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Supporting materials for

Hierarchical ZnO hollow microspheres with exposed (001) facets as a promising catalyst for the thermal decomposition of ammonium perchlorate

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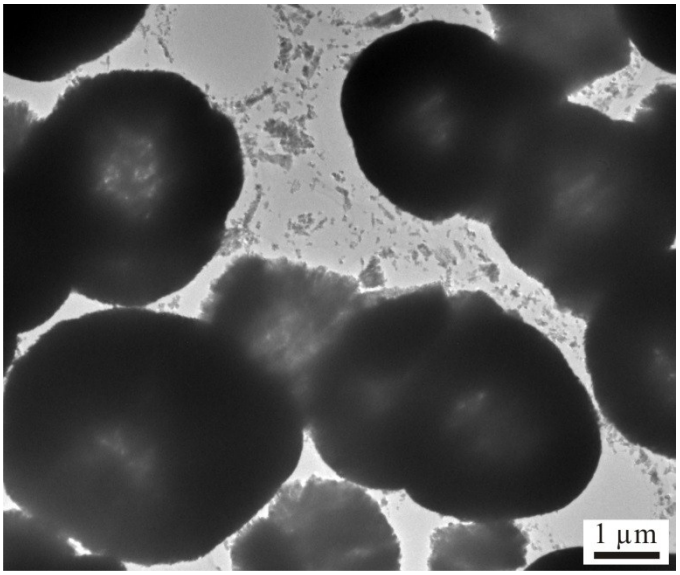

Fig. S1 TEM image of ZnO hollow microspheres.

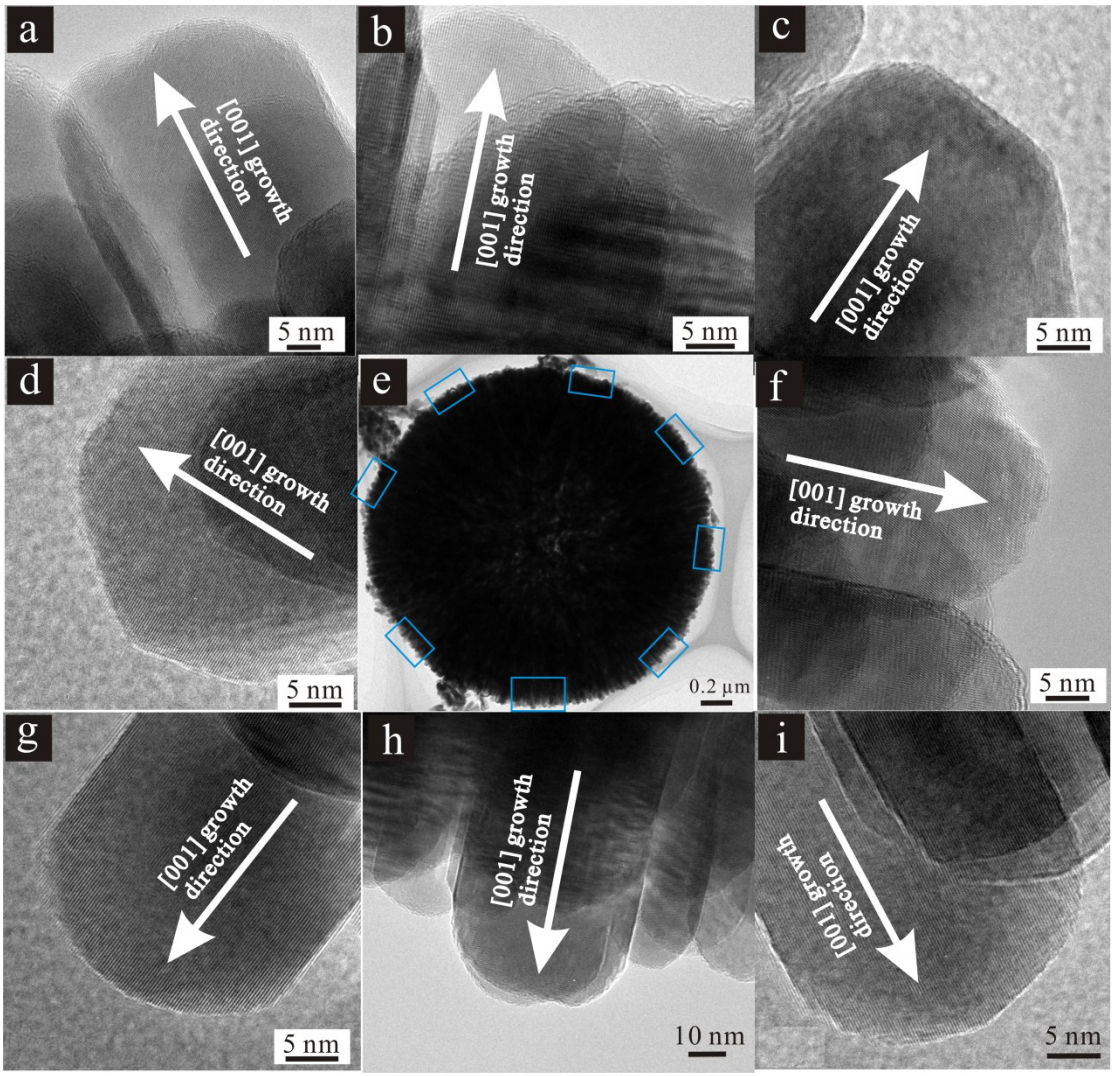

Fig. S2 The HRTEM images of different parts of surface of a single ZnO hollow microsphere (e): (a) upper left, (b) top, (c) upper right, (d) left, (f) right, (g) bottom left, (h) bottom, (i) bottom right.

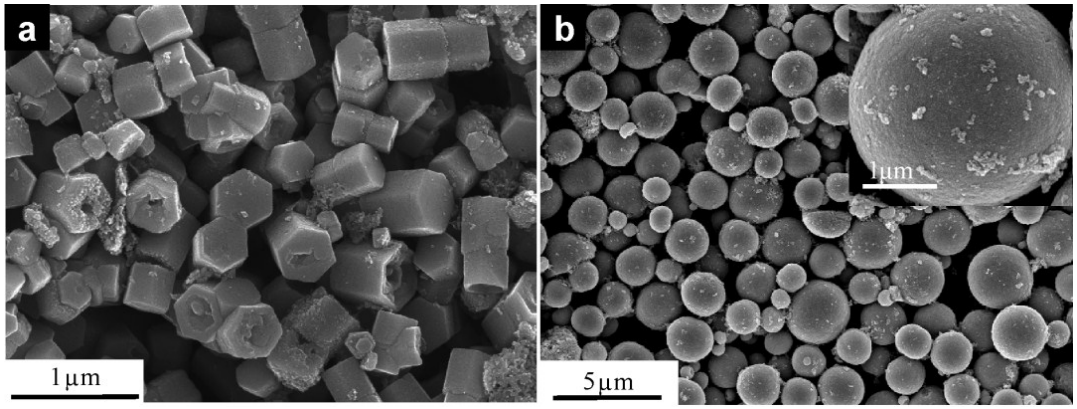

Fig. S3 FE-SEM images of (a) the short prisms obtained from the control experiment in which methanol serves as a solvent instead of glycol and (b) the solid microspheres prepared in the control experiment without adding H_2O, with a higher magnification FE-SEM image in the inset.

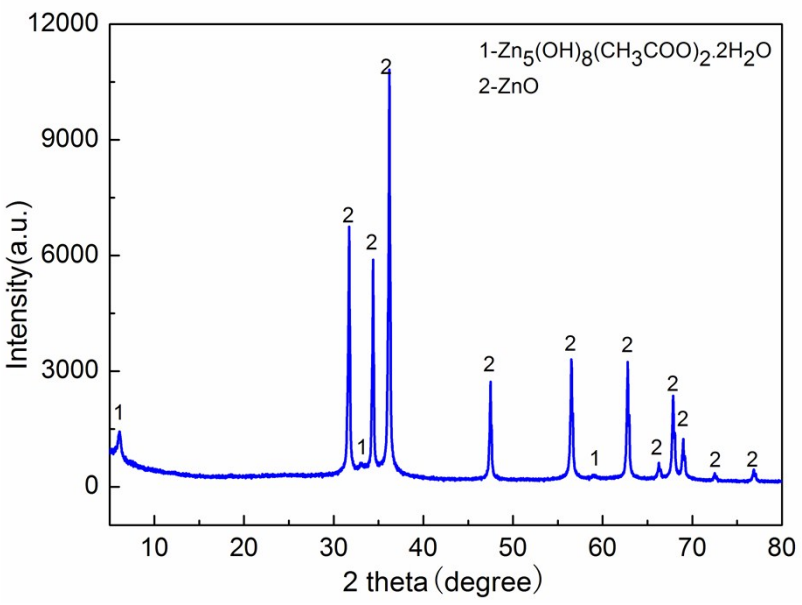

Fig. S4 XRD pattern of samples at the reaction time of 0.5 h.

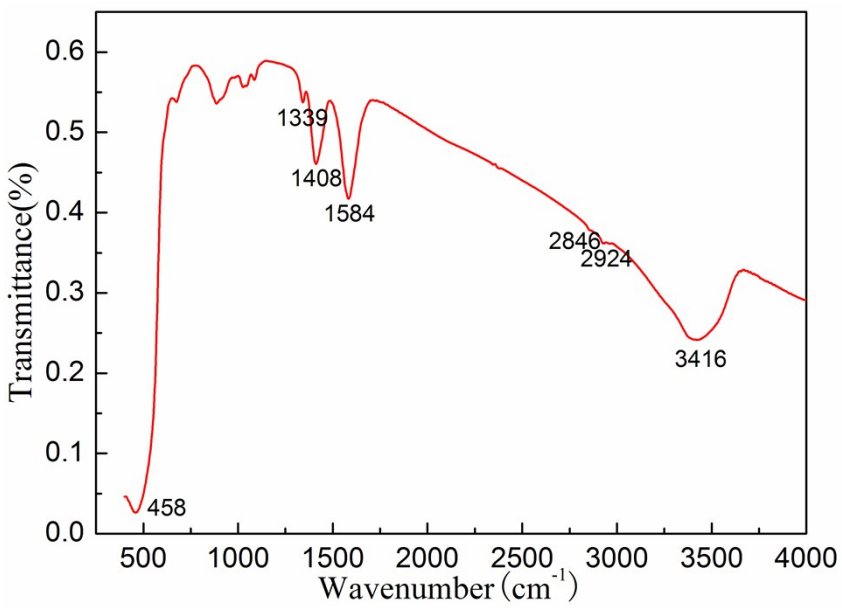

Fig. S5 FTIR spectra of samples at the reaction time of 0.5 h.

The FTIR spectrum was displayed in Fig.S5. The broad absorption bands of the sample located at ~3416 cm^{-1} can be ascribed to the O-H stretching mode.[1] The bands at ~1339 and ~1584 cm^{-1} can be probably attributed to the C-O and C-O-Zn stretching mode, respectively.[2] In addition, the bands at ~1408, ~2924, and ~2846 cm^{-1} are due to CH_2 bending vibration mode, asymmetric and symmetric stretching vibration modes, respectively.[3] The band at ~458 cm^{-1} can be ascribed to Zn-O stretching vibration mode,[4] indicating the formation of ZnO. These results also revealed that the initial product contains EG impurities.

Reference:

1. J. Rao, A. Yu, C. L. Shao, X. F. Zhou, *ACS Appl. Mater. Interface,* 2012, **4**, 5346-5352.
2. M. N. Kamalasanan, S. Chandra, *Thin Solid Film,* 1996, **288**, 112-115.
3. Y. N. Rajeswari, B. A. Chandra, *Appl. Phys. A: Mater. Sci. Process.,* 2011, **103**, 33-42.
4. R. Y. Hong, J. Z. Qian, J. X. Cao, *Powder Technol.,* 2006, **163**, 160-168.

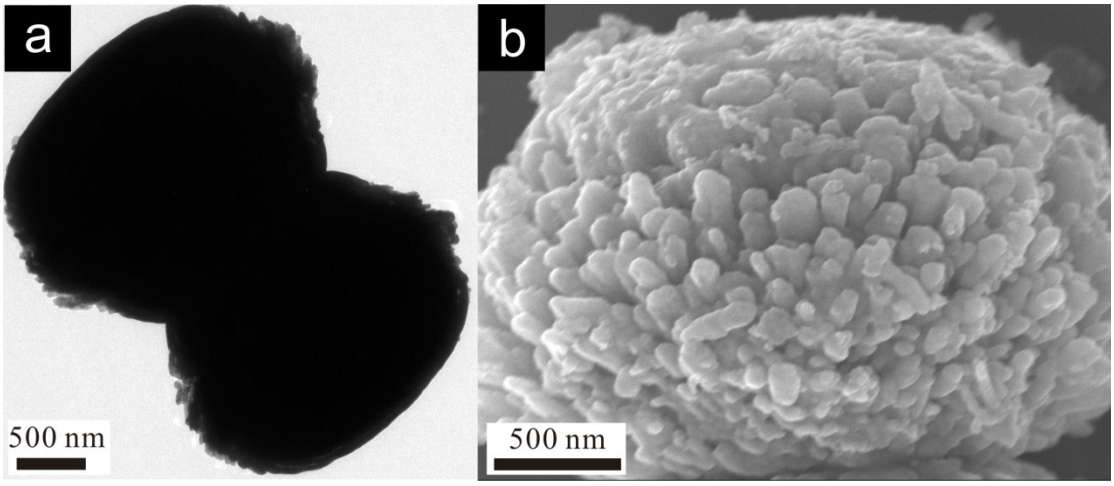

Fig. S6 (a) TEM and (b) FE-SEM images of samples at the reaction time of 0.5 h.

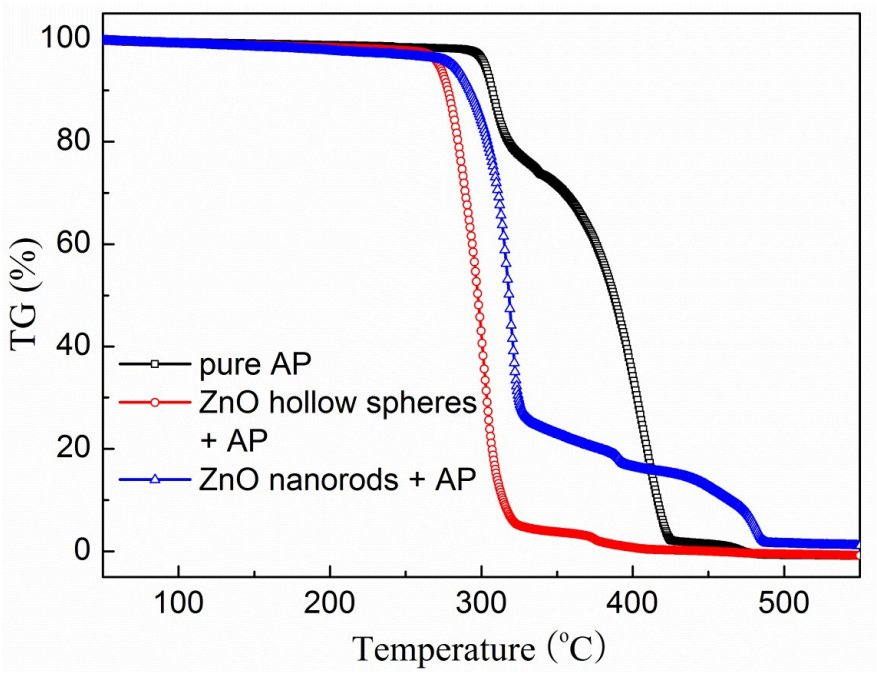

Fig. S7 TG curves of pure AP and mixture of AP with the as-prepared ZnO particles at a heating rate of 20 K/min.

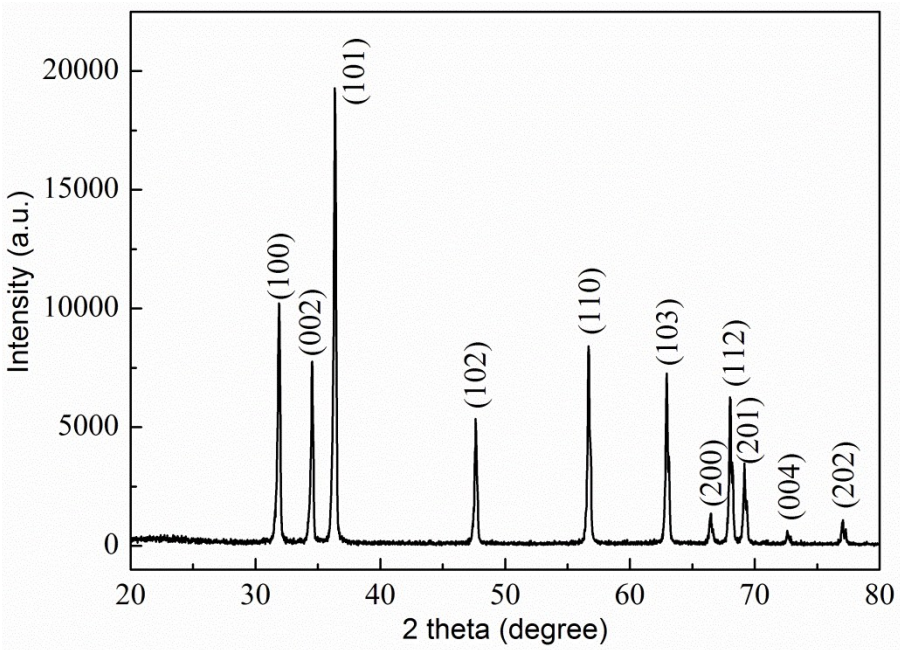

Fig. S8 XRD patterns of ZnO dispersed nanorods.

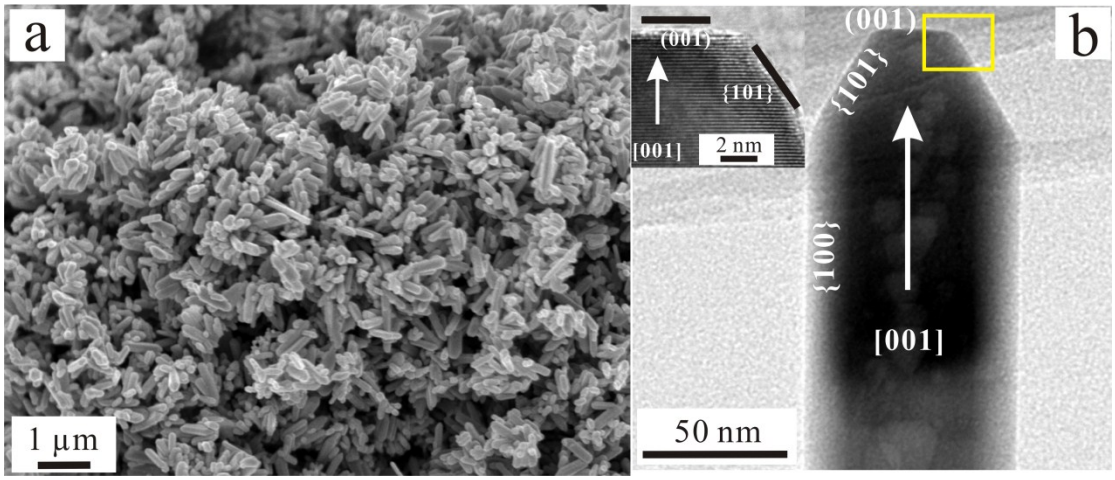

Fig. S9 (a) The FE-SEM image of dispersed ZnO nanorods, and (b) the typical TEM image of a single ZnO nanorod, with HRTEM image in the inset.

The morphology of the dispersed ZnO nanorods is shown in Fig. S9(a). It can be seen that these nanorods are well dispersed rather than assembled into a hierarchical structure. The length of these nanorods is about 1 μm. To further observe these nanorods, TEM characterization was carried out. The TEM and HRTEM images are shown in Fig. S9(b). It can be seen that the diameter of these nanorods is about 60 nm and their surface is composed of {100} facets, {101} facets and (001) facet. Also, the {100} facets are the dominant surface of these nanorods.