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Supplementary Information

Liquid Phase Epitaxy of $CuGaO_2$ on GaN: P-N Heterostructure for Photocatalytic Water Splitting

Hadi Sena[1,2*], Sho Kitano[3], Hiroki Habazaki[3], Masayoshi Fuji[1,2]

[1] Advanced Ceramic Research Center, Nagoya Institute of Technology, Tajimi 507-0033, Japan

[2] Department of Life Science and Applied Chemistry, Nagoya Institute of Technology, Tajimi 507-0071, Japan

[3] Division of Applied Chemistry, Faculty of Engineering, Hokkaido University, 060-8628 Japan

Corresponding Author

*sena.hadi@nitech.ac.jp

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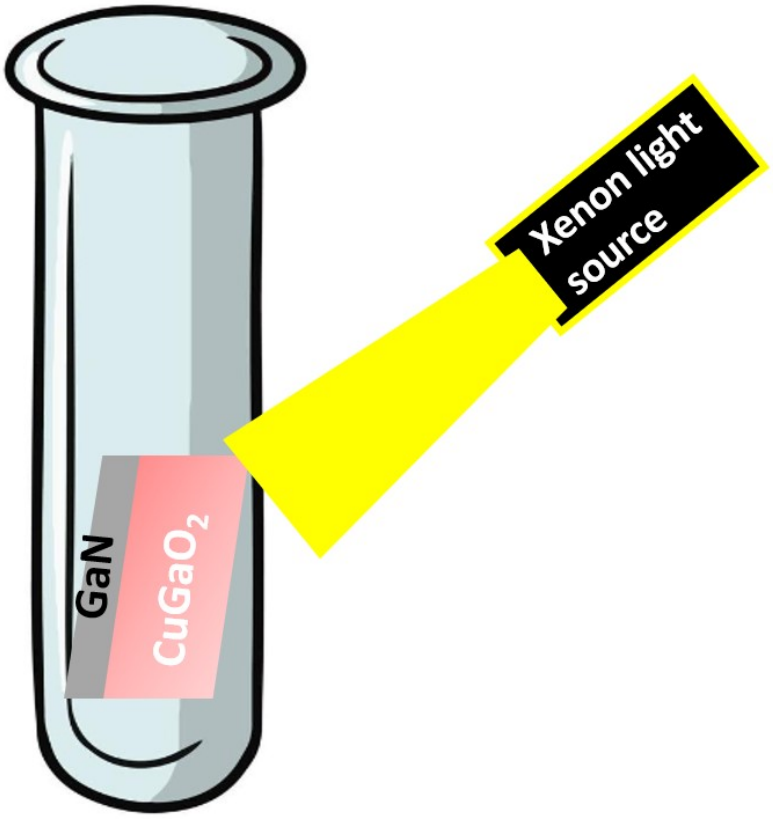

Figure S1. A schematic illustration of the photocatalytic experiment setup.

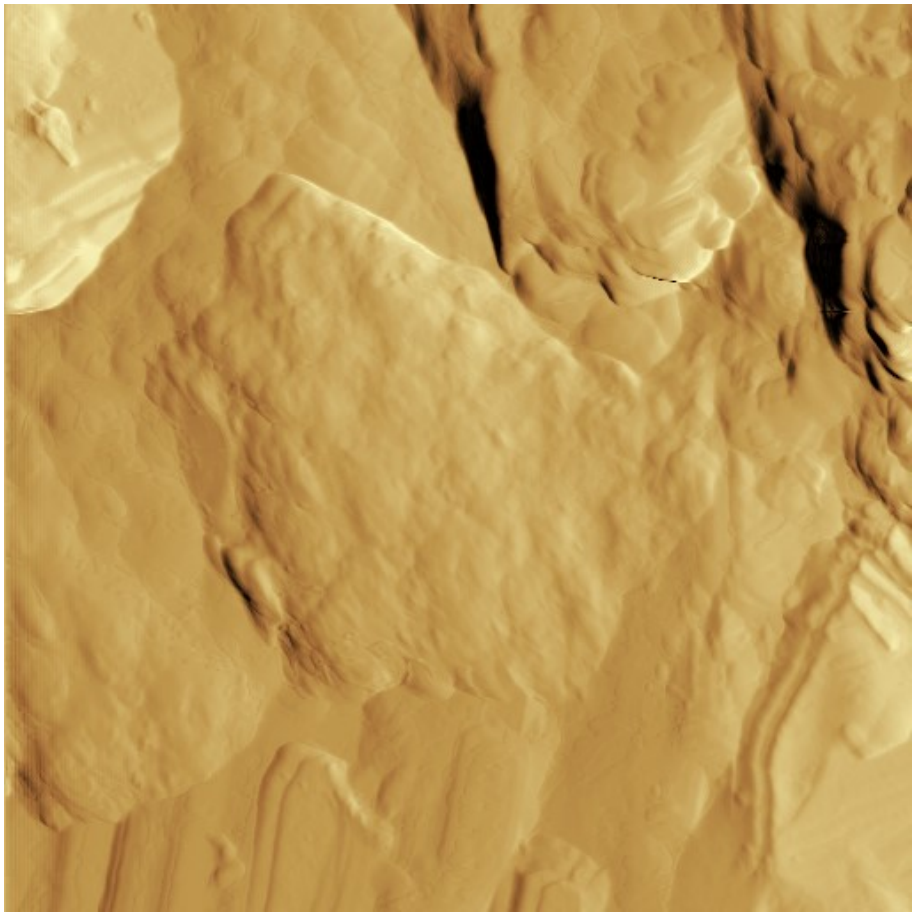

Figure S2. Atomic force microscopy image of the $CuGaO_2$ film on GaN substrate in the scan area of 2 μm x 2 μm.

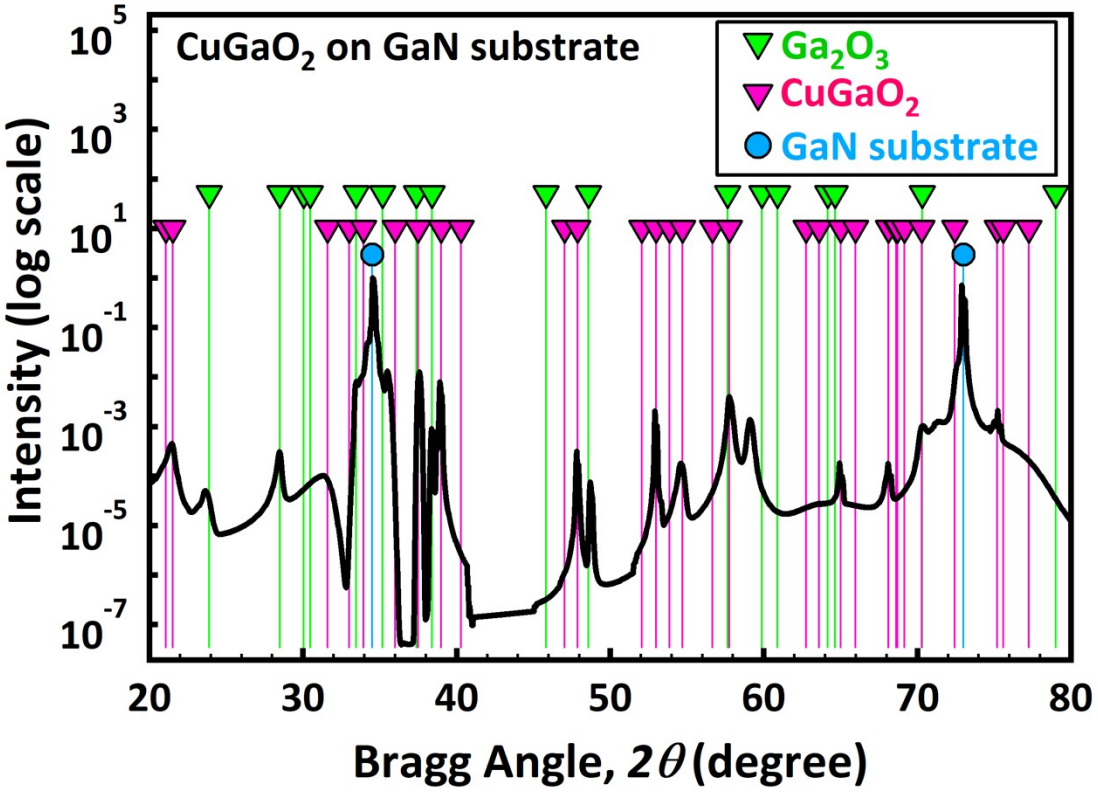

Figure S3. XRD profile of the $CuGaO_2$ film on GaN substrate. The intensity is in the log scale.

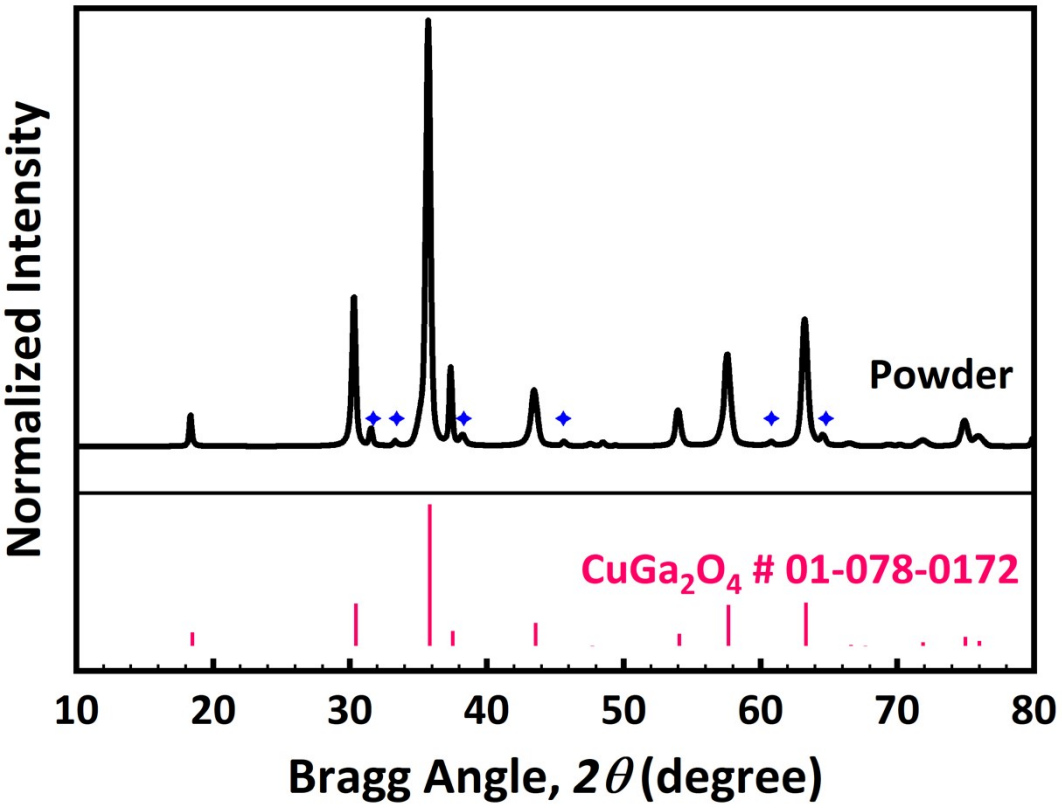

Figure S4. XRD profile of the powder synthesized inside the crucible. Star markers are related to Ga_2O_3 impurities.

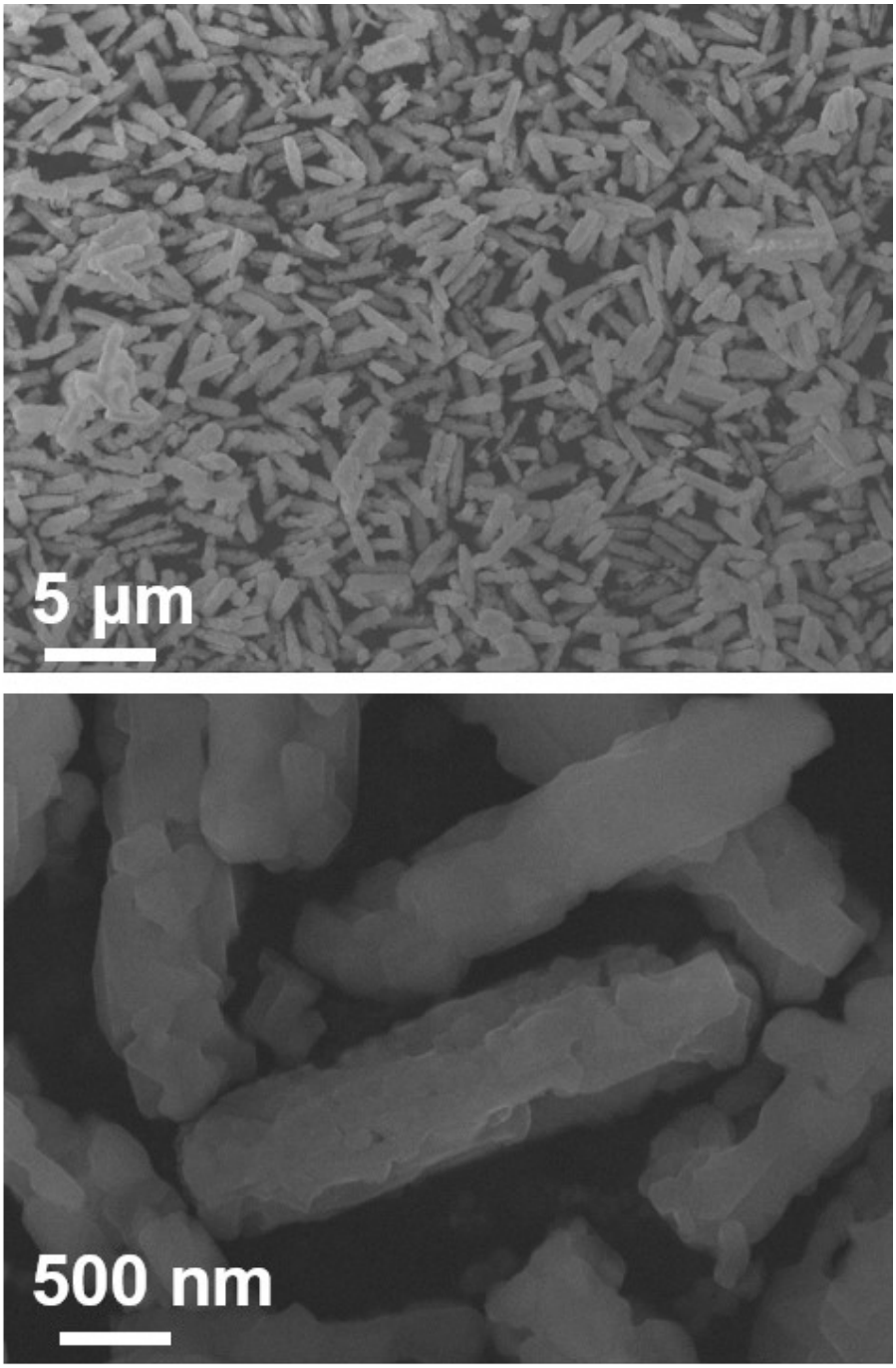

Figure S5. SEM micrographs of the powder synthesized inside the crucible. (upper): low-magnification, (lower): high-magnification.

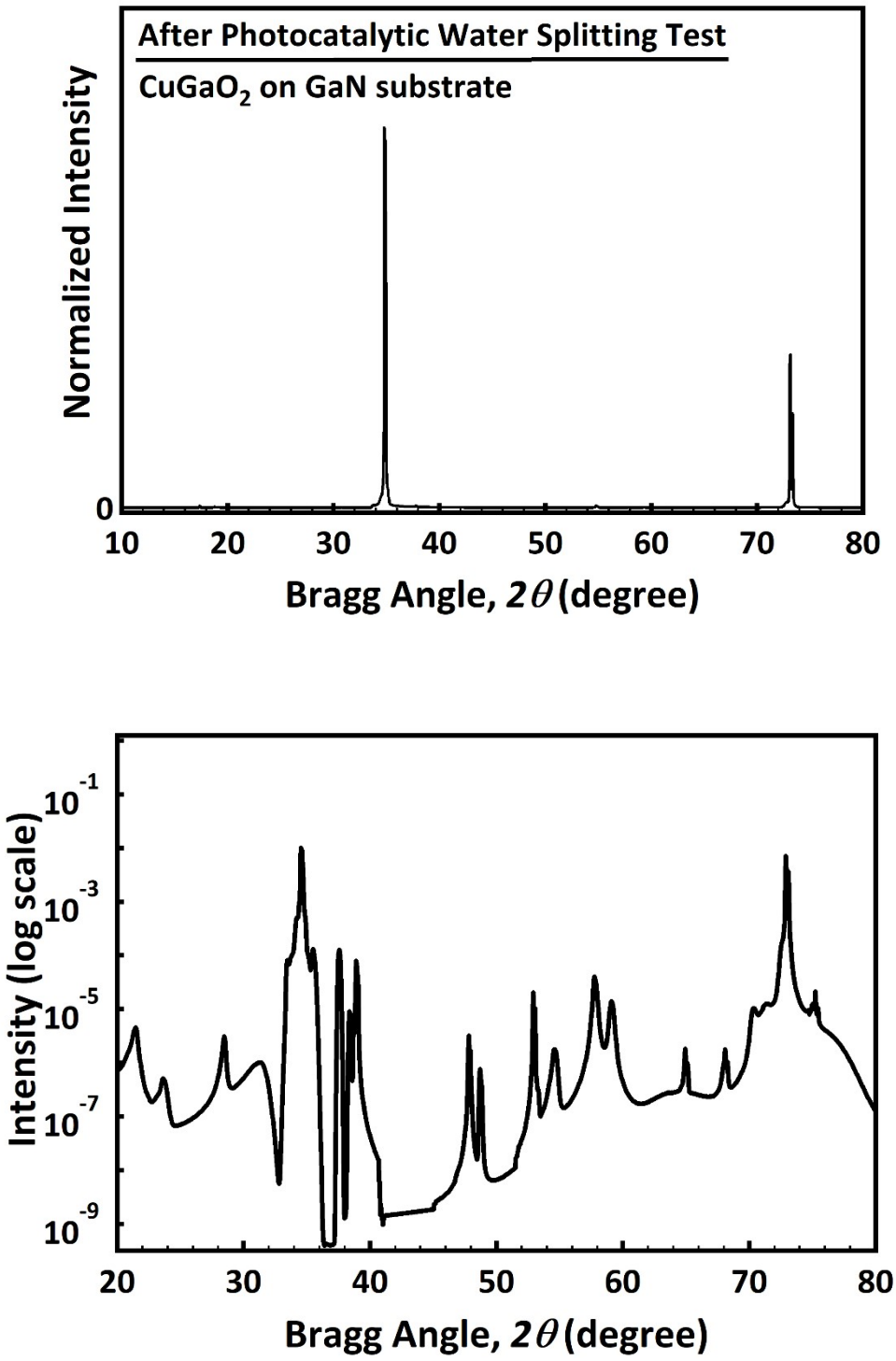

Figure S6. XRD profile of the $CuGaO_2$ film on GaN substrate after photocatalytic test for confirming the stability of the photocatalyst. (Upper): Normalized Intensity, (Lower): log scale.

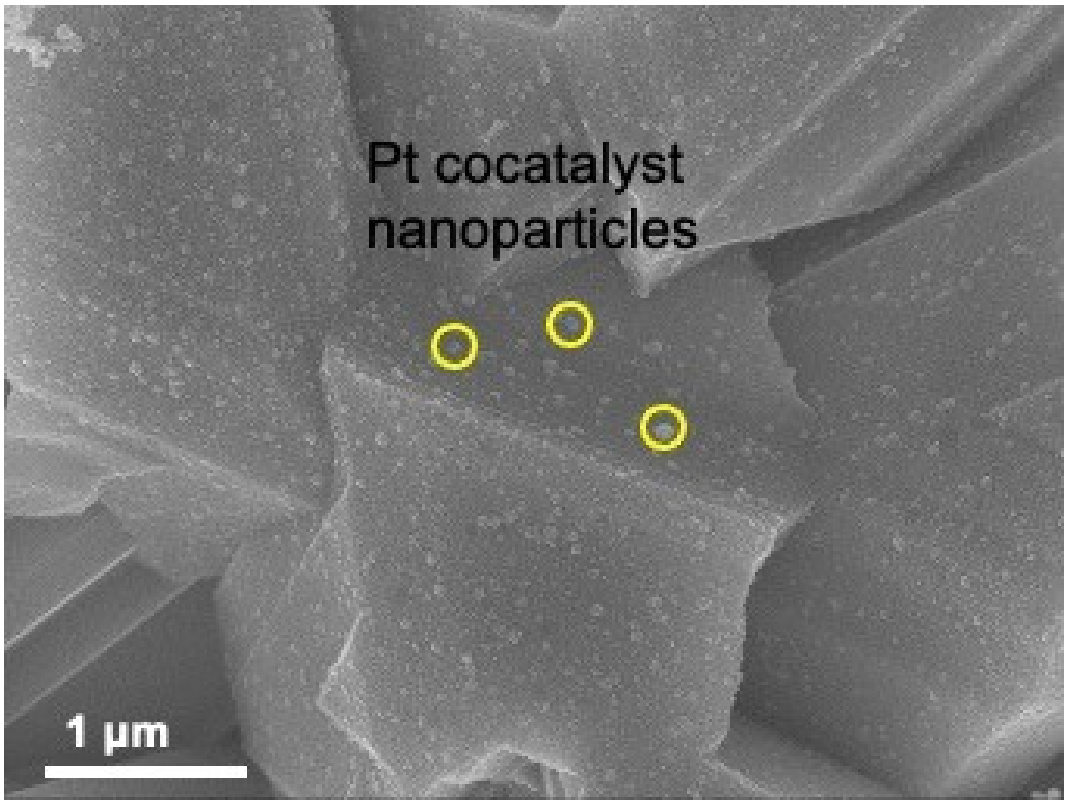

Figure S7. SEM micrograph of Pt cocatalyst nanoparticles on the surface of $CuGaO_2$ film on GaN substrate. Some representative Pt particles are shown with yellow circles.

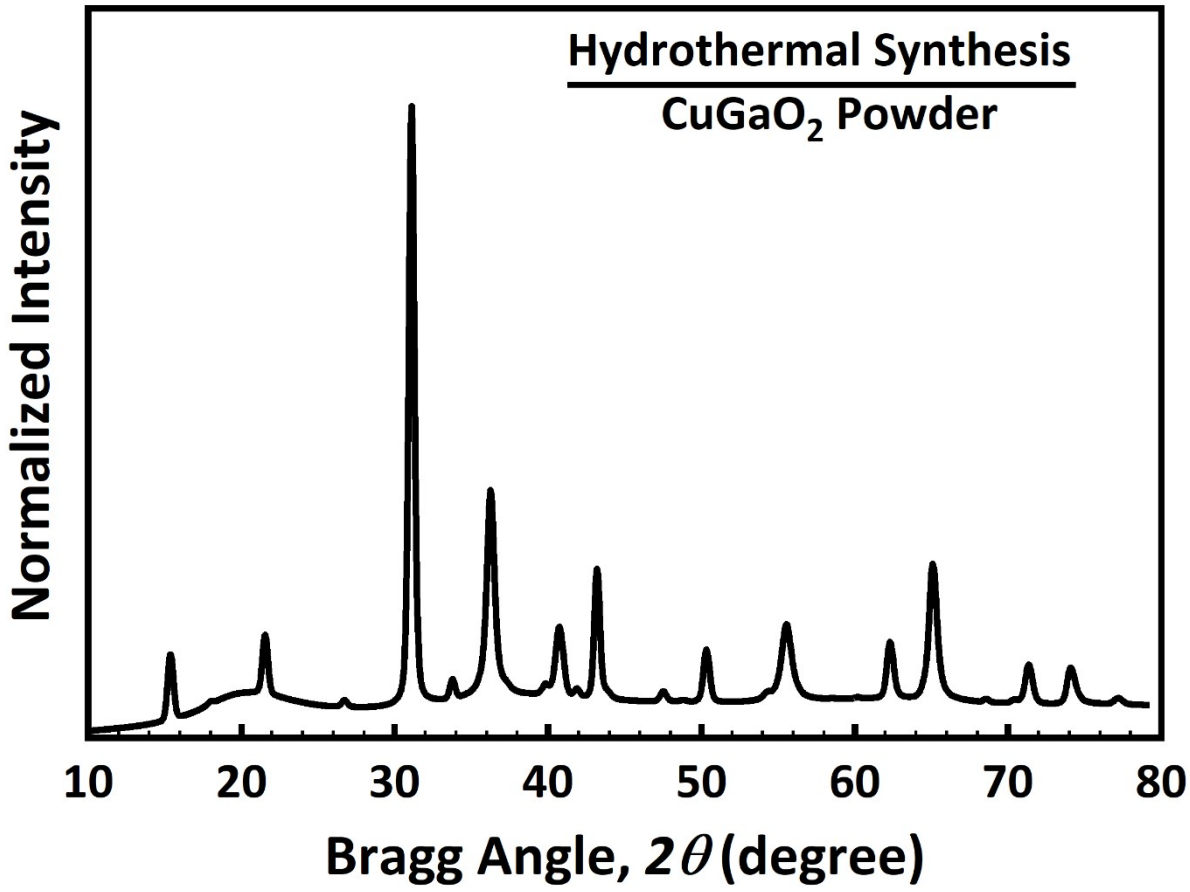

Figure S8. XRD profile of the hydrothermally synthesized $CuGaO_2$.

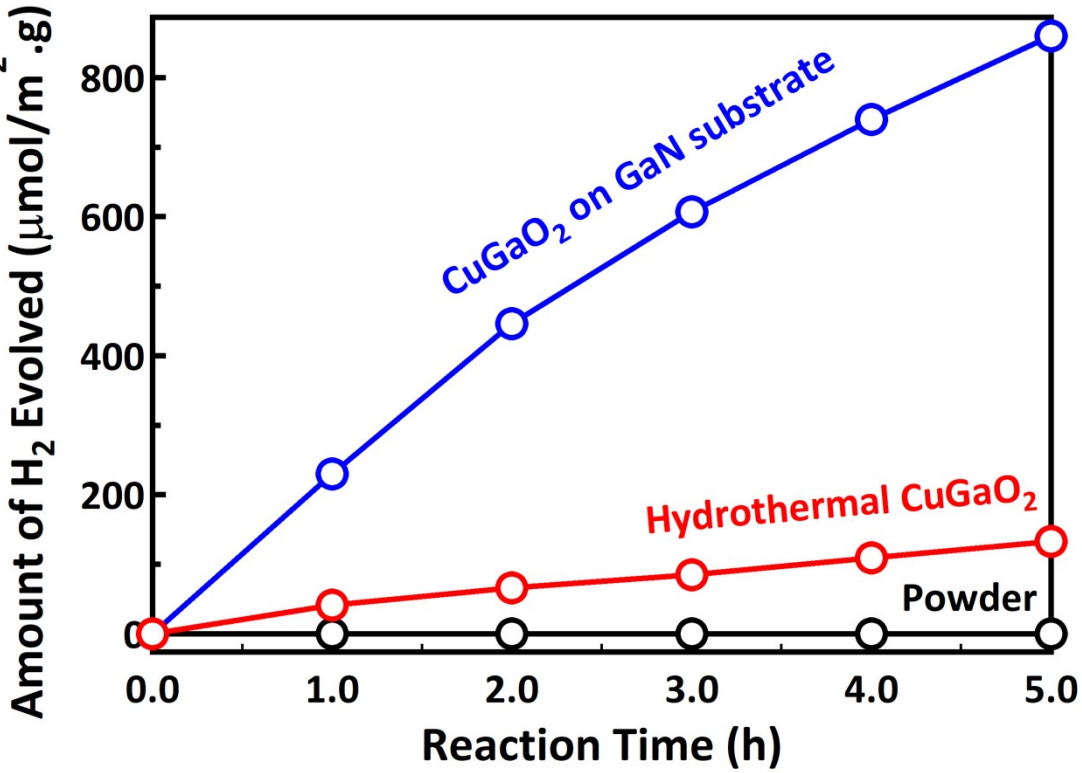

Figure S9. Photocatalytic hydrogen generation of the hydrothermally synthesized $CuGaO_2$.

Experimental procedure of $CuGaO_2$ synthesized by a hydrothermal method.

The $CuGaO_2$ was synthesized by the classical alcohol reduction method at low temperature. 5 mmol of $Ga(NO_3)_3.xH_2O$ and 5 mmol of $Cu(NO_3)_2 \cdot 3H_2O$ were dissolved in 40 mL deionized water. Then, 1 M KOH water solution was slowly added to the mixture and the pH was adjusted to 7.5. After that, the hydrothermal precursor was transferred to a 150 mL container and reacted at 230°C for 3 h. After discarding the supernatant, the collected precipitates were washed with diluted ammonia (5 wt%), nitric acid solution (5 wt%) and deionized water 5 times. Finally, pure $CuGaO_2$ was obtained by washing the product with ethanol 3 times.