Supplementary Information

Superconducting TaS$_{2-x}$I$_y$ hierarchical nanostructures

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Fig. S1. EDX spectra of the products prepared with a 30 mg of iodine. (a) A single nanorod; (b) a piece of nanosheet.

Fig. S2. EDX spectra of the products prepared with a 60 mg of iodine. (a) A single nanorod; (b) a piece of nanosheet.
Fig. S3. EDX spectrum of the nanosheets prepared with a 120 mg of iodine.

**Discussion about the XRD patterns:**

In the powder XRD patterns, the intense peaks of the sample 1, 2 are similar to those of 1T-TaS$_2$, but both need adopt 3R-TaS$_2$ structure if all peaks are indexed, and moreover the most intense peak ($2\theta=14.95^\circ$, $d=0.593$ nm) of the XRD are closer to peak ($d_{003}=0.594$ nm) of 3R-TaS$_2$. The main phases of the sample 3, 4 can be indexed according to 2H-TaS$_2$ ($a=0.3314$ nm, $c=1.209$ nm, ICDD PDF: 80-0685), but length of $c$-axis increases to 1.258 nm. It may be attributed to intercalation of iodine.