

Supplementary Data for

## Monitoring the Length-controlled Synthesis of One-dimensional Metalloporphyrin-containing Coordination Polymer Particles and their Photocatalytic Properties

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Yu Sun<sup>a</sup>, Bongyoung Yoo<sup>a\*</sup>

<sup>a</sup>Department of Materials Engineering, Hanyang University,ERICA Campus, Ansan, Gyeong-gi Do, 426-791, Republic of Korea

### Experimental

#### 1. Materials

Zinc 5, 10, 15, 20-tetra(4-pyridyl)-21*H*, 23*H*-porphine (ZnTPyP) from Aldrich Chemical Co., Sodium dodecyl sulphate (SDS) (85%) from SAMCHUN Chemical Co., Sodium hydroxide, hydrochloric acid, from Wako Chemical were used without further purification. All solvents were prepared by using Milli-Q water.

#### 2. Preparation of Stock Solution

##### 2.1 ZnTPyP Stock Solution

The ZnTPyP stock solution (0.01 M) was prepared by dissolving 0.2046 g ZnTPyP in 30 mL of a HCl solution (0.2 M).

##### 2.2 Basic Stock Solution

The basic stock solution was prepared by dissolving an appropriate amount of SDS and sodium hydroxide in an aqueous solution.

The details are as follows:

|            | ZnTPyP Stock solution (μL) | Basic Stock Solution (in 100 mL pure water solvent) |              | Reaction Time                    |
|------------|----------------------------|---|--------------|----------------------------------|
|            |                            | SDS (mol/L)   | NaOH (mol/L) |                                  |
| Fig. 1     | 250                        | 0.05  | 0.1          | (A), (B), 3 h;<br>(C), (D), 24 h |
| Fig. 2     | 250                        | 0.05  | 0.1          | (A), (B),<br>(C), 72 h           |
| Fig. 3     | 250                        | 0.05  | 0.1          | Time dependence                  |
| Fig. S1(A) | 250                        | 0.05  | 0.05         | 3 h                              |
| Fig. S1(B) | 150                        | 0.05  | 0.1          | 24 h                             |
| Fig.       | 150                        | 0.05  | 0.05         | 24 h                             |

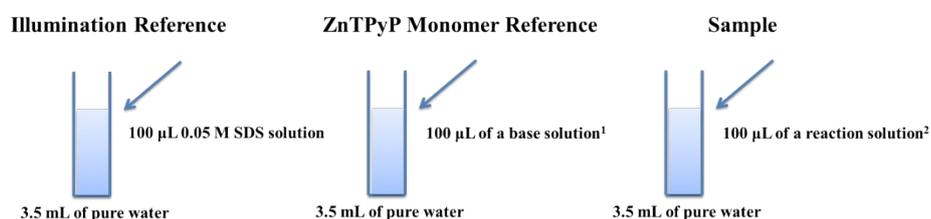
|             |     |      |     |                       |
|-------------|-----|------|-----|-----------------------|
| S1(C)       |     |      |     |                       |
| Fig. S1(D)  | 350 | 0.05 | 0.1 | 24 h                  |
| Fig. S2, S3 | 250 | 0.05 | 0.1 | (A), 3h;<br>(B), 72 h |
|             |     |      |     |                       |

**Table S1:** Summary of experimental conditions for each figure.

### 3. Characterization

Powder X-ray diffraction data were collected on a Rigaku (D/MAX-2500/PC) diffractometer using Cu-K $\alpha$  radiation ( $\lambda = 1.54056 \text{ \AA}$ ) at room temperature. To prepare the samples for field-emission scanning electron microscopy (FE-SEM, TESCAN, MIRA3) and transmittance electron microscopy (TEM, FEI Tecnai F30 Super-Twin), the as-prepared ZnTPyP CPPs were re-dispersed in pure water, dropped onto a silicon wafer substrate and a copper grid, respectively. Finally, the samples were dried at 50 °C in the oven. UV-vis absorption spectroscopy (Lambda 750 UV-vis spectrometer, PerkinElmer), fluorescence spectroscopy (Nanolog-FluoroLog-3, HORIBA JOBIN YVON) were also measured by dispersing the particles in pure water. The fluorescence microscopy images were obtained by

The sample preparation for UV-vis spectroscopy measurement is shown in Scheme S1:



<sup>1</sup> Base solution: 5 mL of 0.05 M SDS solution + 250  $\mu\text{L}$  of a ZnTPyP Stock Solution

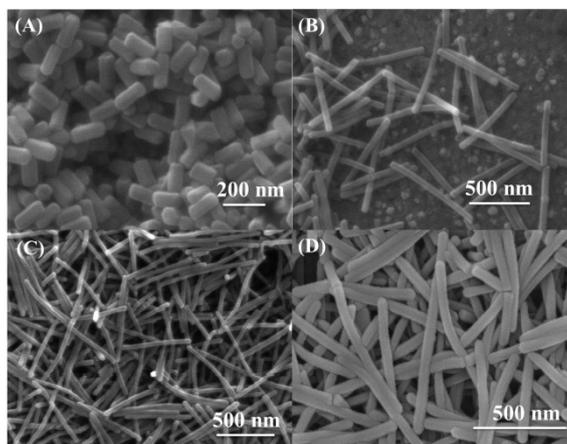
<sup>2</sup> Reaction solution: 5 mL of a basic stock solution (0.05 M SDS + 0.1 M NaOH)

**Scheme S1:** Illustration of sample preparation for UV-vis measurements as a function of time.

The photocatalytic activity of the prepared Z-CPPs was assessed by observing the degradation of MB dye under visible light ( $\lambda > 400 \text{ nm}$ ) irradiation, which was carried out in a 250 mL glass beaker using a home-made irradiation system (a 100 W halogen lamp (HI-Spot 95), purchased from Osram Sylvania Inc., with UV-stop feature) equipped with a quartz cap of water to remove the infrared region of the lamp. The irradiation system was placed on top at a distance of 25 cm from the glass beaker.

Reaction slurry was prepared in a glass beaker of 250 mL capacity by suspending 45 mg of photocatalysts in 150 mL MB (10 ppm) aqueous solution under magnetic stirring. Prior to light irradiation, the solution was stirred for 60 min in dark to stabilize MB adsorption on the photocatalysts and on the surfaces of the glass beakers used for test. At specific time intervals, 4 mL of the reaction slurry was withdrawn and centrifuged to obtain the MB residue solution. The electronic absorption changes of MB solution were observed from its characteristic absorption peak at 664 nm. As a comparison, experiments using the same amount of commercial P25 TiO<sub>2</sub>

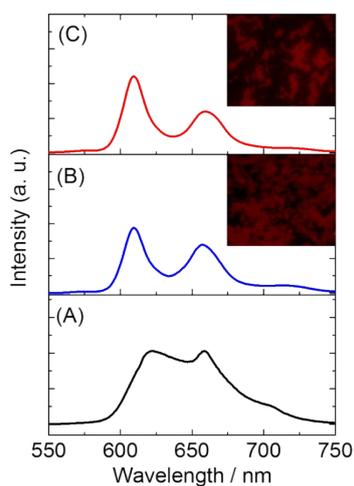
and without catalyst were carried out under the same condition.



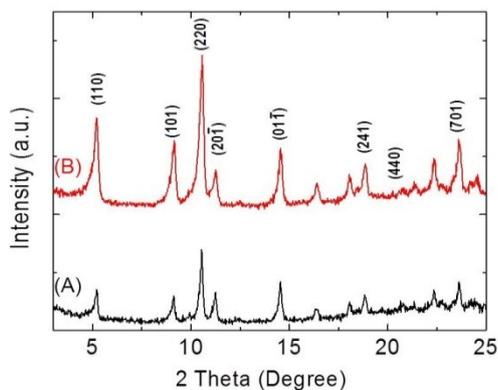
**Figure S1** SEM images of Z-CPPs with various nanorod structures synthesized under different conditions. The details of experimental conditions are shown in the experimental section (See Table S1). The average length of nanorod structures is (A) ~180 nm, (B) ~600 nm, (C) ~800 nm, and (D) ~1000 nm. The average width of nanorod structures is (A) ~80 nm, (B) 50 nm, (C) 35 nm, and (D) 60 nm.

| monomer | Soret Band (nm) |     |
|---------|-----------------|-----|
|         | 426             |     |
| 20 s    | -               | 443 |
| 20 min  | -               | 443 |
| 2 h     | 428             | 443 |
| 4 h     | 426             | 443 |
| 7 h     | 424             | 444 |
| 10 h    | 417             | 445 |
| 13 h    | 417             | 447 |
| 24 h    | 416             | 455 |
| 36 h    | 416             | 456 |
| 48 h    | 416             | 456 |
| 72 h    | 416             | 456 |

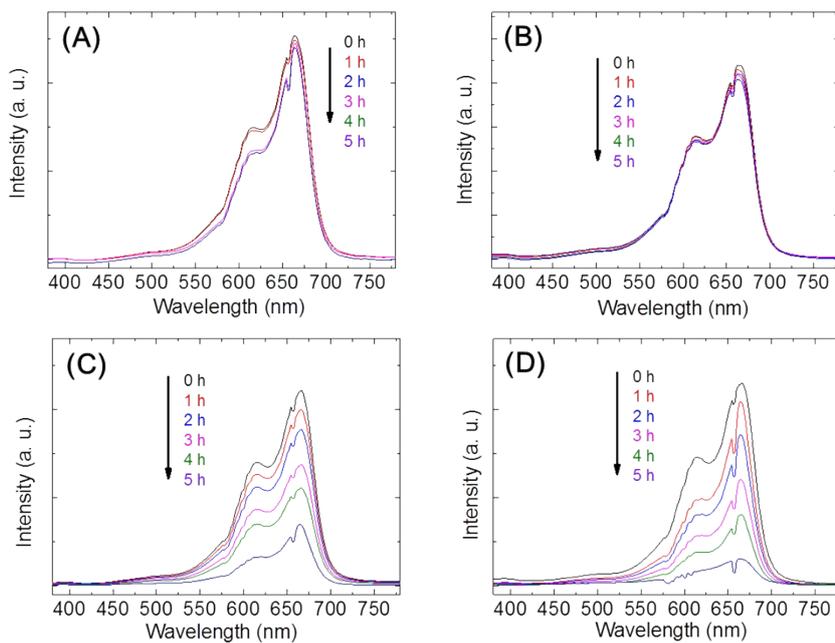
**Table S2:** Summary of the peak positions of Soret bands.



**Figure S2** The fluorescence spectra of Z-CPPs with (A) nanorod structures and (B) nanowire structures. The corresponding fluorescence microscopy (FM) images are shown in the insets.



**Figure S3** XRD pattern of Z-CPPs with (A) nanorod and (B) nanowire structures.



**Figure S4:** UV-vis absorption spectra showing the spectral degradation of MB dye as a function of time under visible light illumination (A) without catalyst, with (B) TiO<sub>2</sub> P25, (C) Z-CPPs nanorods, and (D) Z-CPPs nanowires as catalysts.