Supplementary Information

One-pot preparation of multicomponent photocatalyst with $(Zn,Co,Ni)(O,S)/Ga_2O_3$ nanocomposites to significantly enhance hydrogen production

Hairus Abdullah [a,*], Riski Titian Ginting [b], Anita Christine Sembiring [a], Noto Susanto Gultom [c], Hardy Shuwanto [c], Dong-Hau Kuo [c,**]

[a]*Department of Industrial Engineering, Universitas Prima Indonesia, Medan, Indonesia*

[b]*Department of Electrical Engineering, Universitas Prima Indonesia, Medan, Indonesia*

[c]*Department of Materials Science and Engineering, National Taiwan University of Science and Technology, No.43, Sec. 4, Keelung Road, Taipei 10607, Taiwan*

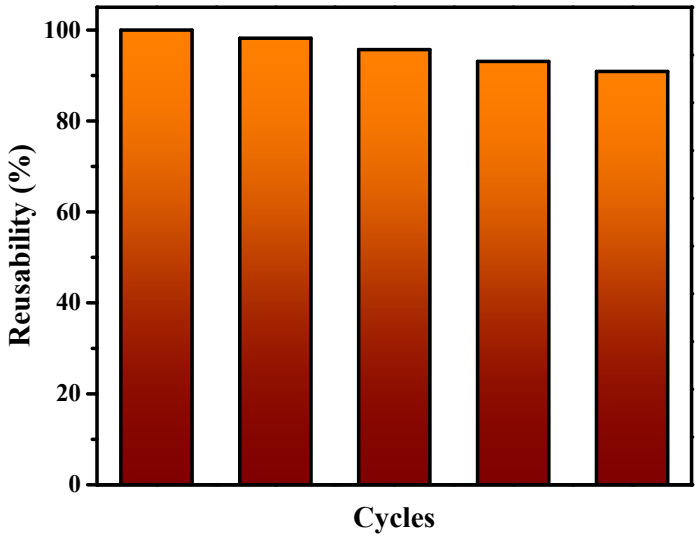

Fig. S1 Reusability performance of ZNC-10G nanocomposite for five-cycle photocatalytic HER

Table S1 EDS elemental analysis of ZNC-10G nanocomposite

Elements	Atomic percentages
Zn	39.97 %
Ni	0.86 %
Co	1.01 %
Ga	2.82 %
O	28.73 %
S	26.61 %

The energy of single photon (Ep) with wavelength of λ is calculated using the equation below:

$Ep = h\ c/\lambda$

where h is Planck's constant (6.6 x 10^{-34} J.s), c is the speed of light (3 x 10^{8} m/s), and λ is the wavelength of the incident light.

The total energy of incident light (Et) is calculated using the equation below:

$Et = PAt$

where P is the power density of the incident light (W/m^2), A is the irradiation area (m^2), and t is the duration of the incident light irradiation (s).

The number of incident photons (N) is determined by the following equation:

$N = Et/Ep = PAt\lambda/hc$

The apparent quantum yield (AQY) is calculated by using the following equation:

$$AQY = \frac{2\ x\ number\ of\ envolved\ hydrogen\ molecules}{number\ of\ incident\ photons}\ x\ 100\ \%$$

$$= \frac{2\ n\ Na\ hc}{PAt\lambda}\ x\ 100\ \%$$

where n is the amount of hydrogen evolved (mol), NA is Avogadro's constant (6.02 x 1023 /mol).

Based on the formula, the calculated AQY was 10.4 %.