A Family of Microscale 2x2x2 Pocket Cubes

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**Figure S1.** TGA analysis of Pocket Cube of ZnSn(OH)$_6$ microparticles. Ramping rate of 10°C /min, in Argon.

**Figure S2.** Additional FESEM images of ZnSn(OH)$_6$ Pocket Cubes prepared via co-precipitation: (a) overall-view; (b) a few presentative Pocket Cubes. Synthesis conditions: SnCl$_4$, 0.15 ml; ZnCl$_2$, 0.17 g; NaOH, 0.32 M; Time, 24 h.
Figure S3. FESEM images of ZnSn(OH)$_6$ Pocket Cubes with different degrees of maturity highlighted: circle 1 shows a subscale cube; circle 2 shows aggregate subscale cubes; circle 3 shows the growth of the aggregated cubes into microscale Pocket Cube.
**Figure S4.** Control experiment for photocatalytic reaction without any photocatalysts: (a) UV-Vis absorption spectra of bare methylene blue (MB) solution (6μM, 60mL) at interval of 3min under exposure to UV light; (b) MB normalized concentration vs. the treatment time over 27 minutes.

**Figure S5.** Preliminary evaluation of the selected Pocket microcubes for lithium-ion batteries: Charge–discharge profiles of the first two cycles of (a) Zn$_2$SnO$_4$&SnO$_2$ and (b) Zn$_2$SnO$_4$&Sn@C at 50 mA/g, and cycling performances of (c) Zn$_2$SnO$_4$&SnO$_2$ and (d) Zn$_2$SnO$_4$&Sn@C at currents of 50 mA/g for the 1$^{st}$ 20 cycles and then at 100 mA/g for the 2$^{nd}$ 20 cycles.
Evaluation of Li-ion battery electrochemical performance: For Li-ion batteries, 80 wt% of Zn$_2$SnO$_4$&SnO$_2$ or Zn$_2$SnO$_4$&Sn@C Pocket microcubes were mixed with 10 wt% of carbon black (Super C65) and 10 wt% of binder (PVDF) to prepare a slurry. The slurry was coated on Cu discs and dried in a vacuum oven at 80 °C overnight. The coated Cu discs were used as working electrode, using Li disc as counter electrode and LiPF$_6$ in EC: DEC (1:1 v/v) as electrolyte. Other procedures were the same as Na-ion battery preparation. The as-assembled Li-ion batteries were tested galvanostatically at room temperature, with a cut off voltage range of 0.005 -3 V at currents of 50 and 100 mA g$^{-1}$ using the MTI BST8-WA battery tester.

Figure S6. Additional SEM images at (a) low and (b) high magnification views of the truncated mesocubes synthesized. Note that dash lines are provided to highlight the feature of truncated cubes.