Analysis

The statistical evaluations of the experiments were performed by ANOVA followed by a Newman-Keuls Multiple Comparison Test.

Figure S1. EDX spectrum of the water-soluble TGA-capped CdTe/CdS after ultrasonic irradiation.

