Electronic Supplementary Information

Monitoring the Insertion of Pt into Cu$_{2-x}$Se Nanocrystals: A Combined Structural and Chemical Approach for the Analysis of New Ternary Phases

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Figure S1: Combined elemental maps by STEM EDS of Pt-Cu-Se_A (a, single elemental maps presented in Figure 3), Pt-Cu-Se_B (b, single elemental maps presented in Figure 4), Pt-Cu-Se_C (c, single elemental maps presented in Figure 5). Copper was represented in cyan, platinum in red and selenium in green in all the elemental maps.
Figure SI2: Nominal (left) and normalized (right) elemental linescans of Pt-Cu-Se_A indicating the distribution of platinum, copper and selenium. The corresponding single elemental maps are presented in Figure 3 and the two-elements combined elemental maps are presented in Figure SI1a. Copper, platinum and selenium are represented in blue, red and green, respectively, in the combined elemental map. The same color coding applies to the linescan profiles, where the HAADF intensity profile (indicated in black) was also added as a further reference. The corresponding HAADF image is presented in Figure 3.

Figure SI3: Nominal (left) and normalized (right) elemental linescans of Pt-Cu-Se_B indicating the distribution of platinum, copper and selenium. The corresponding single elemental maps are presented in Figure 4 and the two-elements combined elemental maps are presented in Figure SI1b. Copper, platinum and selenium are represented in blue, red and green, respectively, in the combined elemental map. The same color coding applies to the linescan profiles, where the HAADF intensity profile (indicated in black) was also added as a further reference. The corresponding HAADF image is presented in Figure 4.
Figure SI4: Nominal (left) and normalized (right) elemental linescans of Pt-Cu-Se_C indicating the distribution of platinum, copper and selenium. The corresponding single elemental maps are presented in Figure 5 and the two-elements combined elemental maps are presented in Figure SI1c. Copper, platinum and selenium are represented in blue, red and green, respectively, in the combined elemental map. The same color coding applies to the linescan profiles, where the HAADF intensity profile (indicated in black) was also added as a further reference. The corresponding HAADF image is presented in Figure 5.

Figure SI5: Nominal (left) and normalized (right) elemental linescans of Pt-Cu-Se_D indicating the distribution of platinum and copper. The corresponding single elemental maps are presented in Figure 6. Copper and platinum are represented in blue and red, respectively, in the combined elemental map. The same color coding applies to the linescan profiles, where the HAADF intensity profile (indicated in black) was also added as a further reference. The corresponding HAADF image is presented in Figure 6.
Figure SI6: TGA data for Pt-Cu-Se_B and Pt-Cu-Se_C.

Figure SI7: X-ray diffractograms of Pt-Cu-Se_B/\ g-C_3N_4 and Pt-Cu-Se_C/\ g-C_3N_4 nanocomposites used as photocatalysts, compared to those of the precursor Pt-Cu-Se_B and C nanostructured materials.
Figure S18: EDS spectrum of Pt-Cu-Se_B/ g-C$_3$N$_4$ nanocomposite used as photocatalyst. The energy units are in keV.

Table S11: XPS data for Pt-Cu-Se_B/ g-C$_3$N$_4$ and Pt-Cu-Se_C/ g-C$_3$N$_4$ nanocomposites.

| Sample          | Tag     | BE / eV | FWHM | % Atomic | Specie       |
|-----------------|---------|---------|------|----------|--------------|
| Pt-Cu-Se_B/ g-C$_3$N$_4$ | C 1s    | 284.4   | 1.5  | 8.48     | carbon       |
|                 | C 1s    | 285.5   | 1.5  | 5.51     | carbon       |
|                 | C 1s    | 288.1   | 1.5  | 38.2     | C$_3$N$_4$   |
|                 | N 1s    | 398.5   | 1.4  | 33.8     | C$_3$N$_4$   |
|                 | N 1s    | 399.7   | 1.4  | 7.72     | C$_3$N$_4$   |
|                 | Cu 2p3/2| 932.7   | 2.1  | 0.06     | Cu$_{2-x}$Se |
|                 | Se 3d5/2| 54.6    | 1.4  | 0.15     | Cu$_{2-x}$Se |
|                 | Se 3d5/2| 51.6    | 2.5  | 0.10     | Cu$_{2-x}$Se |
|                 | Pt 4f7/2| 71.4    | 2.2  | 0.03     | Pt$^{[0]}$   |
|                 | Pt 4f7/2| 73.3    | 2.6  | 0.03     | Pt$^{[2+]}$  |
| Pt-Cu-Se_C/ g-C$_3$N$_4$ | C 1s    | 284.2   | 1.5  | 23.4     | carbon       |
|                 | C 1s    | 285.3   | 1.5  | 9.25     | carbon       |
|                 | C 1s    | 288.0   | 1.5  | 30.5     | C$_3$N$_4$   |
|                 | N 1s    | 398.5   | 1.4  | 25.8     | C$_3$N$_4$   |
|                 | N 1s    | 399.6   | 1.4  | 5.95     | C$_3$N$_4$   |
|                 | Cu 2p3/2| 932.7   | 3.2  | 0.05     | Cu$_{2-x}$Se |
|                 | Se 3d5/2| 54.2    | 1.9  | 0.26     | Cu$_{2-x}$Se |
|                 | Se 3d5/2| 51.4    | 2.2  | 0.24     | Cu$_{2-x}$Se |
|                 | Pt 4f7/2| 70.9    | 2.3  | 0.04     | Pt$^{[0]}$   |
|                 | Pt 4f7/2| 73.4    | 2.5  | 0.02     | Pt$^{[2+]}$  |