

## **Supporting information**

# **Novel zinc oxide twins with perfect mirror symmetry by solvothermal synthesis method**

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## Experimental Methods

### 1. Materials

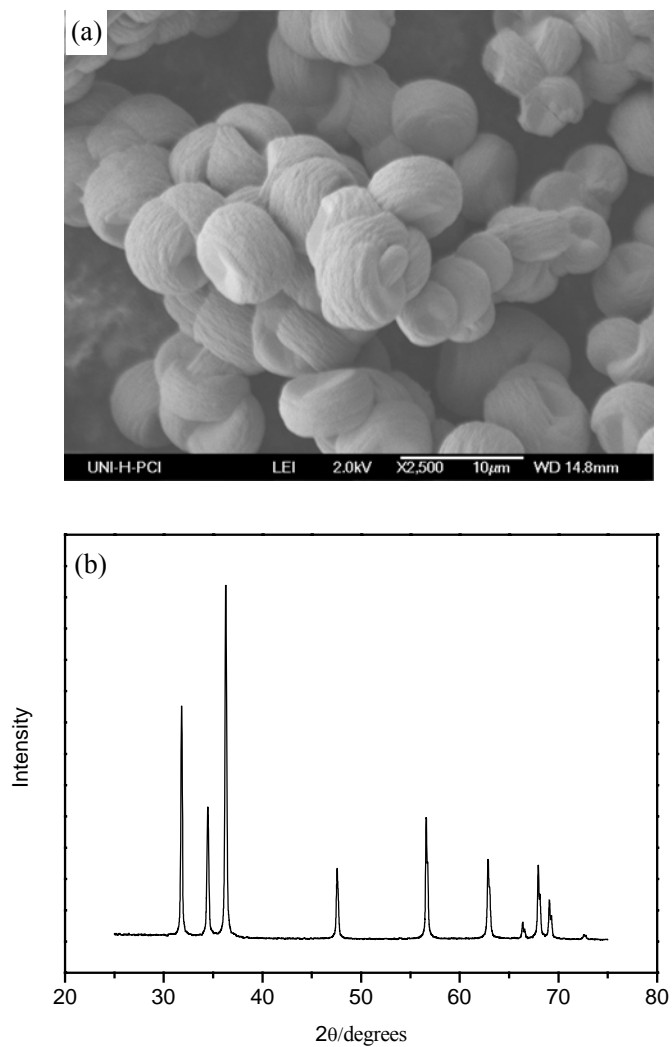
Chemicals were used as received: zinc nitrate hexahydrate ( $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ , Merck), julolidine (98%, Acros); N, N-diethylformamide (DEF, 99%, ABCR) as standard solvent. In some experiments N, N-Dimethylformamide (DMF, water<50 ppm, Acros), methanol (99.9%, Roth) were used as solvent.

### 2. Synthesis of ZnO crystals

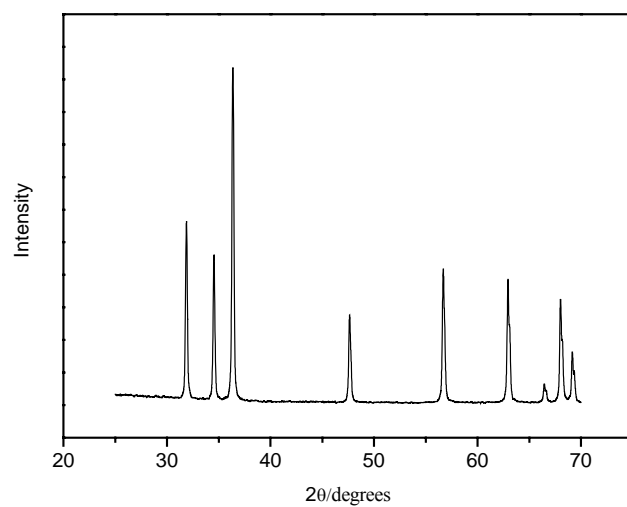
The molar ratio of the solution composition for synthesis of ZnO crystals was 1  $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  : 5 julolidine : (2~10) DEF. a typical synthesis is presented as followed, 0.35 g Julolidine was dissolved in 5.0 g DEF, and then 0.12 g zinc nitrate hexahydrate was added with stirring. After thoroughly stirring for 5 minutes, the mixture was introduced in a Teflon-lined stainless autoclave and heated at 175 °C for 2~6 days in an oven. After crystallization, the solids were filtered, washed several times with DMF, and then dried at 373 K.

### 3. Characterization of ZnO crystals

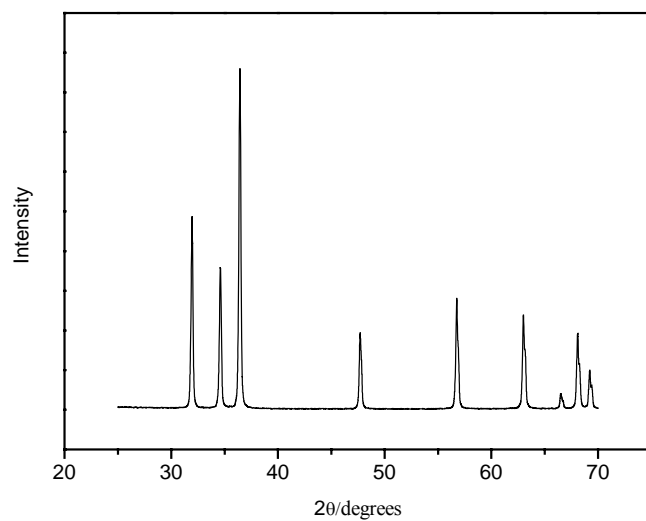
Scanning electron microscopy (SEM) micrographs were taken on a JEOL JSM-6700F with a cold field emission gun operating at 2 kV and 10  $\mu\text{A}$ . Phase purity and crystallinity of the as-synthesized crystals were confirmed by powder The X-ray diffraction (XRD) patterns were recorded at room temperature under ambient conditions with a PANalytical instrument (X'Pert-MPD, Cu  $\text{K}_\alpha$  with  $k = 1.5418 \text{ \AA}$ ) at 40 kV, 50 mA.



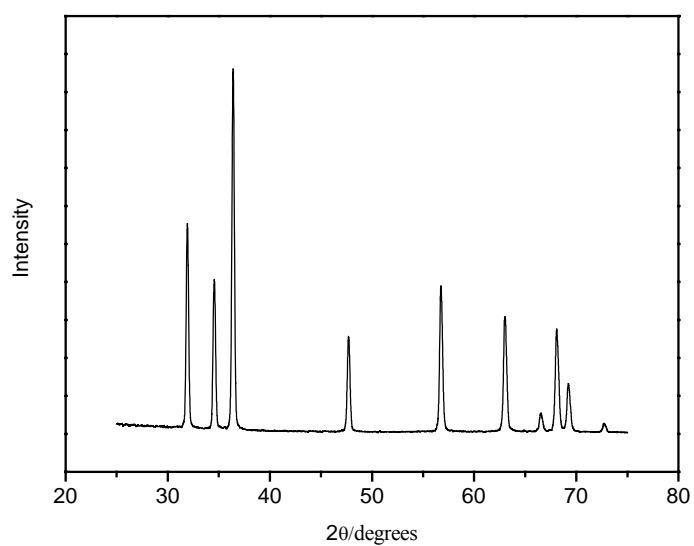
**Fig. S1** Typical SEM image (a) and XRD pattern of the ZnO crystals prepared absence of julolidine in DEF.



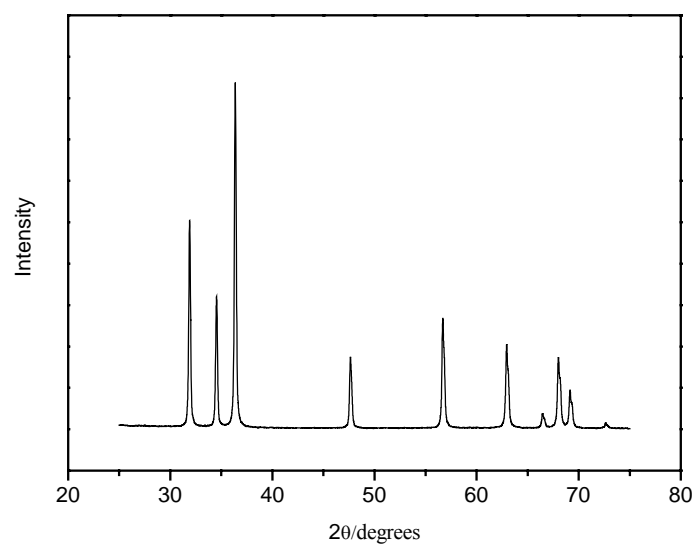
**Fig. S 2.** Typical XRD pattern of the ZnO disks prepared in DMF solvent.



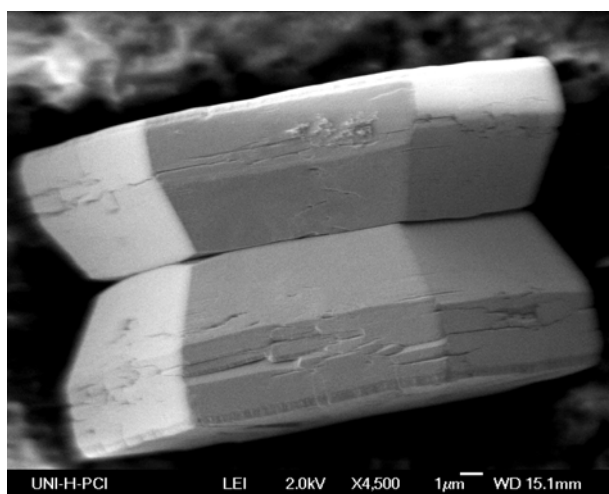
**Fig. S3.** Typical XRD pattern of the ZnO disks prepared in methanol solvent.



**Fig. S4.** Typical XRD pattern of the ZnO crystals prepared in the mixed DEF and DMF.



**Fig. S5.** Typical XRD pattern of the ZnO crystals prepared in the mixed DEF and methanol.



**Fig. S6.** Typical SEM image of the dumbbell-like shaped ZnO twins prepared in DEF at 473 K for 4 days.