Electronic Supplementary Material (ESI) for Dalton Transactions

Supporting Information

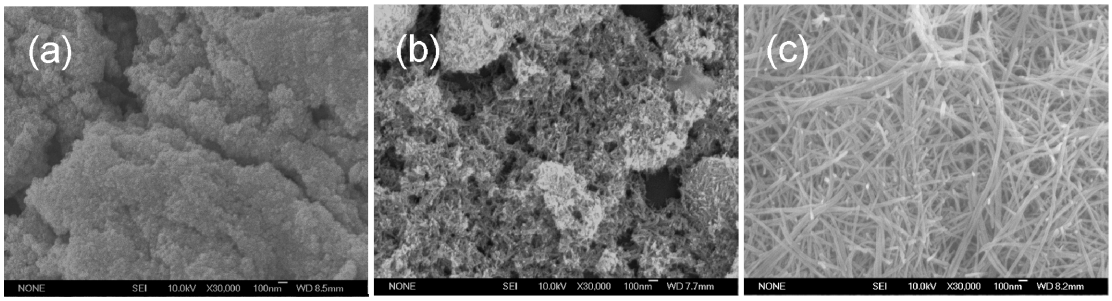

Fig. S1 Morphology evolution of Bi_2S_3 ultralong nanowires with different time: (a) 0.5 h; (b) 1 h and (f) 12 h.

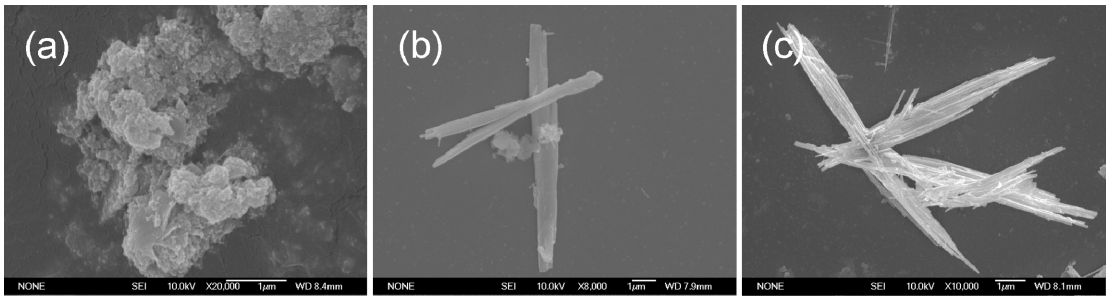

Fig. S2 Morphology evolution of Bi_2S_3 nanowire bundles with different time: (a) 0.5 h; (b) 1 h and (c) 2 h.

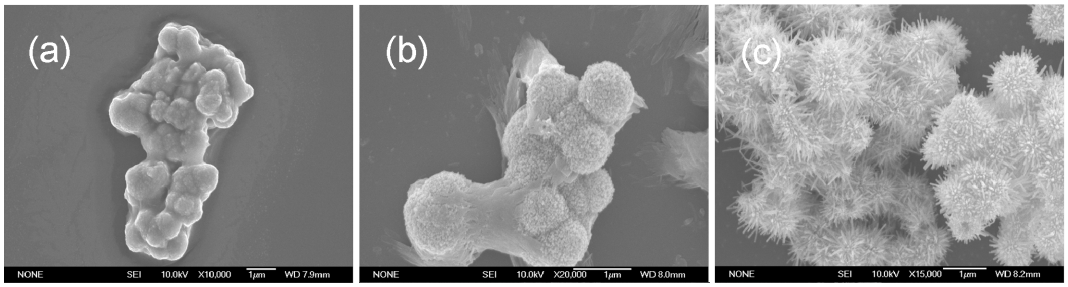

Fig. S3 Morphology evolution of urchin-like Bi_2S_3 microspheres with different time: (a) 0.5 h; (b) 2 h and (c) 12 h.

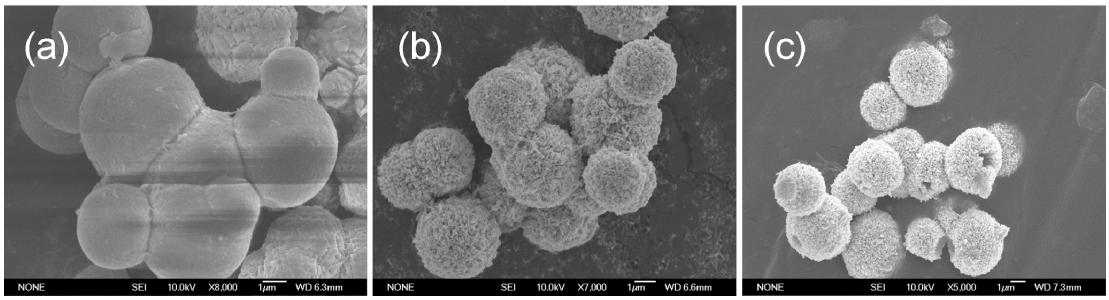

Fig. S4 Morphology evolution of Bi_2S_3 microspheres with cavities at different time: (a) 0.5 h; (b) 2 h and (f) 12 h.

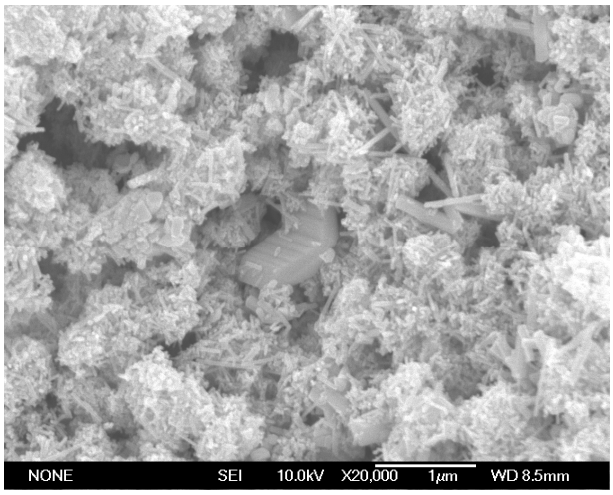

Fig. S5 SEM image of the sample synthesized under the same condition as the ultralong nanowires except that the amount of TAA is 0.75 g.

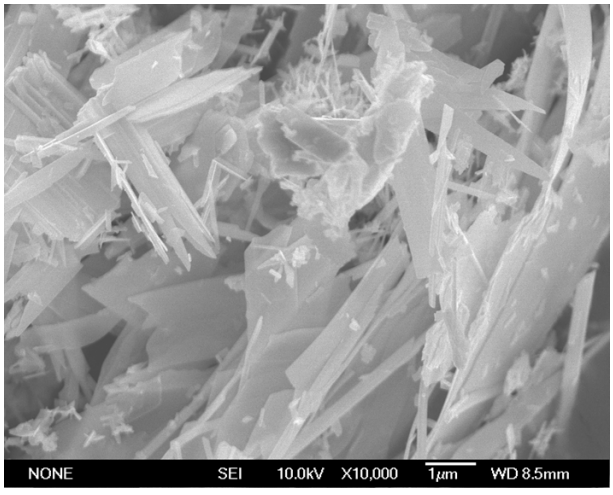

Fig. S6 SEM image of the sample synthesized under the same condition as the nanowire bundles except that the amount of KSCN is 0.3 g.

Influence of Experimental Parameters on Various Bi_2S_3 Nanostructures

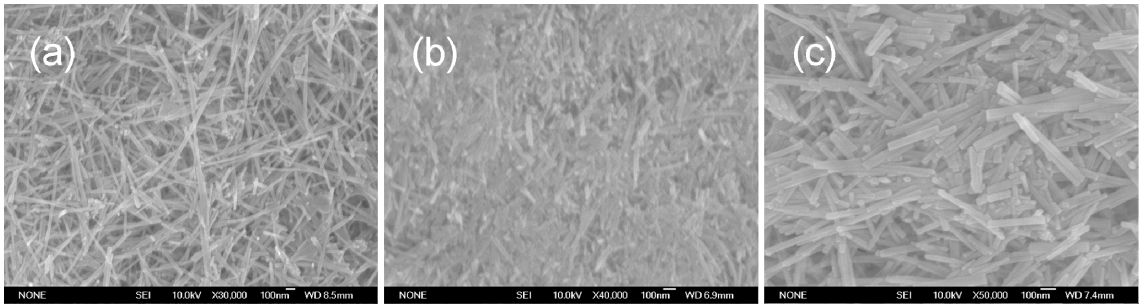

Fig. S7 Typical SEM images for Bi_2S_3 samples: (a) P2, (b) P3 and (c) P4.

The results of syntheses performed by using TAA as the sulfur source under different conditions are summarized in Fig. 1b-d, S7 and Table 1. The length of the resulting Bi_2S_3 nanostructures can be varied greatly by varying the experimental parameters such as the amount of TAA and reaction temperature. When the amount of TAA was decreased to 0.75 g while other conditions kept the same, pure Bi_2S_3 nanowires with a length of about 3 μm (Fig. 1b and S7a) could be obtained. Moreover, reaction temperature also strongly affected the length of final product. When the reaction temperature was decreased to 140 °C, shorter Bi_2S_3 nanorods with a length of about 300 nm (Fig. S7b) were obtained. When the reaction temperature was enhanced to 220 °C, Bi_2S_3 nanorods with a length ranging from 300 to 600 nm (Fig. S7c) were obtained. From XRD data (Fig. 1a, b and d), one can see that the impurity (sulfur) among the products was attributed to high concentration of TAA. In summary, the influence of those factors is realized through changing their nucleation and growth.

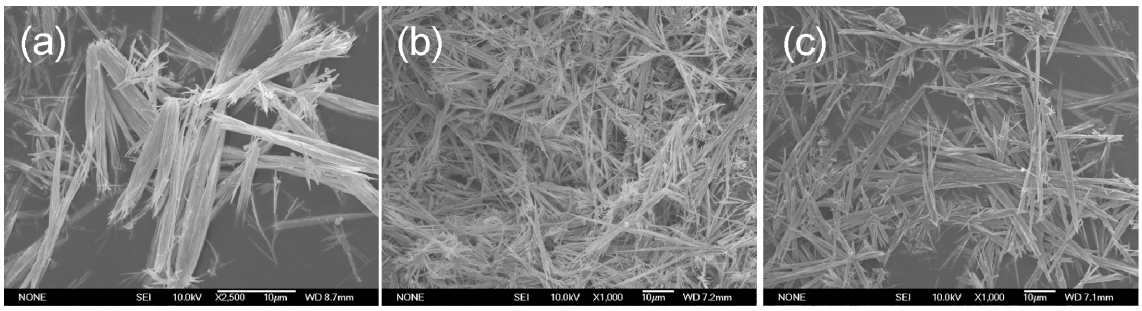

Fig. S8 Typical SEM images for Bi_2S_3 samples: (a) P6, (b) P7 and (d) P8.

Bi_2S_3 nanowire bundles were synthesized by using KSCN as the sulfur source under different conditions. The results of the syntheses performed with different experimental parameters are summarized in Fig. 3b-d, S8 and Table 1. In Fig. S8, one could find that the amount of KSCN played important roles in determining the size of Bi_2S_3 nanowire bundles. When the amount of KSCN reached 2.5 g, the morphology of Bi_2S_3 (Fig. S8a) kept bundle-like shape with similar size. When the amount of

KSCN was decreased to 1.5 g, the length of nanowire bundles (Fig. S8b) obviously increased to several tens of micrometers. Moreover, one also found that nanowires in bundles displayed divergent. However, one can see that the nanowires in bundles are tightly held together when further decreasing the amount of KSCN to 1 g. Based on above-mentioned data, we can conclude that amount of KSCN could influence the size and shape of nanowire bundles.

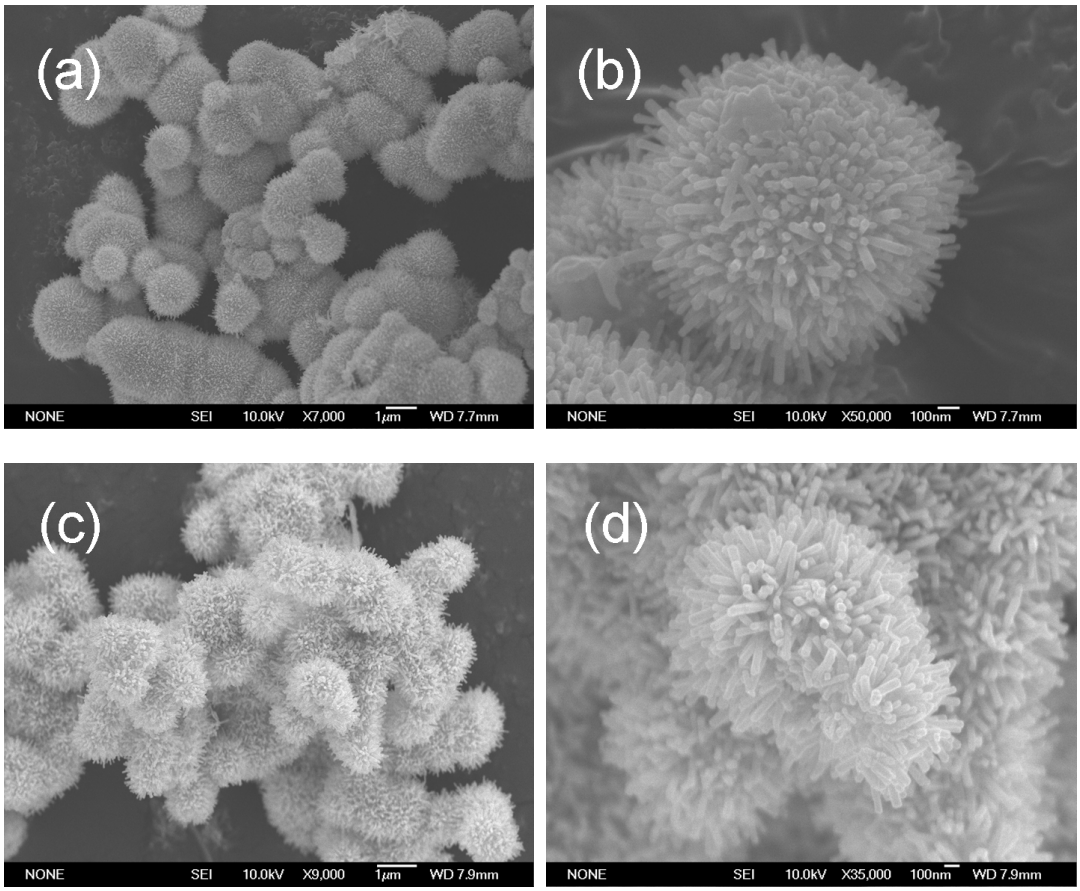

Fig. S9 Typical SEM images for Bi_2S_3 samples: (a and b) P10 and (c and d) P11.

Analogously, the urchin-like Bi_2S_3 microspheres with were synthesized by using $Na_2S_2O_3 \cdot 5H_2O$ as the sulfur source under different conditions. The results of the syntheses performed with different experimental parameters are summarized in Fig. 3b and c, S9 and Table 1. When the amount of $Na_2S_2O_3 \cdot 5H_2O$ was decreased to 2.4 g, the non-uniform urchin-like microspheres (Fig. S9a) were obtained. The nanorods arrayed in the microspheres were held more tightly than these in Fig. 5a. In Fig. S9b, the diameter of nanorods in the microspheres is about 40 nm. The aggregated urchin-like microspheres (Fig. S9c) were produced when the amount of $Na_2S_2O_3 \cdot 5H_2O$ was further decreased to 1.2 g. In Fig. S9d, the nanorods in the microspheres look like loose and have a diameter of about 40 nm. Moreover, we also found that there were some impurities (sulfur) in the product. In conclusion, the

morphology of urchin-like microspheres is controlled by the amount of $Na_2S_2O_3 \cdot 5H_2O$.