Photochemical Growth of Cadmium-rich CdS Nanotubes at the Air–Water

Interface and Their Use in Photocatalysis

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Electronic Supplementary Information

CdS tubes only formed at the air-water interface under UV irradiation and they are rich in metal cadmium. At the same time, CdS particles without regular shapes could form in the inner of the precursor solution, but they were rich in sulfur and no metal cadmium was detected, as shown in figure S1.



Figure S1, SEM image of CdS particles from the inner of the solution (A) and the corresponding XRD spectra (B).

The formation of CdS nanotubes was closely related to the air. When the photochemical reactions occurred in N2-water interface instead of air-water interface, there were only CdS dentritic lamellas produced on the surface of the solution. No any tube could be found, as shown in figure S2.



Figure S2, CdS structured film formed on the surface of solution in N2 ambience after irradiated 24 hours with UV light.

The metal cadmium either in tube or in wall could be removed by the nitric acid, as shown in Fig. S3. Comparing the TEM image of the HNO₃-treated tube (Fig. S3 B) with that of the original Cd-rich tube (Fig. S3 A), we could find the wall of the HNO₃-treated tube was loose and porous, while that of the Cd-rich tube was dense. The porous wall should be induced by the removal of the metal Cadmium. The concentration of nitric acid should be limited in a certain range, otherwise, when it gets high, part of CdS could be solved. Fig. S4 shows an image of a sample washed with 0.5M nitric acid. A groove-like curved lamella was clearly showed. This could further explain the nanotube formed by the bend of the lamella.



Figure S3, TEM images of Cd-rich CdS nanotube (A) and the HNO₃-treated tube (pure CdS nanotube) (B)



Figure S4, SEM image of CdS nanotube from Cd-rich CdS nanotube washed with 0.5M nitric acid.The as-prepared pure CdS nanotubes had high surface area than that of Cd-Doped samples.Figure S5 shows the measurement of the two samples.



Figure S5, BET measurement of Cd-rich (A) and pure (B) CdS nanotubes.

In the first hour of the photochemical reaction, there was a temperature variation with about 4°C, which might be an important factor for the bend of the origin lamellas. And then the temperature could keep invariable, as shown in figure S6.



Figure S6, Temperature variation of the solution in the initial stage in an experiment.