

## **Supplementary Material**

### **Zinc-Containing Coordination Polymer as a Suitable Precursor for Solid State Synthesis of ZnO**

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## **Experimental**

### ***Materials and apparatus***

All chemicals and solvents were obtained from Acros, Alfa-Aesar and Sigma-Aldrich and used as received unless otherwise noted.

The CHN elemental analyses were done by a Perkin-Elmer 2400 SERIES II. Inductively coupled plasma-optical emission spectroscopy (ICP-OES) was conducted on the SPECTRO ARCOS FHE 12 ICP-OES analyzer.  $^1\text{H}$  NMR spectra were recorded on a Bruker Avance 300 spectrometer. Fourier-transform infrared spectra of solid samples (KBr pellets) were obtained on a Perkin-Elmer Spectrum RXI FT-IR spectrometer. Field-emission scanning electron microscopy (FE-SEM) images were taken on MIRA3TESCAN-XMU and MIRA2TESCAN-XMU scanning electron microscopes. High resolution transmission electron microscopy (HR-TEM) images were recorded on FEL-Tecnaï F20 TEM. Atomic force microscopy (AFM) was employed to characterize surface morphology using Ara-Research AFM full plus in the non-contact mode. Thermogravimetric analysis (TGA) was conducted on a NETZSCH TG 209 F1 Iris thermogravimeter in the temperature range from room temperature to  $700^\circ\text{C}$  at a heating rate of  $10^\circ\text{C min}^{-1}$  under static air. XRD patterns were recorded on a Rigaku D-max CIII X-ray diffractometer using Ni-filtered  $\text{Cu K}\alpha$  radiation. The electronic spectra were taken on a Cintra 101 spectrometer. The emission spectra of the ligand and coordination polymer were taken on a Jasco FP-6500 spectrofluorometer.

### ***Synthesis of the ligand***

#### ***5-(chloromethyl)-2-hydroxybenzaldehyde (A):***

9.18 g (75.17 mmol) of salicylaldehyde was treated with 5.0 g of paraformaldehyde in 50 mL of conc. HCl. After 5 days of stirring at room temperature, the reaction mixture was repeatedly extracted with  $\text{Et}_2\text{O}$ . The organic phases were washed with saturated aqueous

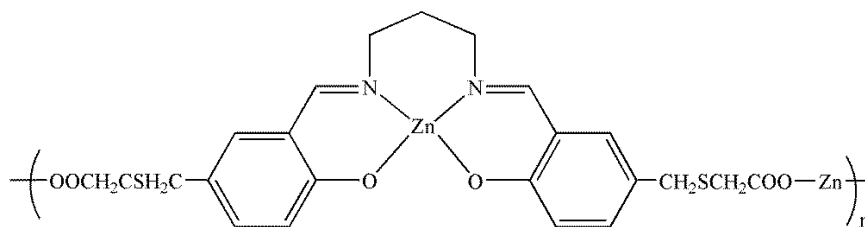
NaHCO<sub>3</sub>, NaCl, and then dried over Na<sub>2</sub>SO<sub>4</sub>. Evaporation of the solvent afforded 5-(chloromethyl)-2-hydroxybenzaldehyde (A) as a wet solid that was washed with diethyl ether several times (6 g, 47% yield, m.p. 86-87 °C). Elemental anal. Calc. for C<sub>8</sub>H<sub>7</sub>O<sub>2</sub>Cl: C, 56.33; H, 4.14. Found: C, 56.72; H, 4.08. <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ = 11.07 (s, 1H, OH), 9.89 (s, 1H, CHO), 7.57 (dd, 1H, H<sub>aromatic</sub>), 7.54 (d, 1H, H<sub>aromatic</sub>), 6.99 (d, 1H, H<sub>aromatic</sub>), 4.59 (s, 2H, CH<sub>2</sub>Cl) ppm. FT-IR (KBr, cm<sup>-1</sup>): 3223 (ν<sub>O-H</sub>), 3042 (ν<sub>C-H-aromatic</sub>), 2964 (ν<sub>C-H-aliphatic</sub>), 2876, 2751 (ν<sub>C-H-aldehyde</sub>), 1659 (ν<sub>C=O</sub>), 1623, 1484 (ν<sub>C=C</sub>).

### ***Sodium (3-formyl-4-hydroxy-benzylthio)-acetate (B)***

A solution of 1.08 g (11.72 mmol) thioglycolic acid in 10 mL acetonitrile was added gradually to a dispersed solution of 0.94 g (23.50 mmol) sodium hydroxide in 40 mL acetonitrile. After 2 hours, 2g (11.72 mmol) of (A) in 20 mL acetonitrile was added slowly to above solution and refluxed for 48 hours. The color of reaction mixture was changed to yellow at initial hours. The yellow precipitate of sodium (3-formyl-4-hydroxy-benzylthio)-acetate was collected and washed with acetonitrile several times. The product was dissolved in methanol, filtered to remove NaCl by product during reaction and the solvent was removed (1.8 g; 62% yield). Elemental anal. Calc. for C<sub>10</sub>H<sub>9</sub>O<sub>4</sub>SNa: C, 48.39; H, 3.65. Found: C, 47.99; H, 3.55. <sup>1</sup>H NMR (D<sub>2</sub>O): δ = 9.83 (s, 1H, CHO), 7.58 (s, 1H, H<sub>aromatic</sub>), 7.50 (dd, 1H, H<sub>aromatic</sub>), 6.89 (d, 1H, H<sub>aromatic</sub>), 3.68 (s, 2H, Ar-CH<sub>2</sub>-S), 3.01 (s, 2H, S-CH<sub>2</sub>-COO) ppm. FT-IR (KBr, cm<sup>-1</sup>): 3201 (ν<sub>O-H</sub>), 3059 (ν<sub>C-H-aromatic</sub>), 2912 (ν<sub>C-H-aliphatic</sub>), 2742 (ν<sub>C-H-aldehyde</sub>), 1663 (ν<sub>C=O-aldehyde</sub>), 1580, 1412 (ν<sub>C=O-acid</sub>), 1486 (ν<sub>C=C</sub>); (carboxylic acid groups frequencies of functionalized aldehyde in acidic form: 1730 (ν<sub>C=O-acid</sub>), 1647 (ν<sub>C=O-aldehyde</sub>)).

### ***Synthesis of Schiff base ligand (C)***

Sodium (3-formyl-4-hydroxy-benzylthio)-acetate, compound **(B)**, (1.5 g, 6.04 mmol) was suspended in 20 mL dry acetonitrile. Then, 0.224 g (3.02 mmol) of 1,3-diaminopropane in 5 mL dry acetonitrile was added dropwise to the suspension and the resulting mixture refluxed for 24 hours. The solvent was removed by filtration, and the prepared Schiff base **(C)** washed with acetonitrile several times and dried under vacuum (1.4 g; 87% yield). Elemental anal. Calc. for  $C_{23}H_{24}N_2S_2O_6Na_2$ : C, 51.68; H, 4.53; N, 5.24. Found: C, 51.55; H, 4.23; N, 5.03.  $^1H$  NMR (DMSO- $d_6$ ):  $\delta$  = 13.40 (s, 2H, OH), 8.48 (s, 2H, HC=N), 7.34 (d, 2H,  $H_{aromatic}$ ), 7.24 (dd, 2H,  $H_{aromatic}$ ), 6.81 (d, 2H,  $H_{aromatic}$ ), 3.63 (s, 4H, Ar-CH<sub>2</sub>-S), 3.61 (t, 4H, NCH<sub>2</sub>), 2.81 (s, 4H, S-CH<sub>2</sub>-COO), 2.03 (quintet, 2H, CH<sub>2</sub>) ppm. FT-IR (KBr,  $cm^{-1}$ ): 3435 ( $\nu_{O-H}$ ), 3044 ( $\nu_{C-H-aromatic}$ ), 2918 ( $\nu_{C-H-aliphatic}$ ), 1636 ( $\nu_{C=N}$ ), 1580, 1394 ( $\nu_{C=O-acid}$ ), 1495 ( $\nu_{C=C}$ ); (carboxylic acid groups frequencies of functionalized aldehyde in acidic form: 1713 ( $\nu_{C=O-acid}$ ), 1641 ( $\nu_{C=N}$ )).



**Chart S1.** Proposed structure of Zn-based infinite coordination polymer.