Supplementary Materials:

S1：TG/DTG/DSC:

Operate the thermogravimetric analyzer and Differential Scanning Calorimeter to set the heating program, including the initial temperature, heating rate, maximum temperature, and holding time. The initial temperature of this experiment is 300 K, and it is heated to 1100 K at a rate of 20 K/min. For both the TGA and DSC experiments, an oxidative atmosphere is selected. Start running the experiment, and the thermogravimetric analyzer and Differential Scanning Calorimeter will automatically record and plot the mass change curve. At the same time, the thermogravimetric analyzer may also record differential thermogravimetric data. Export the data file from the thermogravimetric analyzer and use Origin software for data analysis.

S2：XRD:

The mineralogy was examined by XRD (7000X, Shimadzu Instruments, Japan), and the variations on the major crystal phases. The XRD measurements are taken with Cu Kα1 radiation, and the working current and voltage of XRD measurement is 30 mA and 40 kV. The slit width was set at 0.3mm, and the samples were scanned in the range $2\theta = 10°\sim80°$, continuously-scan mode. The data from XRD tests was analyzed by the software Jade 6.5 (Jade Software Co., Ltd., Christchurch, New Zealand) to obtain the XRD spectrums.

S3：SEM:

The morphology in micro-/nanoscale was respectively observed by SEM (MIRA-LMS, Tescan Instruments, Czech Republic) and HRTEM (Tecnai G2 F20, FEI, USA). All samples were observed by using SEM with electron acceleration voltage of 20 kV after being sprayed with gold, and high resolutional images were analyzed with GMS 3 to determine lattice spacings.

S4: GC Chromatography

According to the gas chromatography method (HJ 592-2010), using a gas chromatograph (GC9720PLUS, manufacturer: Fuli, China) with a KB-5 capillary column (30.0 m × 0.25 mm ID, film thickness 0.25 μm). The analysis employs headspace sampling, with samples heated at 80 °C for 20 minutes. The valve box temperature is set to 100 °C, and the transfer line temperature is maintained at 120 °C. The injection volume is 1 mL. The column oven starts at an initial temperature of 60 °C, held for 0.5 minutes, followed by an increase to 200 °C at a rate of 10 °C per minute. Nitrogen (N2) serves as the carrier gas, with a flow rate set to 1.0 mL/min. The split ratio is set to 10. Conducting the analysis in accordance with standard HJ 592-2010. In addition, 100 x dilution of the aniline solution (i.e., 1mg/L of aniline) is utilized for GC examination, in adjusting and certifying the standard concentrate of aniline involved in wastewater, and 60 x dilution of the wastewater is conducted during the detection of residual aniline.

S5: 3D Fluorescence.

The three-dimensional fluorescence measurements of sample solutions under different reaction systems are carried out using the F97XP three-dimensional

fluorescence spectrophotometer from Shanghai Lengguang. For the three-dimensional fluorescence detection experiments, the excitation wavelength is set from 200 nm to 450 nm with a sampling interval of 10 nm. The emission wavelength is set from 200 nm to 450 nm, with a scan interval of 1 nm.