Electronic Supplementary Information (ESI)

Size-Controlled SnO_2 Hollow Spheres via Template Free Approach as Anodes for Lithium Ion Batteries

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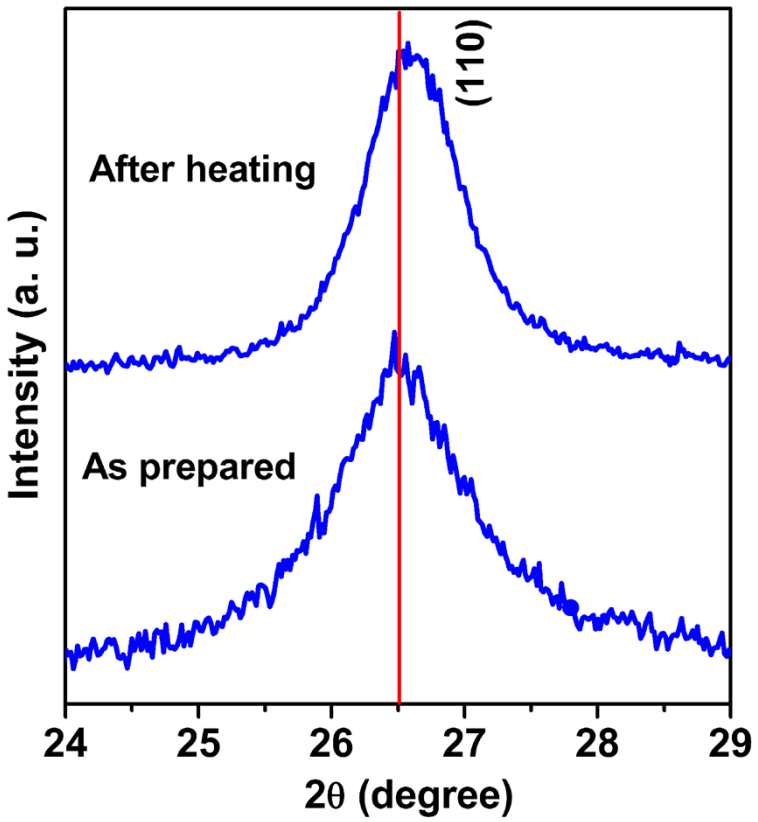

Figure S1. Powder XRD pattern of as-prepared and annealed SnO_2 HS of high intensity peak.

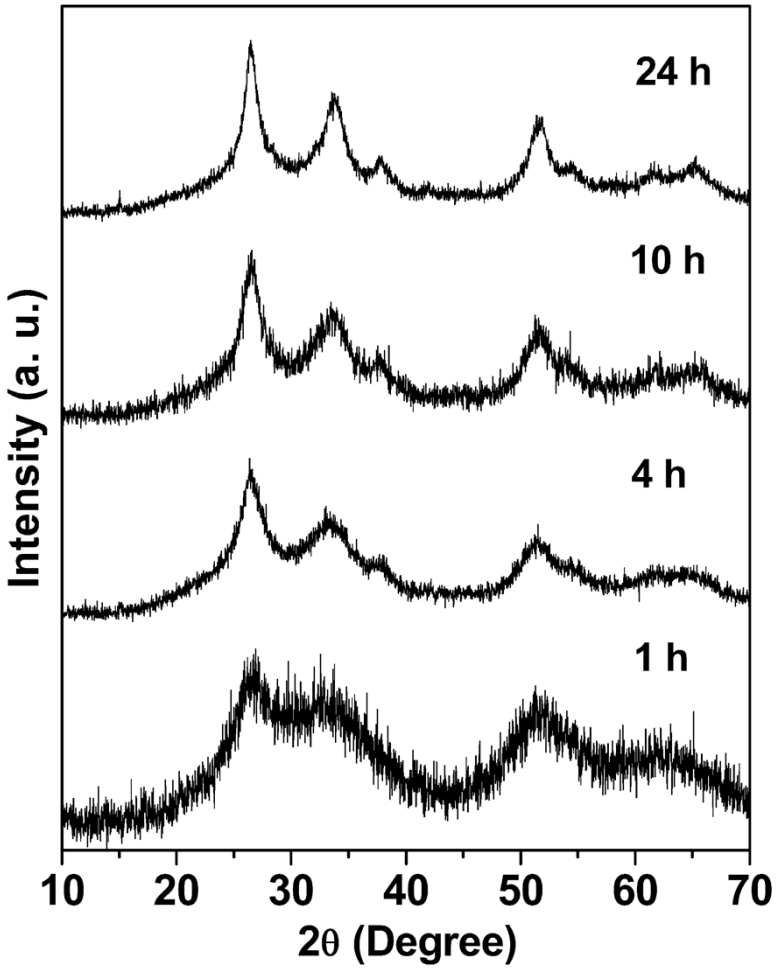

Figure S2. Powder XRD patterns of the samples obtained after hydrothermally heating the precursor solution containing 3.3 mmol of $SnCl_2.2H_2O$, 5 mL of AcAc, 1.1 g of MPA and 100 mg CTAB for intervals of 1, 4, 10, and 24 h at a constant temperature of 160 °C.

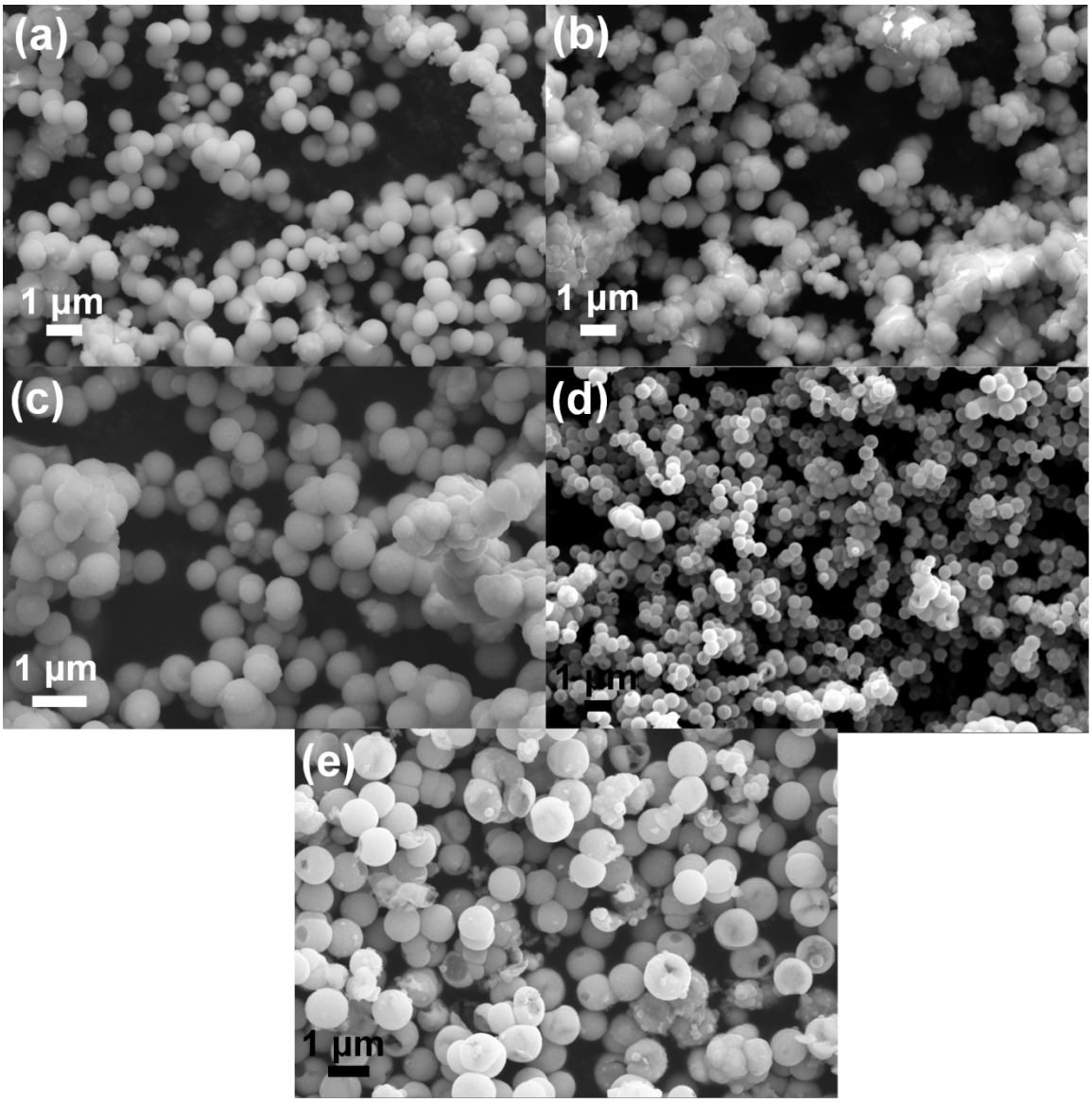

Figure S3. FE-SEM images of the samples obtained after hydrothermally heating the precursor solution containing 3.3 mmol of $SnCl_2.2H_2O$, 5 mL of AcAc, 1.1 g of MPA and 100 mg CTAB for intervals of (a) 1, (b) 4, (c) 10, (d) 13 and (e) 24 h at a constant temperature of 160 °C.

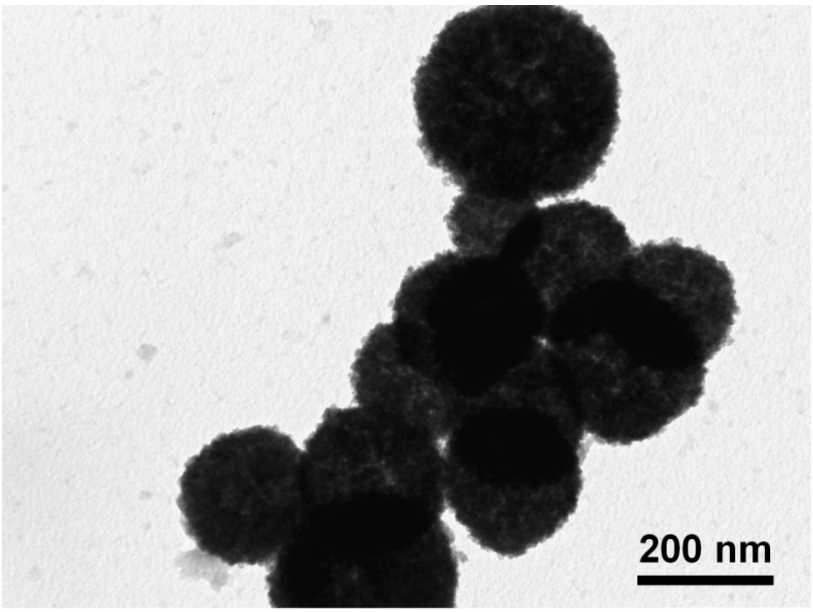

Figure S4. TEM images of the samples obtained after hydrothermally heating the precursor solution containing 3.3 mmol of $SnCl_2.2H_2O$, 5 mL of AcAc, 1.1 g of MPA and 100 mg CTAB for intervals of 10 h at a constant temperature of 160 °C.

The key roles of CTAB and MPA in the formation of SnO_2 hollow spheres were further determined by preparing SnO_2 with only MPA (no CTAB and no AcAc) and with sole CTAB (no MPA and no AcAc). The FE-SEM image of SnO_2 prepared from an only MPA/Sn salt solution (1:3 molar ratio) shows (Figure S5a, shown below) aggregated spheres with thick shells whereas the micrograph of SnO_2 obtained from the CTAB/Sn salt solution (3.324 mmol of $SnCl_2.2H_2O$ + 100 mg of CTAB) (Figure S5b) reveals the formation of densely packed particles of irregular shapes and sizes. Further, the FE-SEM image of the sample obtained from the CTAB/Sn salt solution (3.324 mmol of $SnCl_2.2H_2O$ + 100 mg of CTAB + 1.1 g MPA) shows SnO_2 HS (Figure S5c). But the XRD pattern (not shown) of the sample shows some impurity peaks from SnS, thus indicating the role of AcAc in forming pure phase SnO_2. From the above

observations, we concluded that MPA is the primary structure directing agent for synthesizing SnO_2 spherical hollow spheres whereas CTAB assists as a surfactant to minimize agglomeration.

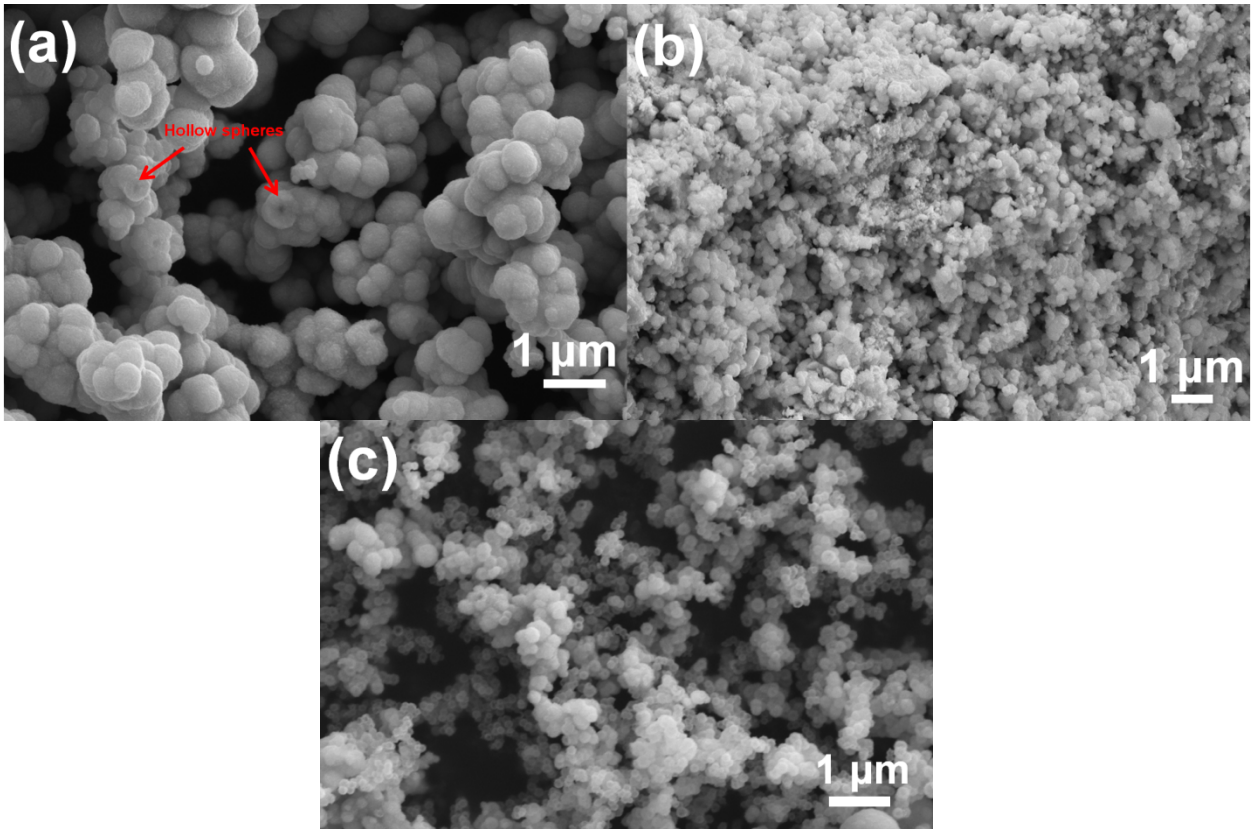

Figure S5. FE-SEM images of samples obtained from the solution containing (a) only MPA (no CTAB and no AcAc) and with (b) sole CTAB (no MPA and no AcAc) (c) with both MPA and CTAB (no AcAc), heated at 160 °C (hydrothermally) for 13 h.