

1 C. Yang, X. You, J. Cheng, H. Zheng, Y. Chen, *Appl. Catal. B- Environ.*, 2017, **200**, 673.

## Supporting Information

### **g-C<sub>3</sub>N<sub>4</sub>@Au@SrAl<sub>2</sub>O<sub>4</sub>:Eu<sup>2+</sup>,Dy<sup>3+</sup> Composite as an Efficient Plasmonic Photocatalyst for Round-the-Clock Environmental Purification and Hydrogen Evolution**

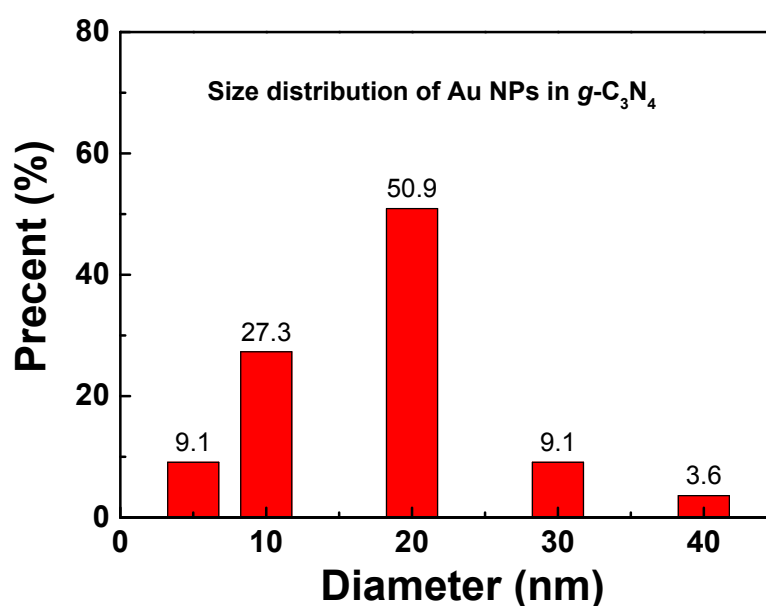
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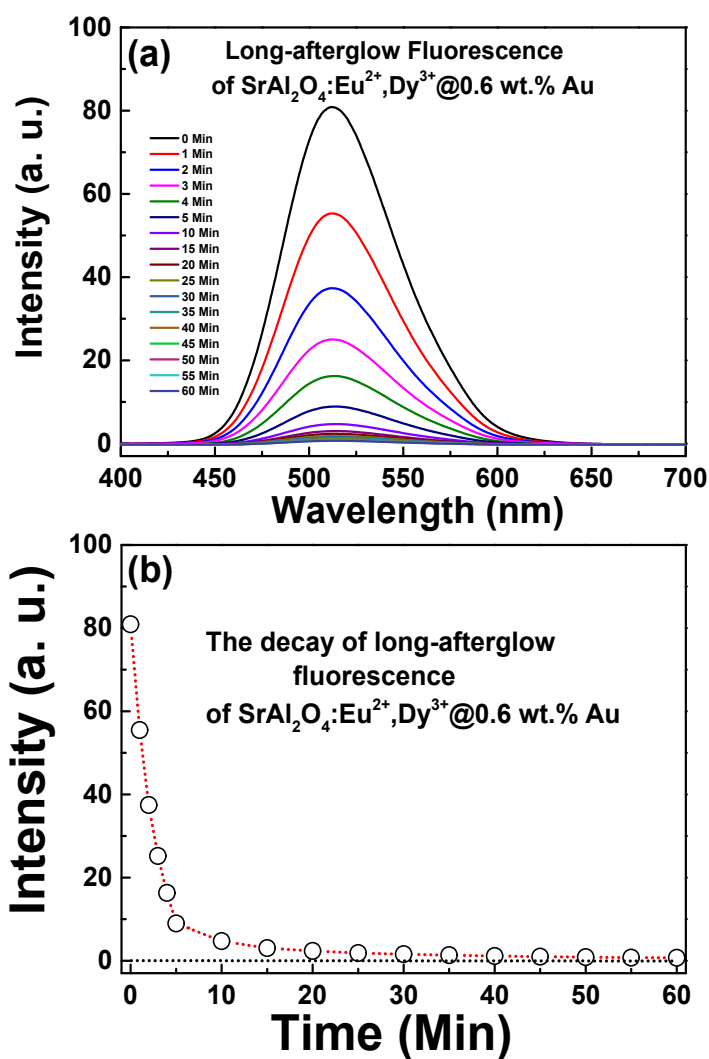
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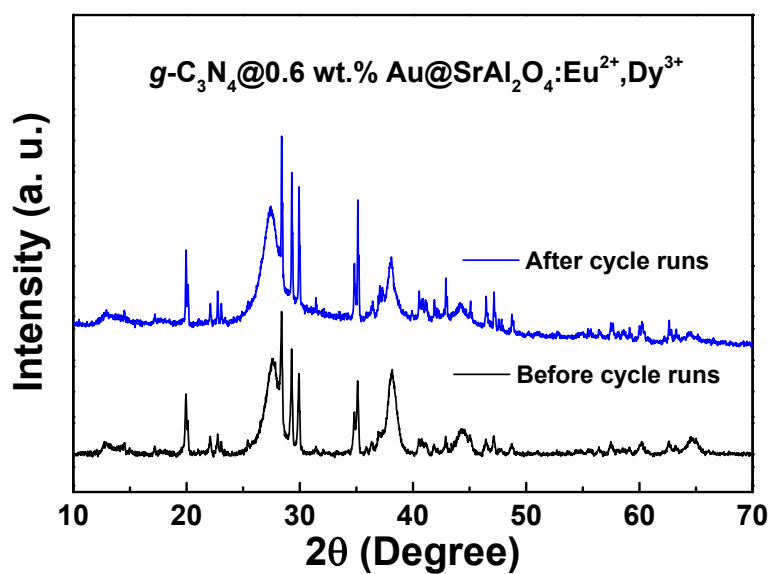
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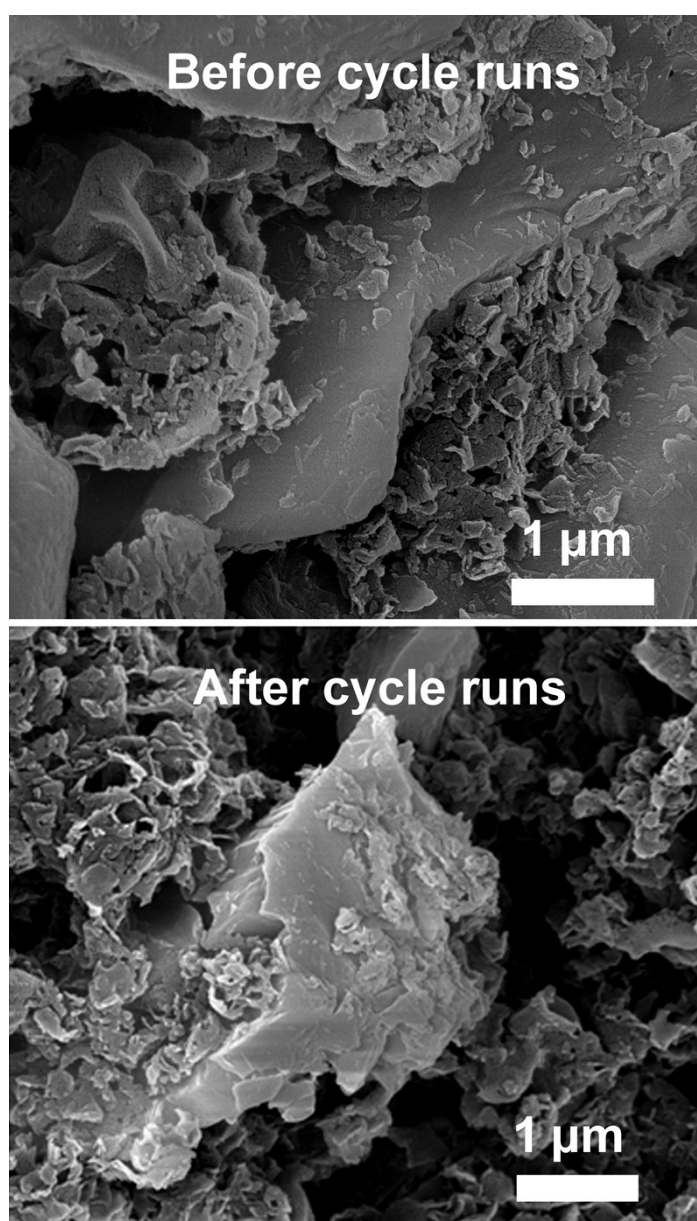


**Figure SP I.** Size distribution of Au NPs in g-C<sub>3</sub>N<sub>4</sub>.**Figure SP II.** The long-afterglow fluorescence spectrum of g-C<sub>3</sub>N<sub>4</sub>@0.6wt.%Au@SrAl<sub>2</sub>O<sub>4</sub>:Eu<sup>2+</sup>,Dy<sup>3+</sup>

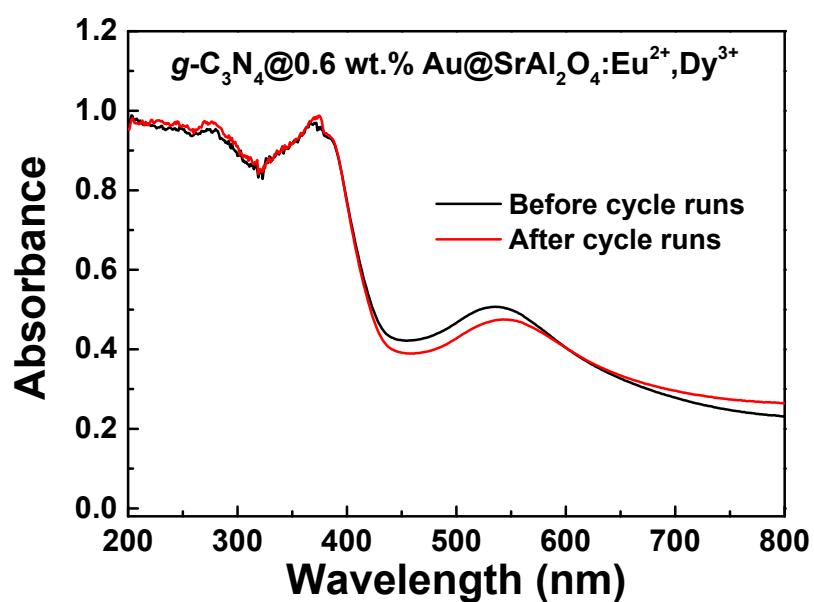
composite last for one hour in every two or five minutes after stop exciting with Xe lamp (a). The decay curve of long-afterglow fluorescence of the  $g\text{-C}_3\text{N}_4@0.6\text{wt.}\% \text{Au}@SrAl_2O_4:\text{Eu}^{2+},\text{Dy}^{3+}$  composite (b).



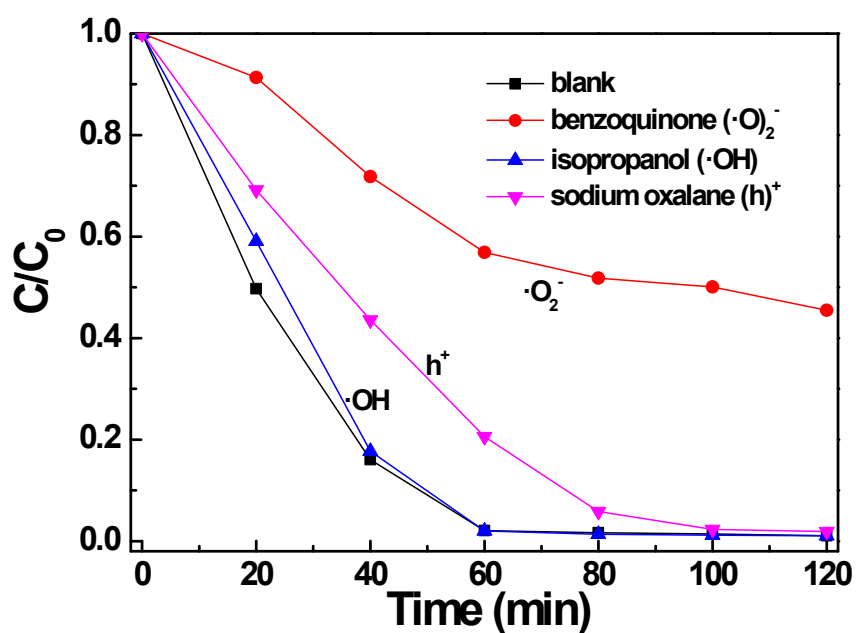
**Figure SP III.** XRDs of  $\text{C}_3\text{N}_4@0.6 \text{ wt.}\% \text{Au}@SrAl_2O_4:\text{Eu}^{2+},\text{Dy}^{3+}$  composite before and after cycle runs.



**Figure SP IV.** FE-SEM of  $C_3N_4@0.6 \text{ wt.}\% \text{Au}@SrAl_2O_4:Eu^{2+}, Dy^{3+}$  composite before and after cycle runs.



**Figure SP V.** UV-vis diffuse reflectance spectra of  $C_3N_4@0.6 \text{ wt.}\% \text{Au}@SrAl_2O_4:Eu^{2+}, Dy^{3+}$  composite before and after cycle runs.



**Figure SP VI.** Photocatalytic degradation of RhB in the presence of three types of scavengers (e.g., benzoquinone, isopropanol, and sodium oxalane) and  $g-C_3N_4@0.6wt.\% Au$  composite photocatalyst with irradiation of visible light.