Supporting Information

Facile Synthesis of Cross-linked Ag-CdS Nanoshell Morphology for Highly Efficient Photocatalytic Activity

Shubhranshu Bhandari[1,*,#], Mir Sahidul Ali[2,*,#], Debayan Roy[3,*], Suresh Saini[4,*], Mir Intaj Ali[5], Mir Sahanur Ali[2,6]

[1] College of Engineering, Mathematics and Physical Sciences, Environment and Sustainability Institute, University of Exeter, Penryn Campus, United Kingdom, TR10 9FE

[2] Department of Polymer Science and Technology, University of Calcutta, 92 A.P.C. Road, Kolkata - 700 009, West Bengal, India

[3] Independent Researcher, 265, Nripen Sarkar Road, Sahid Nagar, Kanchrapara, North-24 Parganas - 743145, India

[4] Centre for Nano and Material Sciences (CNMS), Jain Global Campus, JAIN (Deemed-to-be University), Bangalore - 562112 India

[5] Central Institute of Petrochemicals Engineering and Technology (CIPET): Institute of Petrochemicals Technology (IPT) –Bhubaneswar, B-25, CNI complex, Patia, Odisha - 751024, India.

[6] Centre for Research in Nanoscience and nanotechnology, University of Calcutta, Kolkata - 700106, West Bengal, India

[*] These authors have equal contributions.

[#]Corresponding authors: s.bhandari@exeter.ac.uk, shubhranshu0094@gmail.com, mir.sahidul@gmail.com

Table S1. The elemental weight percentage of Ag-CdS obtained by energy-dispersive X-ray

Elements	Weight%
S	48.44
Ag	11.86
Cd	39.70
Totals	100.00

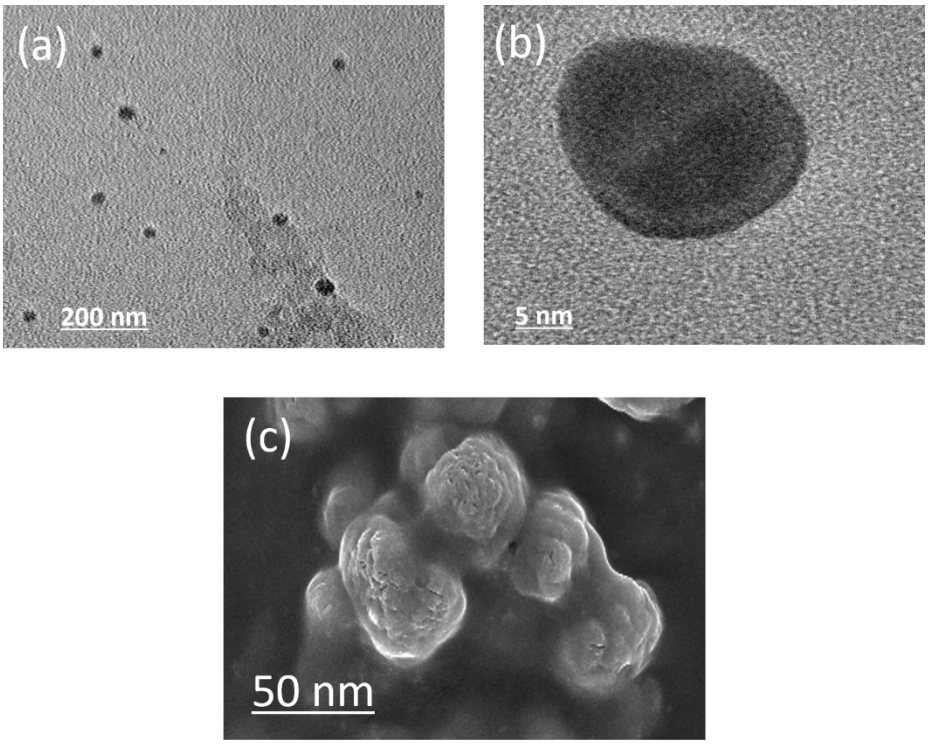

Figure S1. (a-b) TEM images of Ag nanoparticles, (c) SEM image of the Ag nanoparticles, respectively

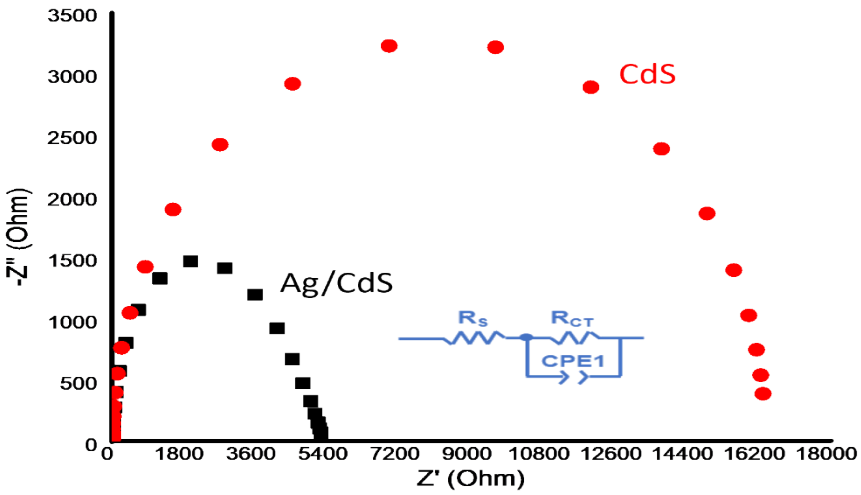

Figure S2. EIS Nyquist plots of CdS and Ag-CdS nanostructures with circuit diagram at the inset

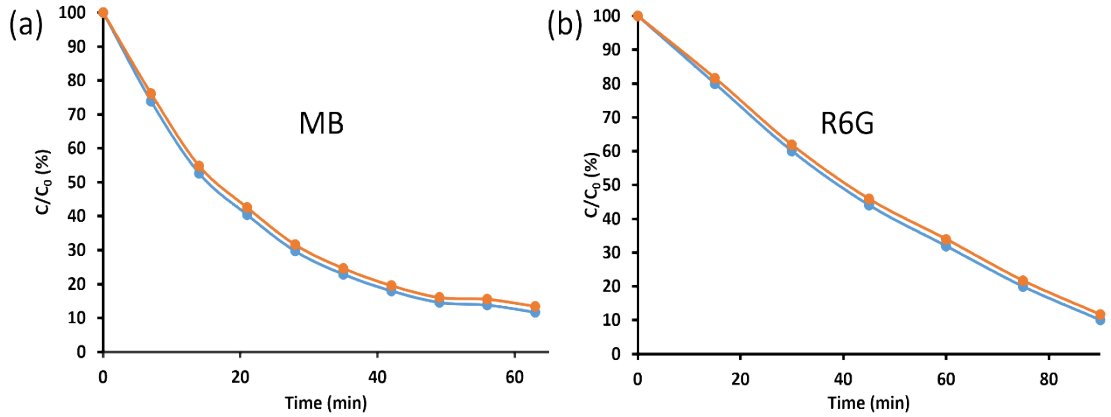

Figure S3. Repeated experiments of photocatalytic degradation of MB and R6G in the presence of Ag/CdS composite after the first (Blue) and fourth (Orange) round, respectively

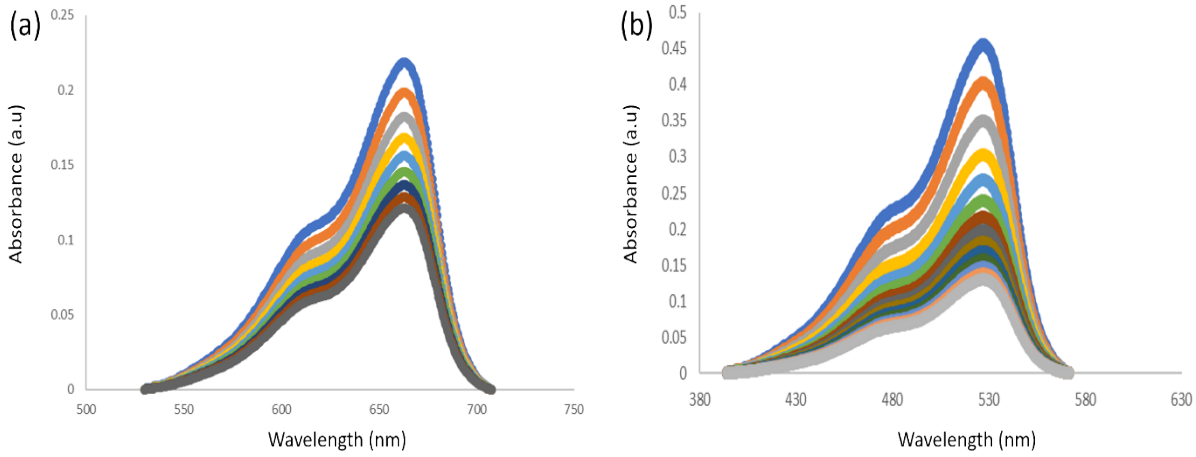

Figure S4. (a-b) Visible light photodegradation of MB and R6G dyes in the presence of CdS nanostructures, respectively

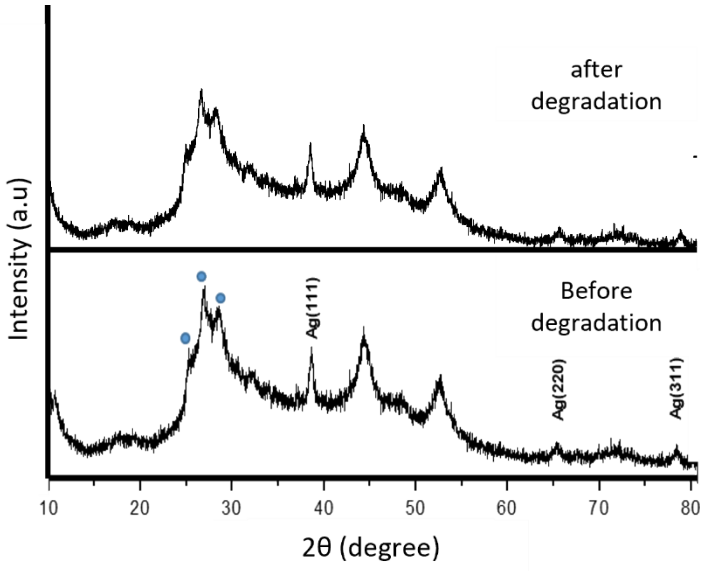

Figure S5. XRD pattern comparison for Ag/CdS heterostructure before dye degradation and after dye degradation for the fourth cycle

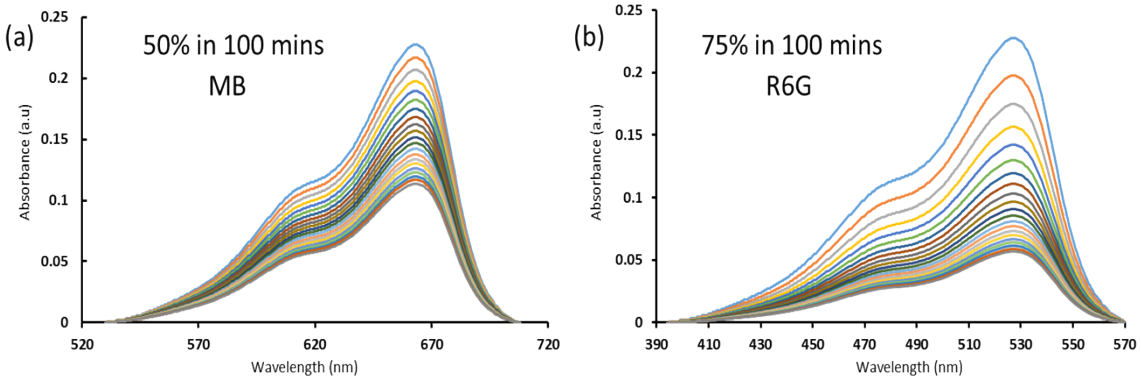

Figure S6. TOC test for mineralization rate of MB and R6G by ultra-violet photooxidation method with the Ag-CdS catalyst

Schematic representation of dye degradation mechanism

$$Ag\text{-}CdS + h\gamma \longrightarrow Ag(e^-)\text{-}CdS(h^+) \longrightarrow \quad (1)$$

$$Ag(e^-)\text{-}CdS(h^+) + H_2O \longrightarrow Ag(e^-)\text{-}CdS + H^+ + {}^{\bullet}OH \longrightarrow \quad (2)$$

$$MB + {}^{\bullet}OH \xrightarrow{[O]} \text{Oxidised product} \longrightarrow \quad (3)$$

$$Ag(e^-)\text{-}CdS + O_2 \longrightarrow Ag\text{-}CdS + O_2^- \longrightarrow \quad (4)$$