Precursor-Induced Self-Assembly of Bi$_5$O$_7$NO$_3$ Nanocrystals into Superstructures and their Distinct Photocatalytic Performances

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Synthesis of Bi$_5$O$_7$NO$_3$ booklets

Bi$_5$O$_7$NO$_3$ booklets were prepared by adding 20 mmol of Bi(NO$_3$)$_3$ to ammonia solution. A detailed procedure was followed. The weighted amount of Bi(NO$_3$)$_3$ was put into a 100 mL Teflon-lined auto clave and mixed with 5 mL NH$_3$.H$_2$O solution and 45 mL deionized water. The mixed solution was then put into an oven at 150 °C for 24 hr. The obtained powder was then rinsed with water and ethanol several times and dried under a vacuum at 40 °C for 15 hr.

Synthesis of Bi$_5$O$_7$NO$_3$ bundles

Bi$_5$O$_7$NO$_3$ bundles were prepared by adding ca. 1.5 mmol of Bi(NO$_3$)$_3$ to ammonia solution while the other conditions were kept the same. A detailed procedure was followed. The weighted amount of Bi(NO$_3$)$_3$ was put into a 100 mL Teflon-lined auto clave and mixed with 5 mL NH$_3$.H$_2$O solution and 45 mL deionized water. After mixing and stirring, the solution was put into an oven at 150 °C for 24 hr. The obtained powder was then rinsed with water and ethanol several times and dried under a vacuum at 40 °C for 15 hr.

Characterization of the Bi$_5$O$_7$NO$_3$ samples

Morphologies of the samples were characterized by SEM (S4800, Hitachi), AFM (Mutimode, Veeco Inc.) and HRTEM (Tecnai G2, FEI). XRD spectra were captured by a D8 Advance Bruker X-ray diffraction spectrometer using graphite monochromatized Cu-Ka (λ = 1.5406 Å) radiation source. Absorption spectra of RhB were obtained by a UV–vis spectrophotometer (HP Lambda 650). The Brunauer–Emmett–Teller (BET) surface areas of the samples were measured by means of N$_2$ adsorption over a Tristar II 3020 (Micromeritics) equipment.
Photoelectrochemical measurements of Bi$_5$O$_7$NO$_3$ samples

Photoelectrochemical measurements were conducted in a conventional three electrode cell by a computer-controlled electrochemical work station (Autolab N204). 20 mg of the as-obtained samples were mixed with 2 mL of 1% Nafion aqueous solution and ultrasonicated for 15 min. to get homogeneous solution. The obtained solution was dipped onto ITO glass (1cmx4cm) and dried in air. Current-time curves were collected at 1.0 V vs SCE.

Photocatalytic performance tests of the Bi$_5$O$_7$NO$_3$ samples

Photocatalytic activities of the Bi$_5$O$_7$NO$_3$ samples were evaluated by photodegradation of RhB. A 300 W Xe lamp was used as a light source. 0.1 g photocatalyst was added to 100 mL of 1×10$^{-5}$ mol /L RhB aqueous solution. Prior to light irradiation, the suspension solution was kept in the darkness for 1 h with magnetic stirring. During measurements, 2 mL aliquots were collected at a certain interval.

Calculation of the thickness of the Bi$_5$O$_7$NO$_3$ nanosheets

The calculation is based on XRD peak of {600} facet according to Scherrer equation $D=\frac{k\lambda}{B\cos\theta}$, where $D$ is thickness, Scherrer constant value 0.9, $k$ 0.9 shape factor, $B$ half width ca. 0.080 of XRD peak of {600} facet, $\lambda=0.154$nm and $\theta$ (Bragg angle) ca. 16.27. So, $D=1.8005$. 
Fig. S1 XRD spectra of the self-assembled Bi$_5$O$_7$NO$_3$ booklets and standard Bi$_5$O$_7$NO$_3$. 
Fig. S2 TEM image of random chosen disassembled Bi$_5$O$_7$NO$_3$ booklets showing typical crease phenomenon, suggesting the nature of the very thin thickness.
Fig. S3 UV-vis absorption spectra of the Bi$_5$O$_7$NO$_3$ booklets and the nanosheets (A), and their extracted bands (B).
Fig. S4 HRTEM image of random chosen self-assembled Bi$_3$O$_7$NO$_3$ booklets, showing good crystallinity.
Fig. S5 SEM image of self-assembled Bi$_5$O$_7$NO$_3$ bundles, showing some twists.
Fig. S6 FFT of HRTEM image of the as-obtained NRs. \{314\} facet is seen.
Fig. S7 UV-vis absorption spectra of the Bi$_5$O$_7$NO$_3$ bundles and the nanorods (A), and their extracted bands (B).
Fig. S8 Photocatalytic stability test of the Bi$_2$O$_3$NO$_3$ booklets.
Fig. S9 Photocatalytic activities of the as-obtained Bi$_5$O$_7$NO$_3$ booklets (A) and bundles (B) before and after disassembly processes.

Table S1 BET specific surface areas of the as-obtained self-assembled Bi$_5$O$_7$NO$_3$ samples

<table>
<thead>
<tr>
<th>Sample</th>
<th>Stacked NS</th>
<th>NR bundles</th>
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</thead>
<tbody>
<tr>
<td>BET surface area (m$^2$/g)</td>
<td>0.84</td>
<td>1.09</td>
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