Supporting Information

Significantly Enhanced Visible-Light-Induced Photocatalytic Performance of Hybrid Zn-Cr Layered Double Hydroxide/Graphene Nanocomposite and the Mechanism Study

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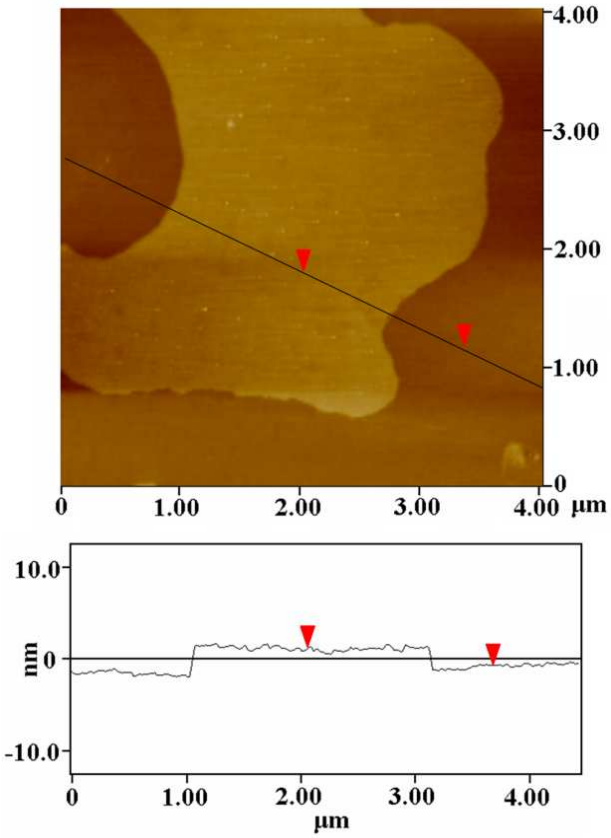

Figure S1. AFM image and cross-section analyses of graphene

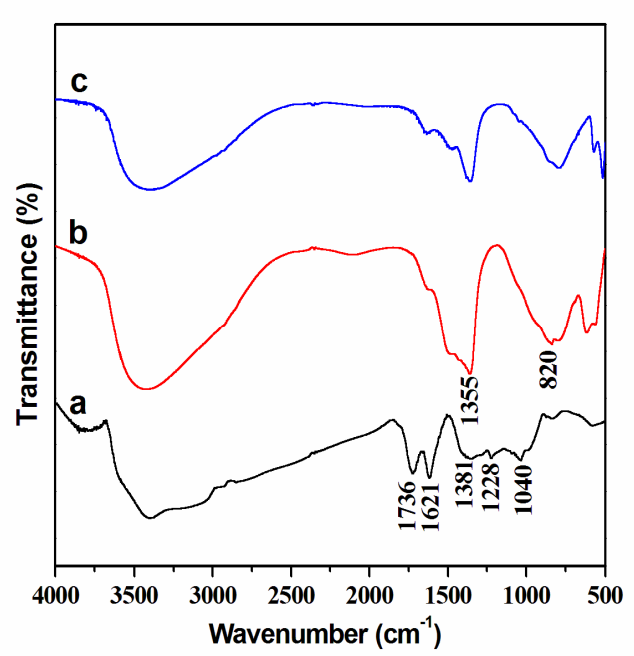

Figure S2. FT-IR spectra of GO (a), ZnCr-LDH (b), and LDH/G-1(c).

Figure S2 presents FT-IR spectra of GO, LDH/G-1, and pure ZnCr-LDH samples. As for GO, the absorption at 1736 cm^{-1} was assigned to the C=O stretching vibration of COOH groups, while the absorption at 1621 cm^{-1} was assigned to the stretching vibration of carbon backbone (C=C/C-C). [1,2] Three weak absorption peaks at about 1040, 1228 and 1381 cm^{-1} were interpreted as the epoxy (C-O-C), alkoxy (C-O), and carboxyl (C-OH) stretching vibrations, respectively. And, the broad absorption between 3650 and 3250 cm^{-1} was associated with the stretching vibration of hydroxyl groups coming from COOH groups and water molecules. However, as for LDH/G-1, above characteristic absorption bands related to C=O and C-O stretching vibrations all disappeared. At the same time, two intense absorption peaks at about 820 and 1355 cm^{-1} were observed, which is assigned to the v_2 (out-of plane deformation) and v_3 (symmetric stretching) vibrations of interlayer carbonate anions; [3] the bands appearing at the low-frequency region were attributed to the metal–oxygen and metal–hydroxyl vibration modes in the lattice of ZnCr-LDH. The above results suggested the reduction of GO in the LDH/G-1 composite.

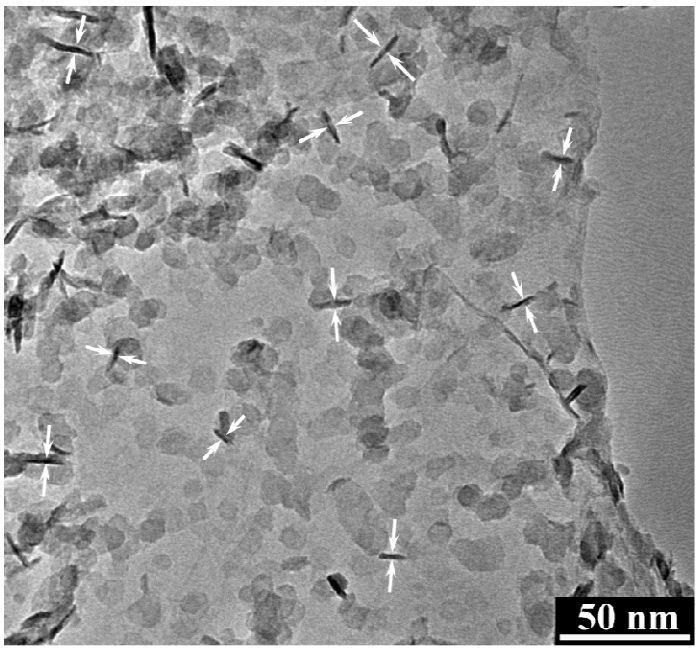

Figure S3. TEM image of LDH/G-1

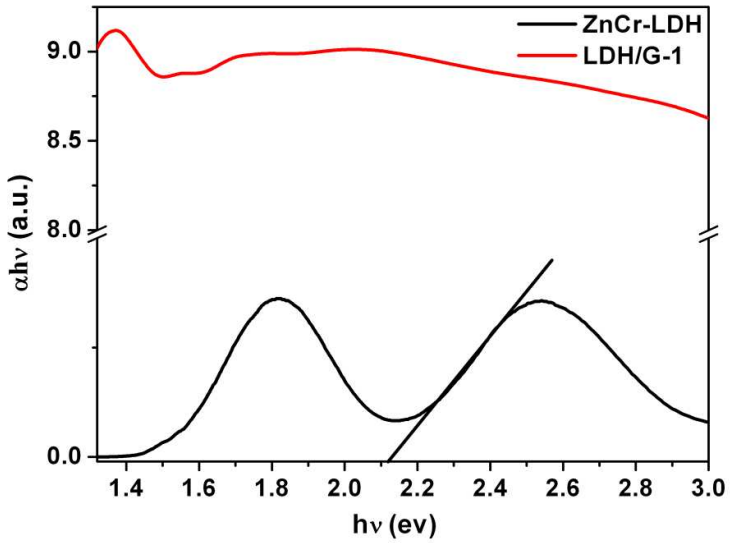

Figure S4. Specific absorption band edges calculated from UV-vis diffuse reflectance spectra.

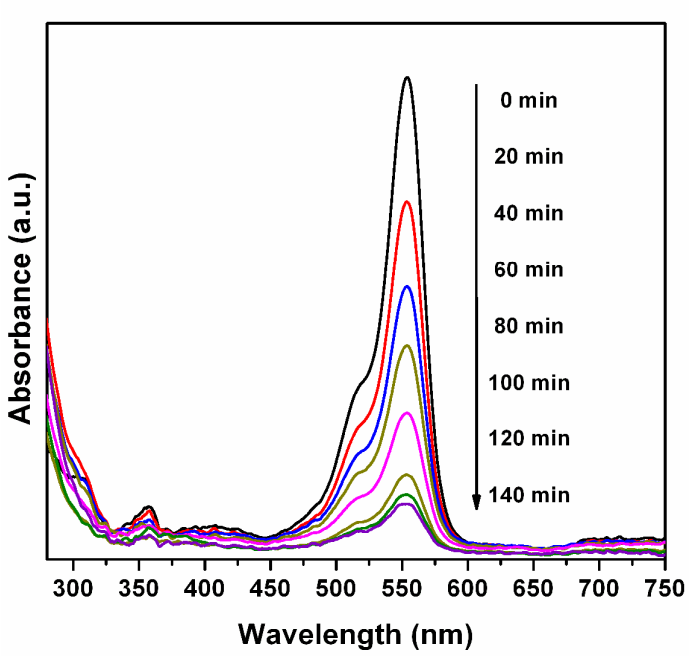

Figure S5. Absorption changes of RhB solution during the photo-degradation process over the LDH/G-1 sample under visible light irradiation.

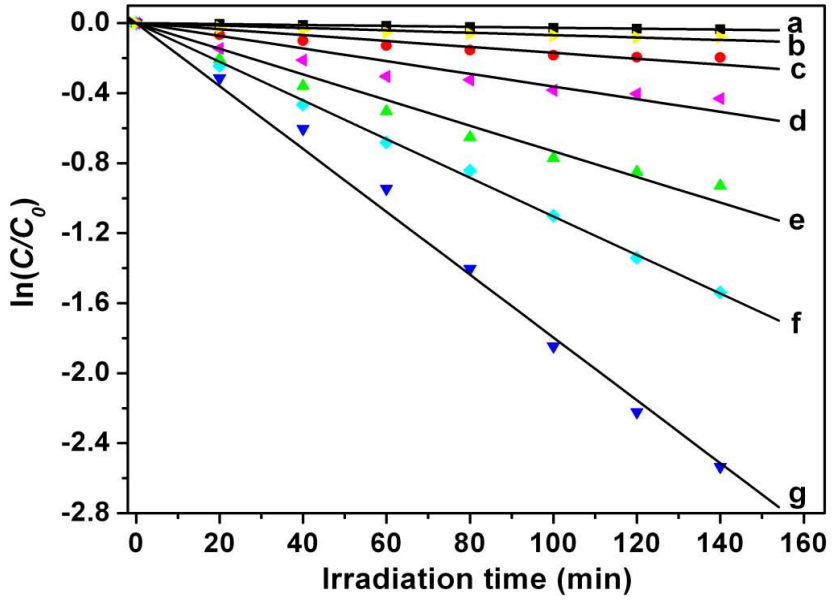

Figure S6. Pseudo-first-order kinetic for the photo-degradation of RhB for different samples under visible light irradiation: (a) blank, (b) graphene, (c) ZnCr-LDH, (d) standard Degussa P25, (e) LDH/G-0.5, (f) LDH/G-2, and (g) LDH/G-1.

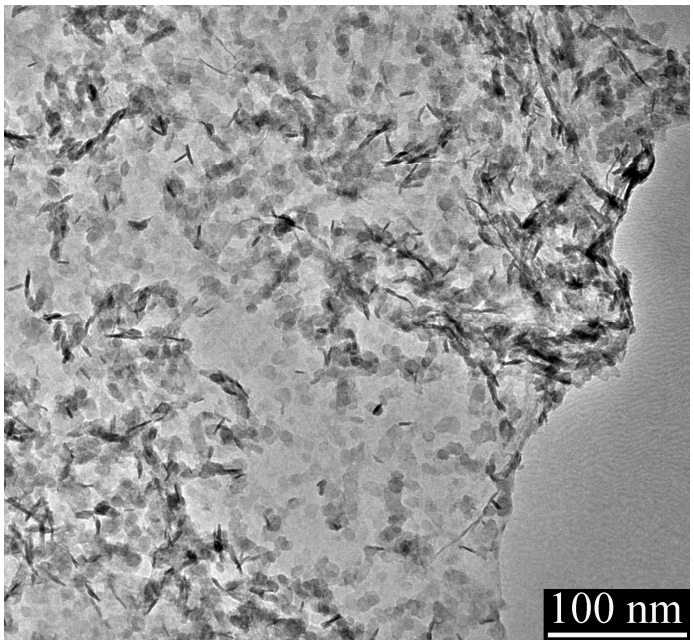

Figure S7. Typical TEM image of LDH/G-1 after recycling for five times.

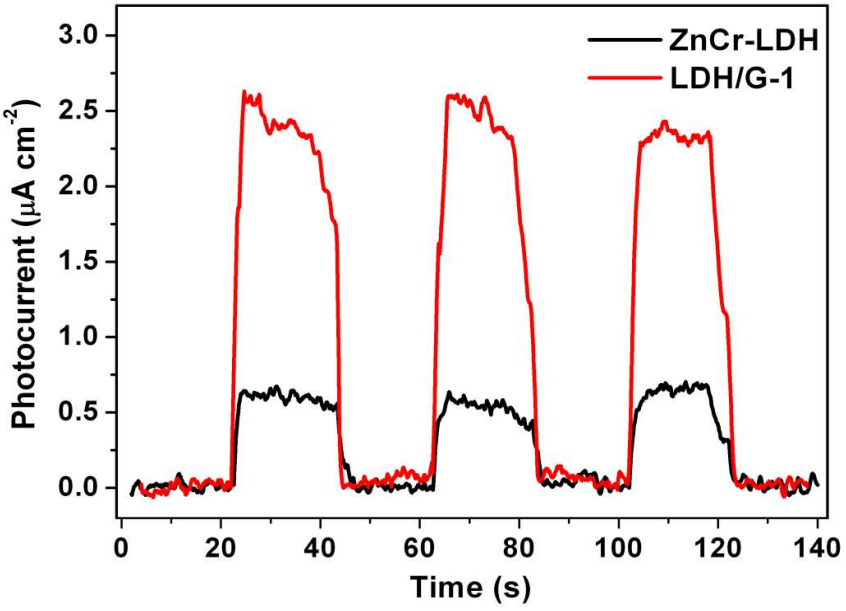

Figure S8. Transient photocurrent responses for ZnCr-LDH and LDH/G-1 samples.

References

(1) Nethravathi, C.; Nisha, T.; Ravishankar, N.; Shivakumara, C.; Rajamathi, M. Graphene-Nanocrystalline Metal Sulphide Composites Produced by a One-Pot Reaction Starting from Graphite Oxide. *Carbon* **2009**, *47*, 2054–2059.

(2) Bourlinos, A. B.; Gournis, D.; Petridis, D.; Szabo, T.; Szeri, A.; Dekany, I. Graphite Oxide: Chemical Reduction to Graphite and Surface Modification with Primary Aliphatic Amines and Amino Acids. *Langmuir* **2003**, *19*, 6050–6055.

(3) Perera, S. D.; Mariano, R. G.; Vu, K.; Nour, N.; Seitz, O.; Chabal, Y.; Balkus, Jr. K. J. Hydrothermal Synthesis of Graphene-TiO_2 Nanotube Composites with Enhanced Photocatalytic Activity. *ACS Catal.* **2012**, *2*, 949–956.