The Illustrative use of Thiosulfate in the Formation of New
Three-dimensional Hybrid Structures: Synthesis, Structure,
Transformation Studies and Sunlight Assisted Photocatalytic
Behavior

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\textbf{ELECTRONIC SUPPLEMENTARY INFORMATION}
Photocatalytic Experiment

Photocatalytic activity was studied using mercury vapor lamp of 125 W (λ=365 nm). Water was circulated through the annulus of the reactor to avoid heating of the solution and to maintain the temperature at 30 °C. The solution was continuously stirred to ensure that the catalyst was suspended uniformly. Samples were collected at regular intervals, filtered through Millipore membrane filters and centrifuged to remove the catalyst and analyzed using UV-Vis spectrometer (Perkin-Elmer, Lambda-32). Control experiments without the catalyst were also carried out which does not show any degradation under UV light.
Fig. S1: Powder XRD (CuKα) pattern of I, (a) experimental and (b) simulated.
Fig. S2: Powder XRD (CuKα) pattern of II, (a) experimental and (b) simulated
Fig. S3: Powder XRD (CuKα) pattern of III, (a) experimental and (b) simulated.
Fig. S4: TGA studies (in oxygen) of I, II and III.
Fig. S5: IR spectra of I, II and III.
Fig. S6: Solid state absorbance spectra (UV-visible) of compound I-III, 4,4’-bipyridine and Na$_2$S$_2$O$_3$. 

Absorbance (a.u) vs Wavelength (nm)
Fig. S8: One dimensional metal-thiosulfate chains in compound I, II and III.
Fig. S9: (a) Two-dimensional layer view of cadmium-thiosulfate with bpy, containing lattice water of compound I. (b) Three-dimensional interpenetrating structure of compound I. Purple, blue, cyan and green lines show that the different layer of bpy. Yellow line corresponds the thiosulfate chain.
Fig. S10: (a) Two-dimensional layer of Cd and bpy in Compound II. (b) One-dimensional edge-sharing rectangular box in compound III. Linear lines are bpy unit and green spheres are Cd.
Fig. S11: (a) Two-dimensional layer view of compound II with metal-thiosulfate and bpy. Two coordination of octahedral cadmium with bpy is missing here which forms the three-dimensional structure. (b) The three-dimensional architecture of compound II.
Fig. S12: (a) Two-dimensional layer view of compound III with metal-thiosulfate and bpy. One coordination of trigonal bipyramidal cadmium with bpy is missing here which forms the three-dimensional structure. (b) The three-dimensional architecture of compound III.
Fig. S13: (a) Schematic diagram of **pcu** net.

Fig. S13: (b) Schematic diagram of **pcu** net in another view.
Fig. S14: (a) Schematic diagram of compound II. Big green spheres are octahedral and small green spheres are tetrahedral cadmium centers which are connected by thiosulfate ion (yellow lines) and 4,4′-bpy (blue and red lines) unit.

Fig. S14: (b) Schematic diagram of pcu net. Purple bonds show the bonds that are absent in II and black dotted lines are extra bonds in II.
Fig. S15: (a) Schematic diagram of compound III. Big green spheres are trigonal bipyramidal and small green spheres are tetrahedral cadmium centers, respectively, connected by thiosulfate ion (yellow lines) and 4,4'-bpy (blue lines) unit.

Fig. S15: (b) Schematic diagram of pcu net. Purple bonds represent the bonds that are absent in III.
Fig. S16: (a) Schematic diagram of compound **III**. Green spheres are tetrahedral cadmium centers (avoiding two terminal water molecules) which are connected by thiosulfate ion (yellow lines) and 4,4'-**bpy** (blue lines) unit.

Fig. S16: (b) Schematic diagram of **peu** net. Purple bonds represent the bonds that are absent in **I** and black dotted lines are the extra bonds present in **I**.
Fig. S17: Transformation of I to II by reaction of I and bpy (1: 0.50) at 45 °C at different times (a) pure I, (b) after 4 hrs, (c) after 8 hrs, (d) after 12 hrs and (e) after 20 hrs (pure II) The symbol * shows the peak of I and the symbol o represents II.
Fig. S18: Transformation of I to III by the reaction of I and bpy (1: 0.25) at 60 °C in different times (a) pure I, (b) after 4 hrs, (c) after 8 hrs, (d) after 12 hrs and (e) after 20 hrs (pure III). The symbol * represent the peaks of I, the symbol o represents the peaks of II and the symbol + represents the peaks of III.