

Supporting information

Layered Zinc Hydroxide Nanocones: Synthesis, Facile Morphological and Structural Modification, and Properties

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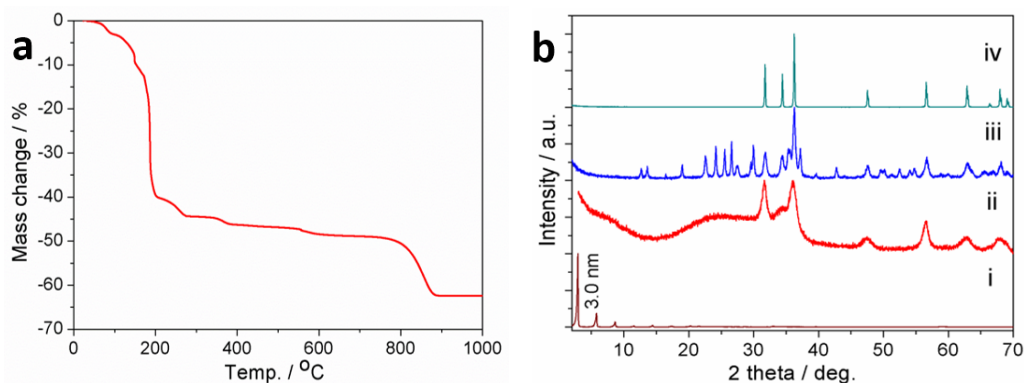


Figure S1. a) TG curve of layered zinc hydroxide nanocones intercalated with DS⁻ anions, b) The evolution of XRD patterns by calcination of as-prepared nanocones at (i) 100 °C, (ii) 200 °C, (iii) 600 °C, (iv) 1000 °C in air, respectively.

Figure S1a exhibits the TG curve of layered zinc hydroxide nanocones in temperature range of room temperature to 1000 °C. The first weight loss of 0.6% below 55 °C is ascribed to the evaporation of adsorbed water molecules on the zinc hydroxide surface. The weight of 2.7% up to 130 °C is attributed to the removal of interlayer water molecules. As Figure S1b(i) shown, the interlayer spacing of layered zinc hydroxide is about 3.0 nm (Figure S1bi). The decrease of interlayer spacing from original 3.2 nm is consistent with the loss of water molecules. With the increasing of temperature to 200 °C, poorly crystalline ZnO started to form (Figure S1b(ii)), then at about 600 °C, ZnO and Zn₃O(SO₄)₂ (PDF # 31-1469) were crystallized. When the temperature was raised to 1000 °C, the loss weight of 59% is due to the removal of dodecyl sulfate (DS⁻) and hydroxyl group. XRD pattern shown in Figure S1b(iv) clearly reveals that ZnO was obtained *via* calcination at 1000 °C.

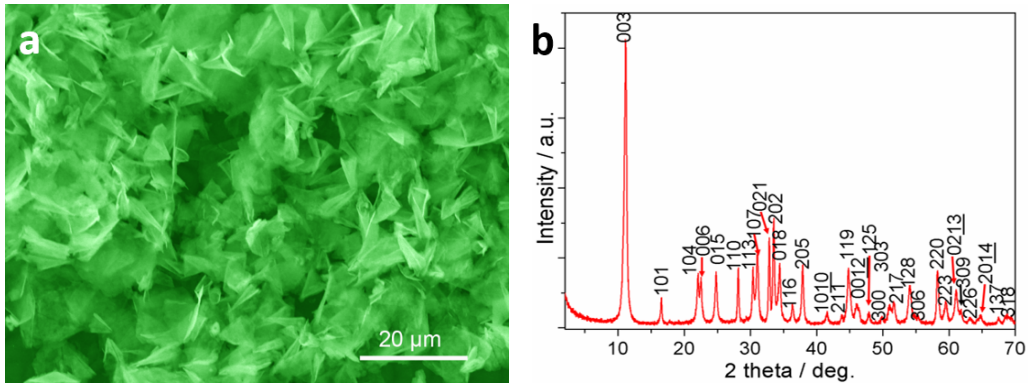


Figure S2. a) SEM image and b) XRD pattern of products obtained by exchanging zinc hydroxide nanocones intercalated with DS⁻ in NaCl ethanol/water binary solution (1:1 v/v) for 24 h.

As shown in Figure S2a, the nanocones were transformed into irregular nanoplates in the 1 M NaCl ethanol/water binary solution (1:1 v/v) for 24 h. All the diffraction peaks in Figure S2b could be indexed as a rhombohedral structure with the lattice parameters of $a = 0.6329 (2)$ nm, $c = 2.372(1)$ nm.

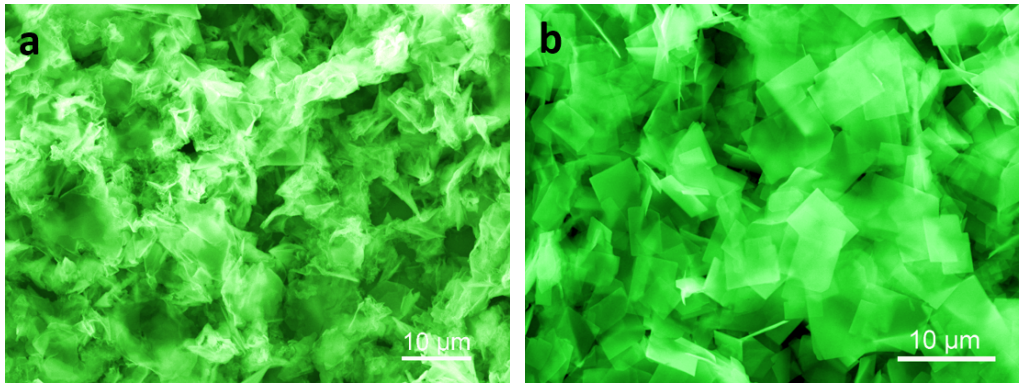


Figure S3. SEM images of as-prepared zinc hydroxide nanocones treated in (a) pure water, (b) 1 M NaNO_3 aqueous solution without any agitation at room temperature for 24 h.

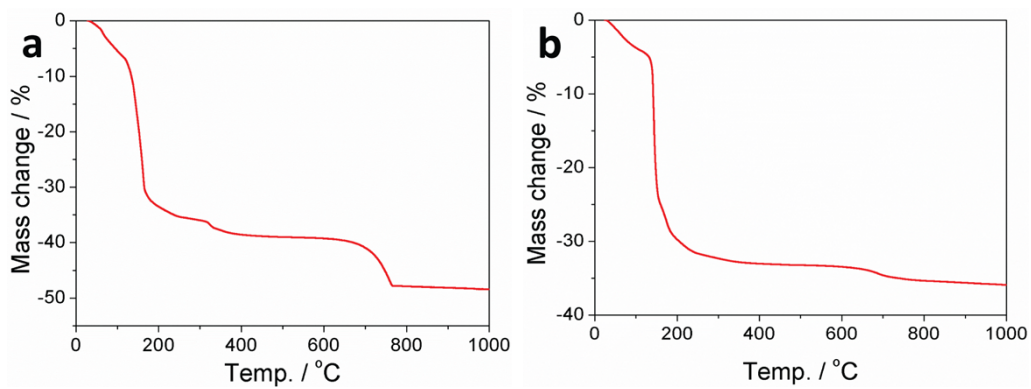


Figure S4. TG curves of layered zinc hydroxide nanoplates in DS⁻ form (a) and zinc hydroxide nanocones in NO₃⁻ form (b), respectively.

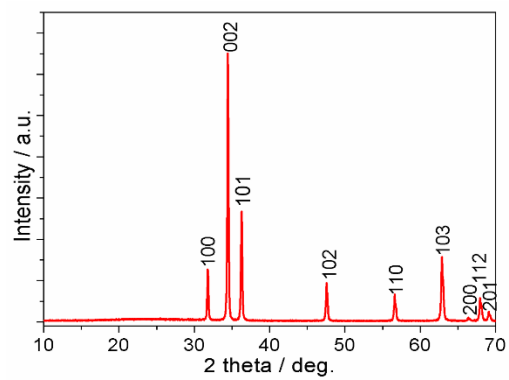


Figure S5. XRD pattern of ZnO nanoplates obtained by heating to 800 °C in air.

Table S1. Peak intensity ratio of ZnO products

I	I(100)/I0	I(002)/I0	I(101)/I0	I(102)/I0	I(110)/I0	I(103)/I0	I(200)/I0	I(112)/I0	I(201)/I0
ZnO nanocones	50	100	92	26	23	36	4	19	9
ZnO nanoplates	20	100	42	15	11	25	2	9	4