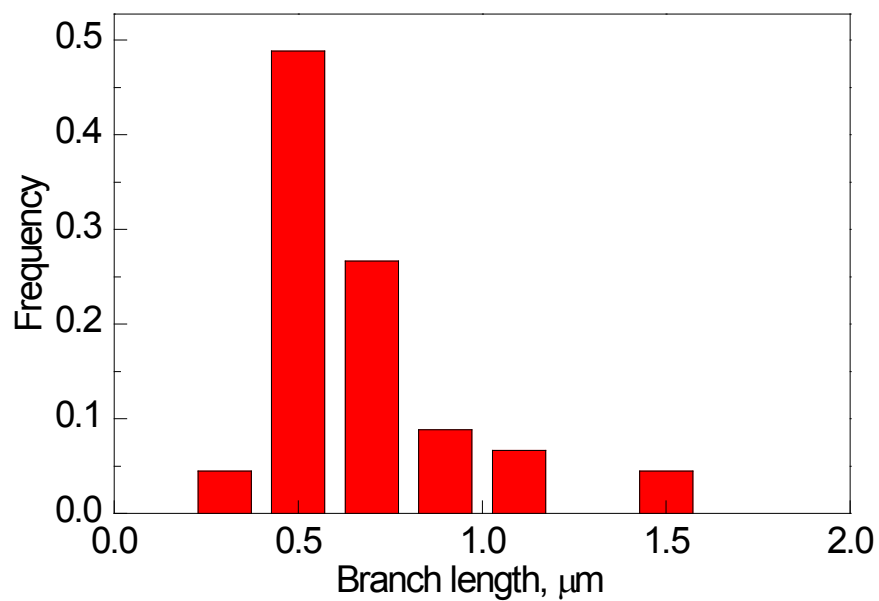


## Support information

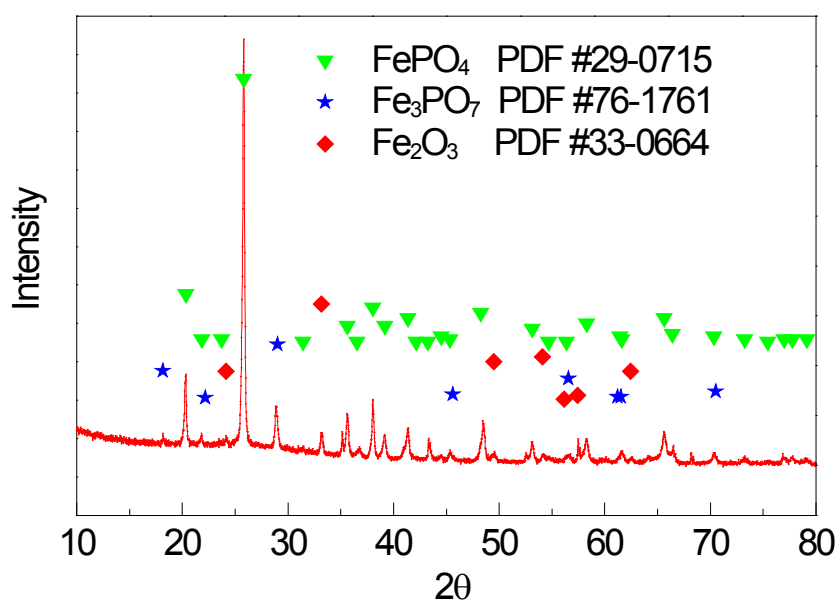
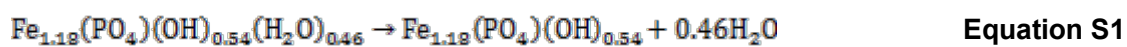
| Item  | Page |
|---|------|
| 1. Characterization on the branch of the dendrite           | S1   |
| 2. Thermal decomposition procedure and products             | S2   |
| 3. Detailed morphology of intermediate product              | S3   |
| 4. Catalyst stability test                                  | S4   |
| 5. Time dependence of surface charge and precipitate amount | S5   |

### 1. Characterization on the branch of the dendrite



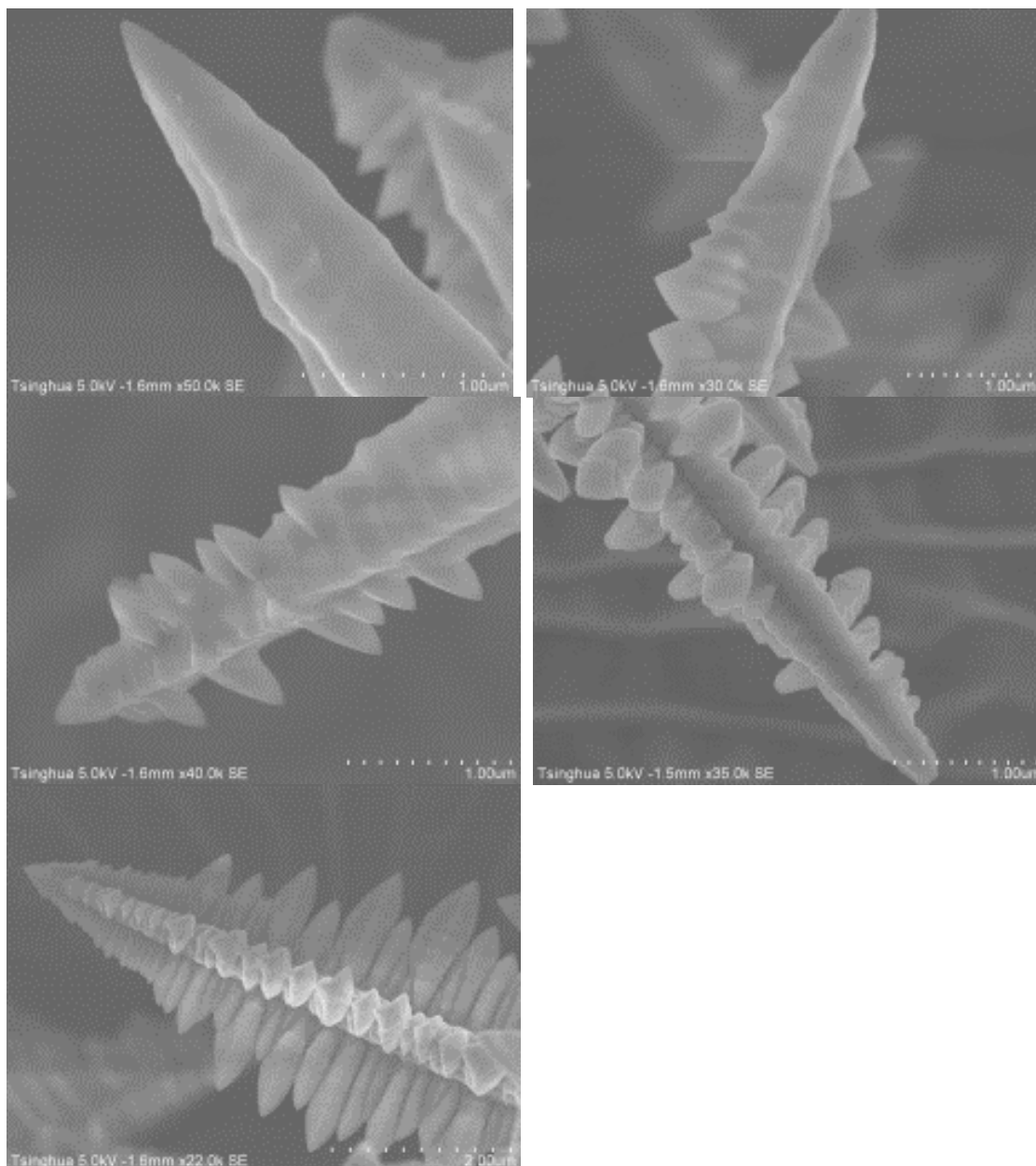
**Figure S1.** Branch length distribution of the dendrite. Data are collected from Figure 1b. The hydrothermal condition was 180 °C, 18 h.

## 2. Thermal decomposition procedure and products



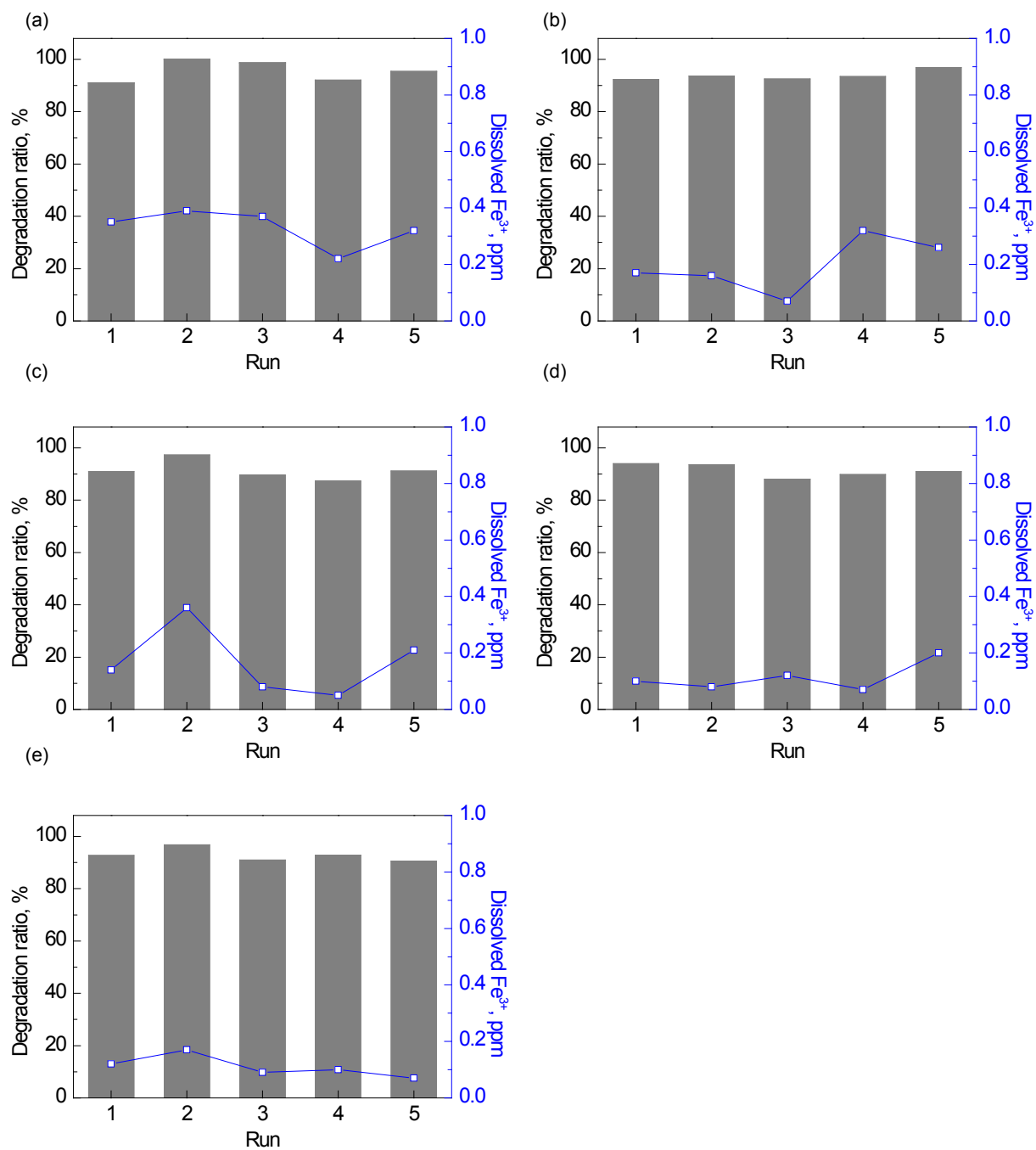
**Figure S2.** XRD pattern of the dendrite after thermal analysis. The hydrothermal condition was 180 °C, 18 h. The thermal analysis condition was from 30 °C to 800 °C, 5 °C/min.

### 3. Detailed morphology of intermediate product



**Figure S3.** Various detailed morphology of intermediate product. The hydrothermal condition was 180 °C, 4.5 h.

#### 4. Catalyst stability test



**Figure S4.** Catalyst stability test with respects of phenol degradation and iron leaching. pH = 3 (a), 5 (b), 6 (c), 7 (d), and 8 (e), respectively.

## 5. Time dependence of surface charge and precipitate amount

**Table S1.** The variance of zeta potential, the precipitate amount and the content of iron in the precipitate with hydrothermal treatment time.

| Time<br>t / h | Zeta potential<br>$\zeta$ / (mV) | Precipitate amount |                                 |
|---------------|----------------------------------|--------------------|---------------------------------|
|               |                                  | weighted / (mg)    | measured / (Fe, $\mu\text{g}$ ) |
| 2.0           | 11.1                             | 6.2                | 1959                            |
| 3.0           | 11.9                             | 5.5                | 2034                            |
| 3.5           | 10.3                             | -                  | -                               |
| 4.0           | 8.9                              | 5.7                | 1957                            |
| 4.5           | 7.4                              | -                  | -                               |
| 5.0           | -12.1                            | 6                  | 2028                            |
| 6.0           | -                                | 5.5                | 2004                            |