# Supported Information

# $CuInS_2/Mg(OH)_2$ nanosheets for the enhanced visible-light photocatalytic degradation of tetracycline

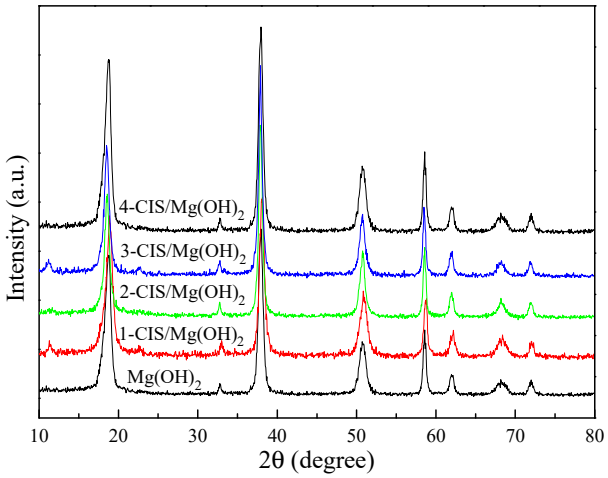


**Figure S1.** XRD patterns of $Mg(OH)_2$ and $CIS/Mg(OH)_2$.

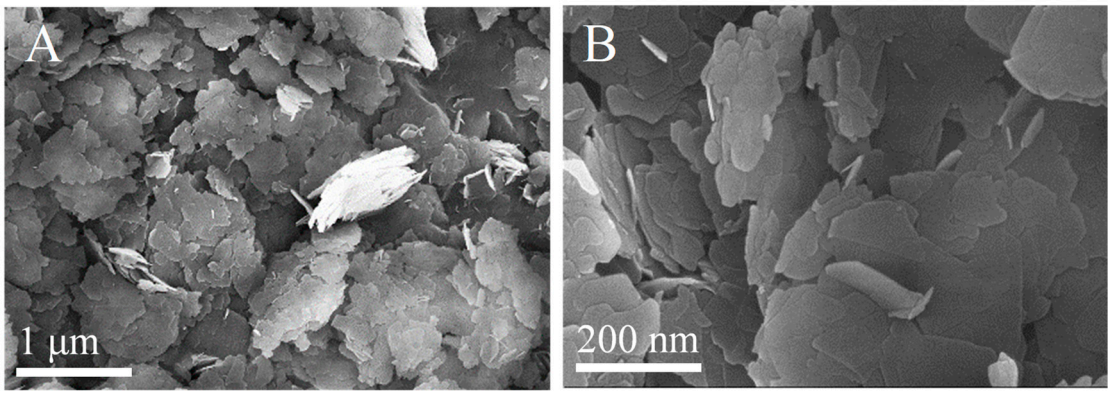


**Figure S2**. SEM images of $Mg(OH)_2$.

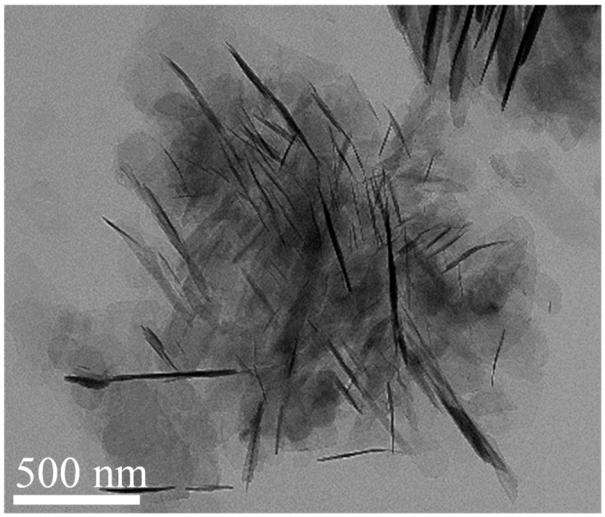


**Figure S3**. TEM images of 2-CIS/$Mg(OH)_2$.

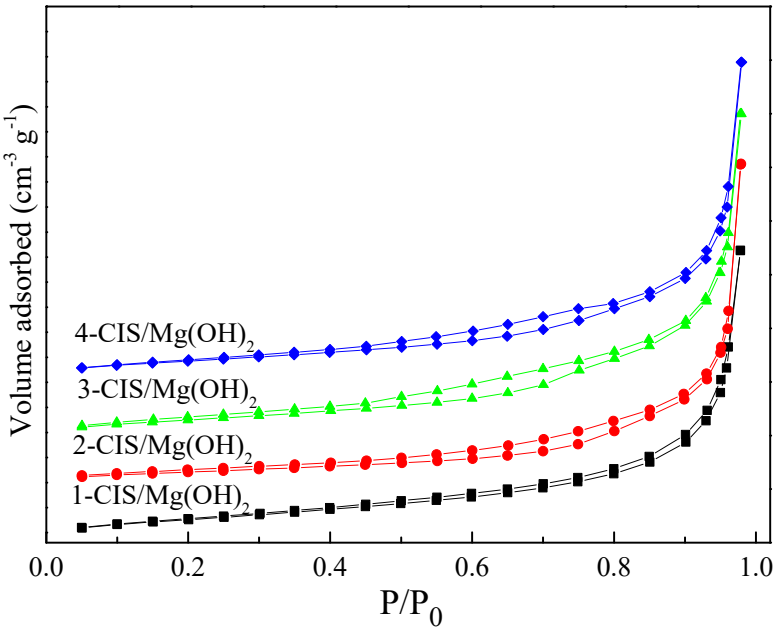


**Figure S4**. $N_2$ adsorption-desorption curves of CIS/$Mg(OH)_2$ with varying $CuInS_2$ content.

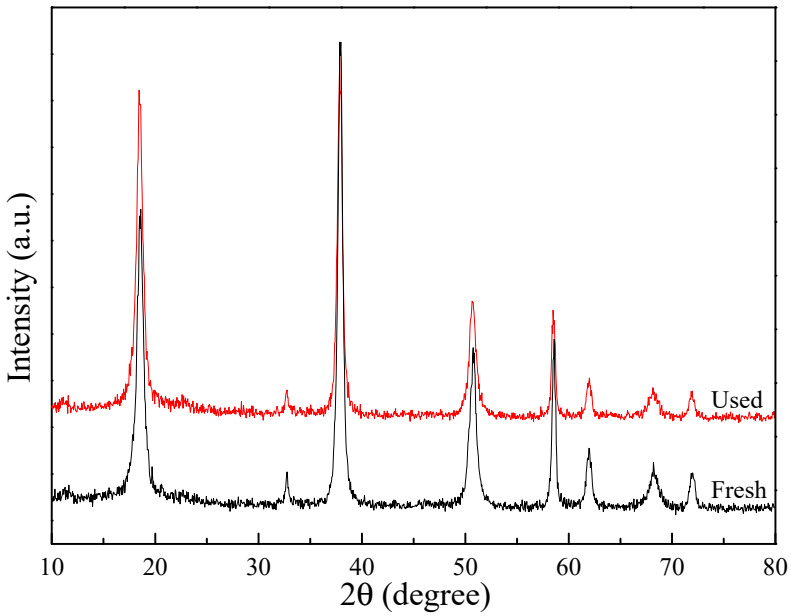


**Figure S5**. XRD patterns of fresh and used 2-CIS/$Mg(OH)_2$.

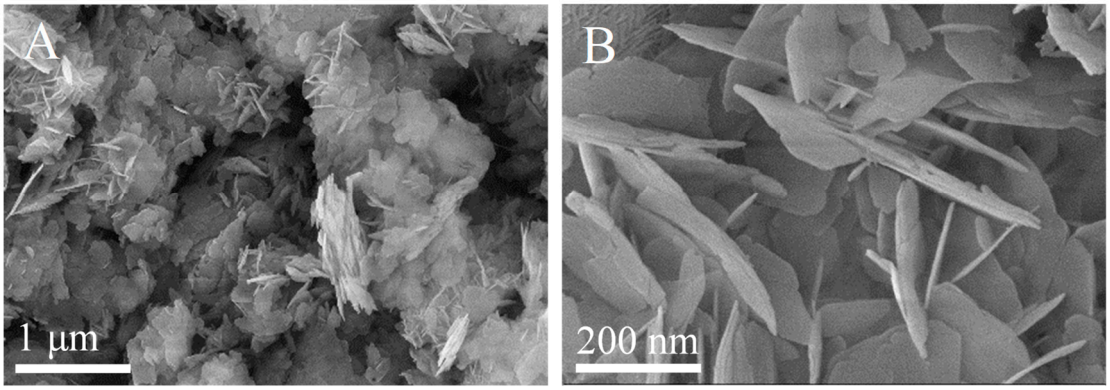


**Figure S6**. SEM images of used 2-CIS/$Mg(OH)_2$.

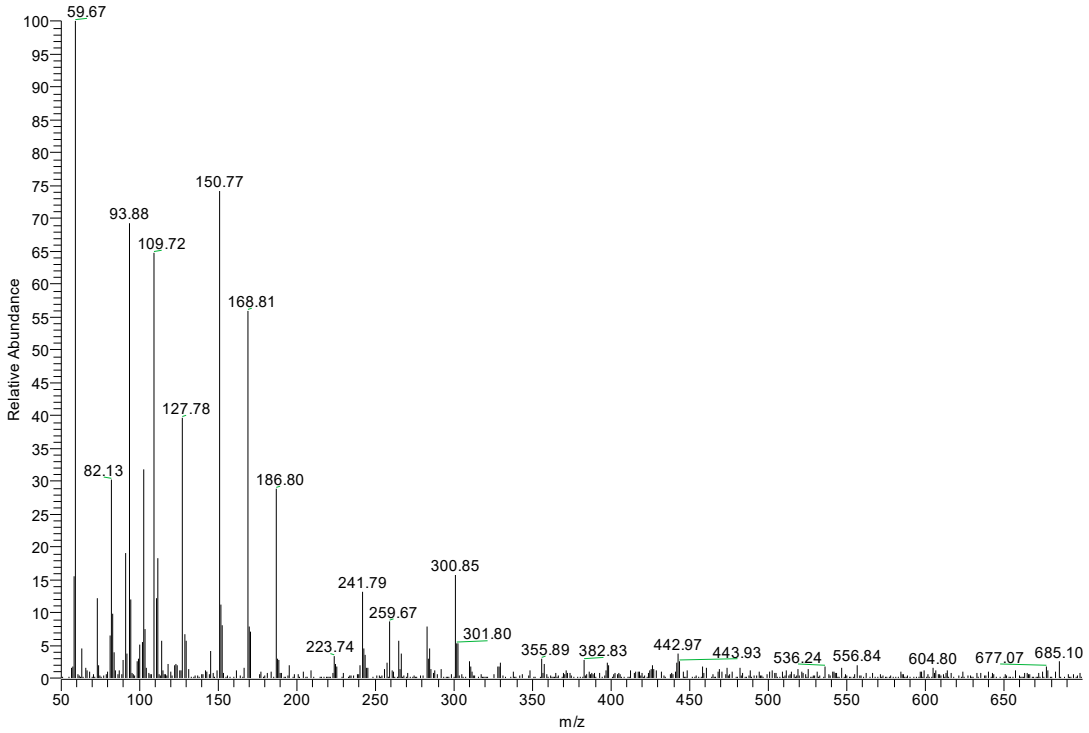


**Figure S7**. HPLC/MS spectrum of TCH solution under visible-light irradiation of 30 min over 2-CIS/$Mg(OH)_2$.

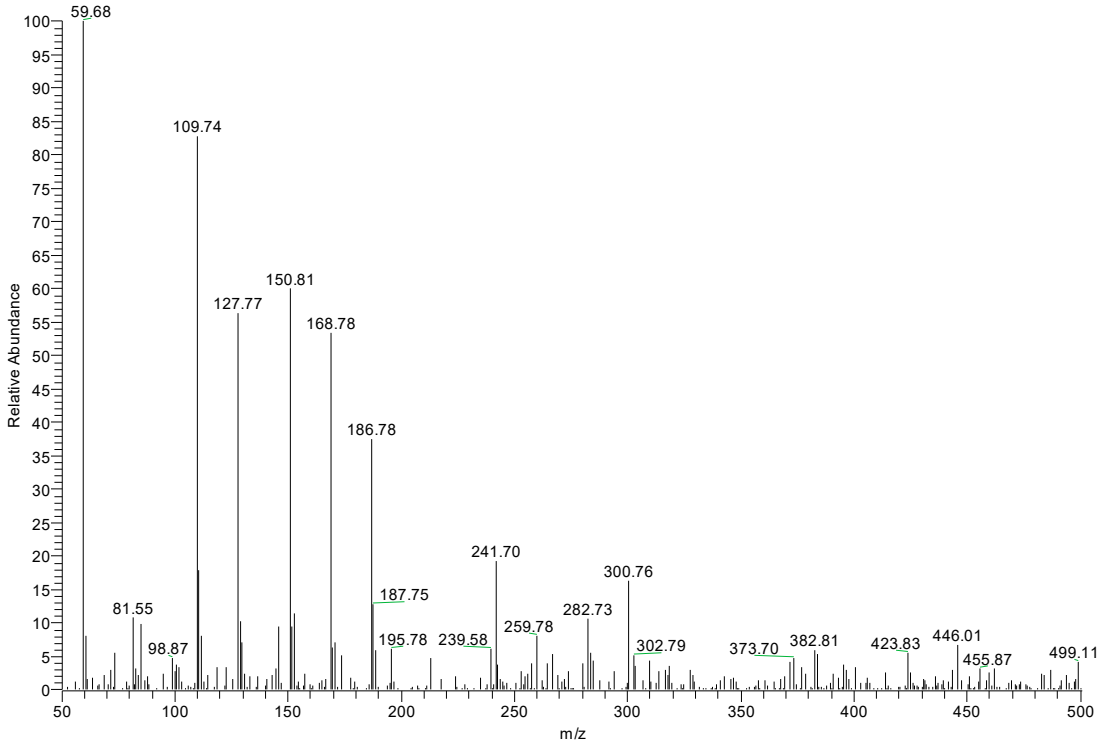


**Figure S8**. HPLC/MS spectrum of TCH solution under visible-light irradiation of 60 min over 2-CIS/$Mg(OH)_2$.

**Table S1.** Texture parameters of CIS/$Mg(OH)_2$-based samples.

| Samples | BET surface area ($m^2$ $g^{-1}$) | Pore volume ($cm^3$ $g^{-1}$) | Pore diameter (nm) | Metallic content (%) [a] | | |
|---|---|---|---|---|---|---|
| | | | | Mg | Cu | In |
| 1-CIS/$Mg(OH)_2$ | 46.7 | 1.25 | 3.06 | 40.59 | 0.51 | 0.92 |
| 2-CIS/$Mg(OH)_2$ | 38.8 | 1.09 | 3.21 | 39.15 | 1.04 | 1.73 |
| 3-CIS/$Mg(OH)_2$ | 33.4 | 0.98 | 3.64 | 38.86 | 1.67 | 3.10 |
| 4-CIS/$Mg(OH)_2$ | 30.5 | 0.91 | 3.52 | 37.69 | 1.83 | 3.41 |
| Used 2-CIS/$Mg(OH)_2$[c] | / | / | / | 38.52 | 0.98 | 1.75 |

[a] The contents of metallic elements was measured by ICP-OES.

[b] The atomic contents of metallic elements was measured by XPS.

[c] The used composite was not detected by $N_2$-sorption for the BET, pore volume and pore diameter.

**Table S2**. The parameters of Surface roughness of 2-CIS/$Mg(OH)_2$.

| Samples | $R_a$ (nm) [a] | $R_q$ (nm) [b] | $S_{sk}$ [c] |
|---|---|---|---|
| Fresh | 8.90 | 15.40 | 2.80 |
| Adsorption [d] | 44.2 | 58.7 | 0.45 |
| Photocatalysis [e] | 1.77 | 3.09 | 3.06 |
| Used [f] | 1.20 | 1.62 | 1.00 |

[a] Ra was the average roughness, nm.

[b] Rq was the root mean square roughness, nm.

[c] $S_{sk}$ was the surface skewness.

[d] The adsorption time is 2.0 h.

[e] The photocatalytic time is 30 min.

[f] The photocatalytic time is 60 min.

**Table S3**. The adsorption-photocatalysis capacities of CIS/$Mg(OH)_2$ samples.

| Samples | Adsorption | | photocatalysis | | Removal (%) |
|---|---|---|---|---|---|
| | $C_0$ (mg $L^{-1}$) | Efficiency [a] (%) | C (mg $L^{-1}$) | Efficiency [b] (%) | |
| $Mg(OH)_2$ | 26.75 | 46.50 | 12.51 | 53.23 | 74.98 |
| 1-CIS/$Mg(OH)_2$ | 38.02 | 23.96 | 3.14 | 91.74 | 93.71 |
| 2-CIS/$Mg(OH)_2$ | 37.54 | 24.92 | 0.03 | 99.92 | 99.95 |
| 3-CIS/$Mg(OH)_2$ | 39.23 | 21.54 | 4.68 | 88.07 | 90.64 |
| 4-CIS/$Mg(OH)_2$ | 37.70 | 24.60 | 2.58 | 93.16 | 94.83 |

[a] Adsorption efficiency = $(50-C_0)/50*100\%$. [b] Photocatalysis efficiency = $(C_0-C)/C_0*100\%$.

Conditions: TCH concentration of 50 mg $L^{-1}$, Photocatalyst bulks of 50 mg, TCH solution volume of 100 mL, Light power intensity of 600 mW $cm^{-2}$, pH value of 4.65 and Adsorption time of 2.0 h.

**Table S4**. Effect of pH value on the adsorption-photocatalysis capacities of 2-CIS/$Mg(OH)_2$.

| pH | Adsorption | | photocatalysis | | Removal (%) |
|---|---|---|---|---|---|
| | $C_0$ (mg $L^{-1}$) | Efficiency [a] (%) | C (mg $L^{-1}$) | Efficiency [b] (%) | |
| 3.17 | 40.75 | 18.50 | 4.46 | 89.06 | 91.09 |
| 4.65 | 37.54 | 24.92 | 0.03 | 99.92 | 99.95 |
| 5.83 | 34.63 | 30.74 | 5.06 | 85.39 | 89.89 |
| 7.42 | 27.18 | 45.64 | 5.56 | 79.54 | 88.87 |
| 8.76 | 37.28 | 25.44 | 4.66 | 87.50 | 90.67 |

[a] Adsorption efficiency = $(50-C_0)/50\times100\%$. [b] Photocatalysis efficiency = $(C_0-C)/C_0\times100\%$.

TCH concentration of 50 mg $L^{-1}$, Photocatalyst bulks of 50 mg, TCH solution volume of 100 mL, Light power intensity of 600 mW $cm^{-2}$ and Adsorption time of 2.0 h.

**Table S5**. Effect of inorganic ions on the adsorption-photocatalysis capacities of 2-CIS/$Mg(OH)_2$.

| Samples | Adsorption | | photocatalysis | | Removal (%) |
|---|---|---|---|---|---|
| | $C_0$ (mg $L^{-1}$) | Efficiency [a] (%) | C (mg $L^{-1}$) | Efficiency [b] (%) | |
| Blank | 37.54 | 24.92 | 0.03 | 99.92 | 99.95 |
| NaCl | 37.69 | 24.62 | 3.95 | 89.52 | 92.09 |
| $Na_2SO_4$ | 38.42 | 23.16 | 4.79 | 87.53 | 90.43 |
| $Na_2CO_3$ | 42.17 | 15.66 | 6.53 | 84.52 | 86.94 |
| $Na_3PO_4$ | 46.47 | 7.06 | 9.22 | 80.16 | 81.55 |

[a] Adsorption efficiency = $(50-C_0)/50\times100\%$. [b] Photocatalysis efficiency = $(C_0-C)/C_0\times100\%$.

TCH concentration of 50 mg $L^{-1}$, Photocatalyst bulks of 50 mg, TCH solution volume of 100 mL, Visible-light power intensity of 600 mW $cm^{-2}$, pH value of 4.65 and Adsorption time of 2.0 h.

**Table S6**. Comparison of photocatalytic performance for removal of organic pollutants.

| Samples | Light source | | Organic pollutants | | | $\eta$ [b] (%) | Ref. |
|---|---|---|---|---|---|---|---|
| | Type [a] | P (W) | Type | C(mg $L^{-1}$) | T(min) | | |
| $Ag/TiO_2$ | Xe | 300 | Tetracycline | 30 | 600 | 90.0 | 8 |
| MgO@N-C | Xe | 300 | Tetracycline | 400 | 70 | 92.20 | 15 |
| $Fe_2O_3$@$TiO_2$ composites | Xe | 300 | Tetracycline | 50 | 90 | 100 | 16 |
| $CuInS_2$/g-$C_3N_4$ | Xe | 300 | Tetracycline | 20 | 60 | 83.70 | 31 |
| $TiO_2$ | Hg | 9 | Tetracycline | 30 | 90 | 78.2 | 55 |
| Core-shell $TiO_2$@α-$Fe_2O_3$ | Xe | 300 | Methyl orange | 10 | 16 | 96.6 | 56 |
| Core-shell $Fe_2O_3/TiO_2$ | Hg | 450 | Paracetamol | 50 | 90 | 87.8 | 57 |
| Flower–like α-$Fe_2O_3$@$TiO_2$ | Hg | 300 | Acid orange 7 | 10 | 90 | 98.6 | 58 |
| α-$Fe_2O_3$@$TiO_2$ nanorods | Hg | 300 | Rhodamine B | 100 | 120 | 100 | 59 |
| $TiO_2$ P-25 | Hg | 125 | Tetracycline | 40 | 120 | 100 | 60 |
| 2-CIS/$Mg(OH)_2$ | Xe | 300 | Tetracycline | 50 | 60 | 99.95 | Present |

[a] Hg lamp were the UV-light sources, and Xe lamp was the visible-light source.

[b] η was the total removal efficiency of organic pollutant.