Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Glycerol-water mediated centrifuge controlled green synthesis of oleic acid capped PbS quantum dots for live cell imaging†

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Synthesis of PbS QD: Briefly, Sulphur precursor of the PbS QDs is acquired by loading 2.041 g of sodium sulphide, 50 mL of oleic acid and 50 mL of glycerol/water (v/v 1:1) solution in a 200 mL three neck flask at room temperature. The mixture is purged with N_2 gas to evacuate oxygen and after that warmed to 180^o C utilizing the oil bath. Next, lead precursor is acquired from a mixture of lead acetate in 0.2 mL Oleic acid and 0.4 ml glycerol at room temperature. The mixture is again purged with N_2 gas to evacuate oxygen and warmed at 80^o C for 30 minute using the oil bath. Solution of this lead precursor was injected rapidly into the vigorously mixing sodium sulfide solution at 180^o C. The color of the solution turned into dark immediately. After that we utilized different precipitation strategy for precipitating the nanoparticles. In the first method, the temperature of the reaction vessel was diminished to 150^o C and kept up for the remaining growth time and thereafter cooled to room temperature. Then the solution was transferred to centrifuge tubes. PbS nanoparticles were acquired by precipitation in ethanol and the tubes were centrifuged for 15 minute at the speed of 4000 rpm. This precipitation was rehashed for five times for complete evacuation of un-reacted precursor and solvents. At last, the dark precipitated products were dried under vacuum at 90° C for 2 hour and the sample acquired through this technique is referred as sample A. In the second technique, the temperature of the reaction vessel was diminished to 150° C and kept up for the remaining development time under steady mixing, then cooled to room temperature without exposing the solution to atmospheric conditions. The solution was then transferred to centrifuge tubes and the purification of dots was done by precipitation it with ethanol. The tubes were centrifuged for 10 minute at a speed of 7000 rpm. This precipitation was rehashed for 7 times for completely removing the impurities. At last, the products are dried at 90° C for 6 hour and this sample is referred as sample B.

***In vitro* cytotoxic activities (MTT assay):** *In vitro* cytotoxicity was determined using the standard MTT assay. [1] The MTT proliferation assay is based on the reduction of the yellow MTT tetrazolium salt (3-[4,5-dimethylthiazol-2-yl]-2,5diphenyltetrazolium bromide) by mitochondrial dehydrogenases to form a blue MTT formazan in viable cells. Oleic acid capped PbS QD were practiced aforementioned to the experiment by dissolving in buffer followed by serial dilution with medium. One cancer cell lines i.e. human Epitheloid Cervix Carcinoma (HeLa), and one normal Human embryonic kidney cells (HEK-293) were used in the assay. Approximately 1×10^4 cells/ml in each well for all the cell lines were cultured in 100 µL of a growth medium in 96-well plates and incubated at 37 °C under a 5% CO_2 atmosphere. The cells were then treated with different concentrations of the PbS (0-800 µg/ml) in the volume of 100 µL /well. Cells in the control wells accepted the same volume of medium containing 0.1% DMSO. After 24 h, the medium was discarded and cell cultures were incubated with 100 µl MTT reagent (1 mg/ml 1 mg/mL in PBS buffer with pH 7.4) for 5 h at 37^o C. After removing the solution, the cells were lysed by adding 200 µL methyl sulfoxide. Then the suspension was placed on microvibrator for 10 min and subsequently the absorbance was recorded by the ELISA reader at λ = 570 nm. The experiment was also performed in triplicate. The data were expressed as the growth inhibition percentage calculated according to the equation: % Cell viability = $[OD_{sample}\text{-}OD_{blank}/OD_{control}\text{-}OD_{blank}]$ x 100, where OD_{sample} is the measured absorbance in wells containing samples, $OD_{control}$ is the absorbance measured for cells with a medium and a vehicle and OD_{blank} is the absorbance measured for blank well (no cells). Dose response curve was fitted in origin 6.1 software and IC_{50} was calculated.

METHODOLOGY FOR CANCER CELL FLUROSCENCE IMAGING:

HeLa cell line from NCCS was used for this study. Cellular uptaking study of the drugs was carried out in 6 well plates. Cultured cells with 80% confluence were taken and trypsinisation was done by using 1-2ml of 1X trypsin. Then it was transferred to fresh 15 ml falcon tube and centrifuged at 2000 rpm for 5 minutes. DMEM fresh media (80µl) was added to the pellet formed at the bottom of the tube and the cells were seeded in 6 well plates. Then Sample B ($3X10^{-5}$M in PBS buffer) was added to well plates. After incubated for 4 h at 37 °C, all the wells

6 well plates washed twice with PBS buffer (pH 7.4). The glass slides as the fluorescence images were prepared using the cover glass of the 6-well plates. Then, the fluorescence images were recorded with an Olympus Fluorescence microscope with both the excitation filter (green channel: 460-490 nm excitation and red channel: 480-550 nm excitations).

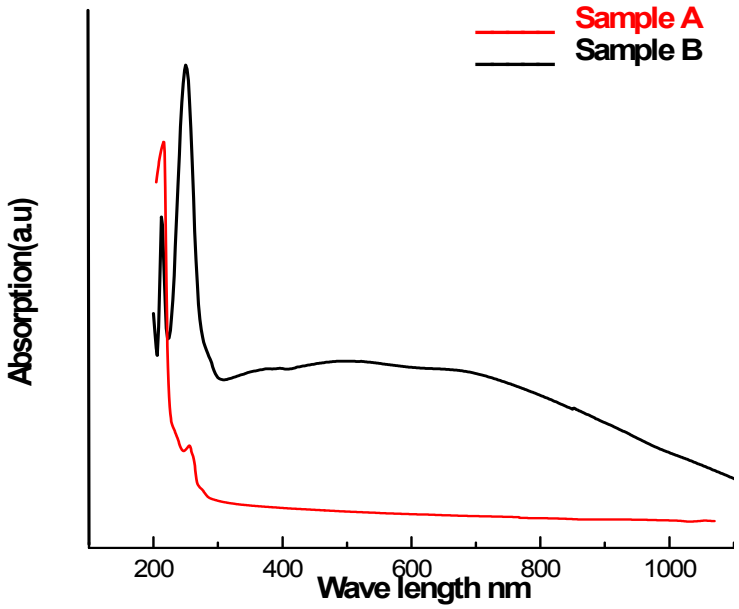


Figure S1. Absorption spectra of PbS quantum dots (Red colour spectra for sample A dots and Black colour spectra for sample B dots.)

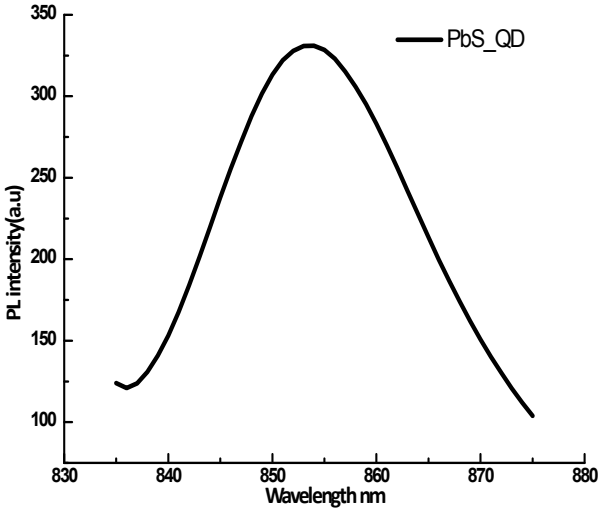


Figure S2. PL spectra of Sample B in NIR I window (PbS QD excited at 550 nm)

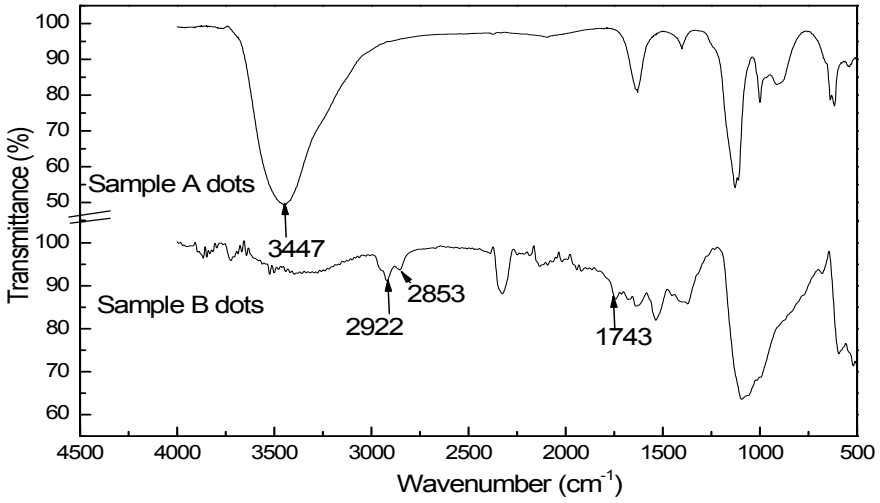


Figure S3. FTIR spectra of sample A and sample B PbS QDs

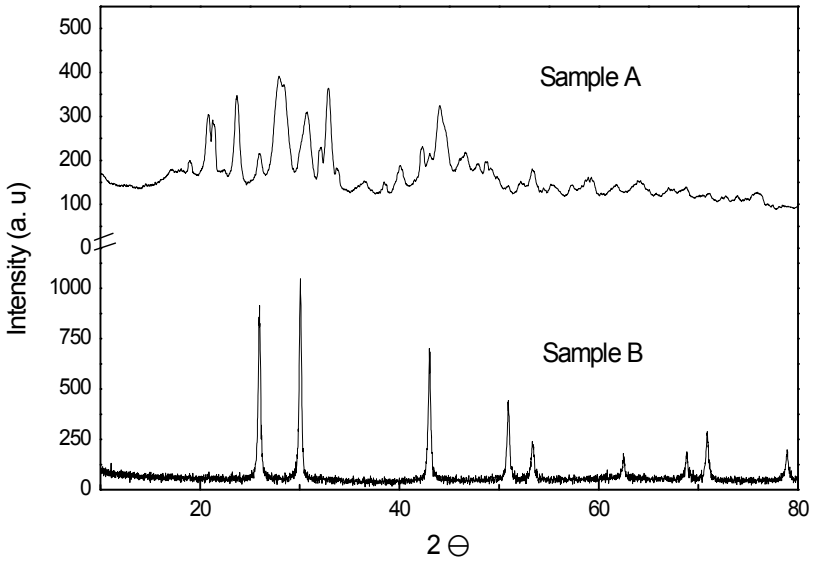


Figure S4. High power X-ray diffraction pattern of sample A dots sample B dots

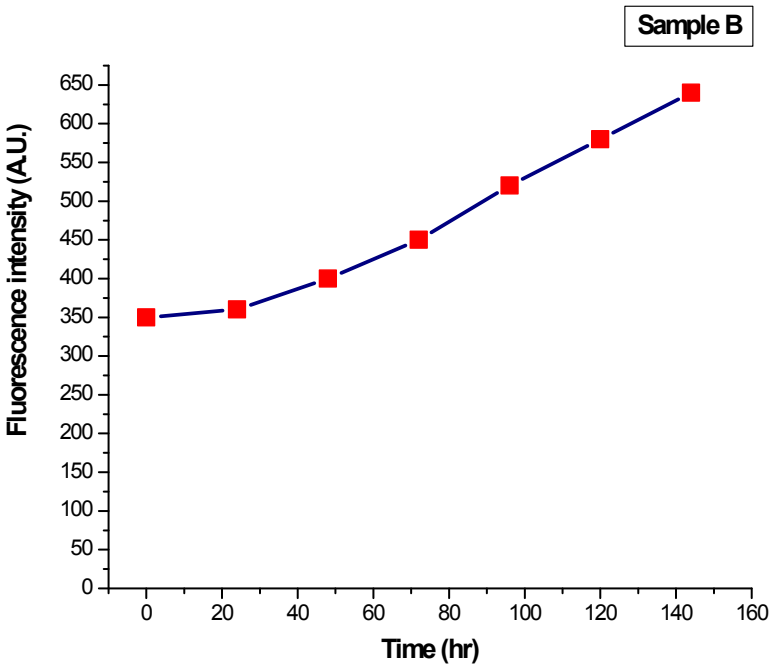
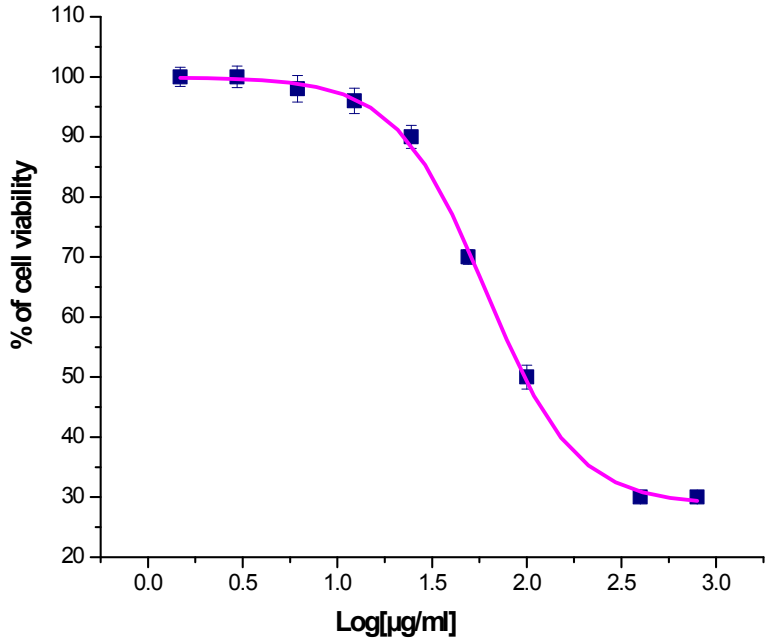
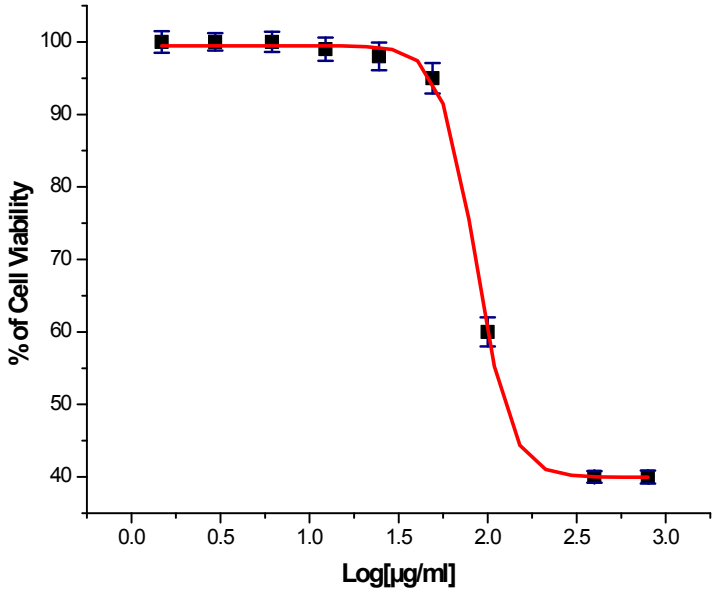


Figure S5. Fluorescence stability of Oleic acid capped PbS QD (sample B)



(a)



(b)

Figure S6. The influence of PbS QD (sample B) on the cell viability of (a) HeLa cell line (b) HEK-293 cell line

References

1 (a) T. Mossman, *J. Immunol. Methods*, 1983, **65**, 55-63.; (b) S. Saeed, N. Rashid, P. G. Jones, M. Ali and R. Hussain, *Eur. J. Med. Chem.*, 2010, **45**, 1323-1331.