Thermal Oxidation Strategy towards Porous Metal Oxide Hollow Architectures

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**Figure S1.** XRD patterns of as-synthesized CuO architectures: a) porous hollow spheric structure, b) porous hollow doughnut-shaped structure.
Figure S2. SEM images and EDX patterns of CuS precursors and their conversion to CuO products at different stages of the reaction.
Figure S3. SEM images and EDX patterns of Cu$_2$S precursors and their conversion to CuO products at different stages of the reaction.
**Figure S4.** Low-magnification SEM images of as-synthesized porous CuO doughnut-shaped (a) and spheric (b) hollow architectures.
**Figure S5.** SEM images of the porous CuO hollow structures after ultrasonication of 20 min: a,c) low-magnification image, b,d) high-magnification image. Arrows indicate the broken hollow structures.

**Figure S6.** TEM image and SAED pattern of a porous hollow doughnut-shaped CuO architecture. The SAED pattern shows that the hollow particle is polycrystal. The scale bar is 500 nm.
Figure S7. TEM characterization of Cu$_2$S precursor particles and their conversion to CuO products. a) TEM image of Cu$_2$S precursor, b) TEM image of porous hollow CuO spheres, c) HRTEM image of the selected area in b, d) SAED pattern of a hollow CuO sphere indicating that the porous hollow CuO sphere is polycrystal.
Figure S8. SEM images of the obtained Cu$_2$S with different diameters and their conversion to porous CuO hollow spheres.
**Figure S9.** SEM images of the porous CuO bowl-shaped structure fabricated by thermal oxidation of CuS in a furnace at a previously maintained temperature of 700 °C for 4 h.
Figure S10. XRD patterns of as-synthesized CuS and Cu$_2$S precursors: a) doughnut-shaped CuS hierarchical structure, b) monodisperse Cu$_2$S sub-microspheres.
Figure S11. SEM images of as-synthesized CuS (a,b) and Cu$_2$S (c,d) precursors.
**Figure S12.** SEM images of CuS products obtained after different reaction stages: a,b) 4 h, round nanoplates, c,d) 10 h, distorted round nanoplates self-assembled layer-by-layer.
Figure S13. SEM images of as-synthesized copper selenide (CuSe), metal sulfides (NiS and CoS), and their conversion to the corresponding porous metal oxide hollow structures. a) CuSe, b) CuO, c) NiS, d) NiO, e) CoS, f) Co$_3$O$_4$. 