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Ultra-fast, self-powered and flexible visible-light photodetector based on graphene/Cu_2O/Cu gradient heterostructures

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Supporting Information

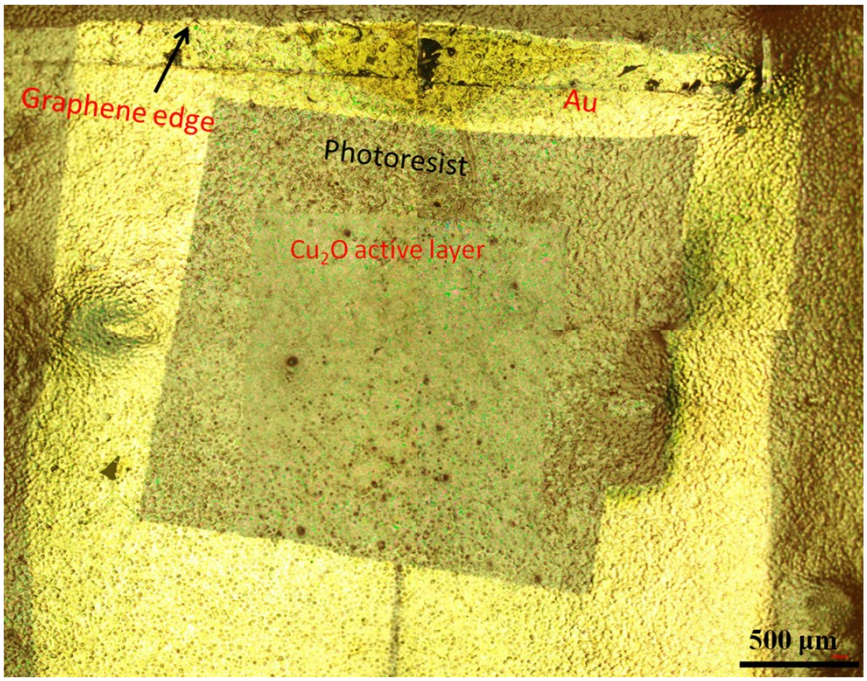

Figure S1. Microscope picture of graphene/Cu_2O/Cu device

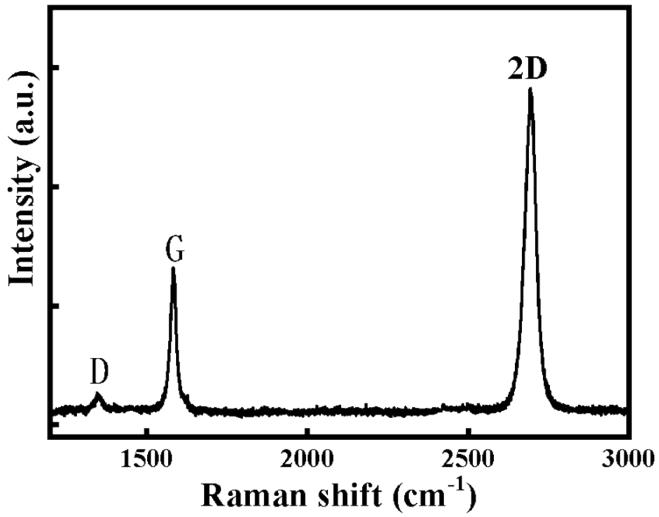

Figure S2. The Raman spectrum of the graphene electrode on sapphire substrate

Figure S2 shows the Raman spectrum of graphene transferred to a sapphire substrate. The weaker peak is the D band. The two stronger peaks represent the G band and the 2D band respectively. The intensity ratio of 2D to G bands (I_{2D}/I_G) was about 2, indicating the graphene film is most likely monolayer. In addition, the value of I_D/I_G is about 0.15, indicating that the structural defect density was relatively low in the graphene film [1].

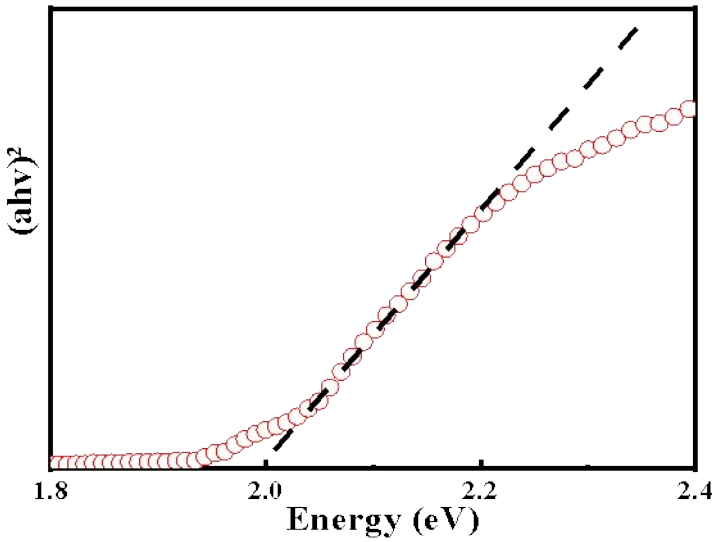

Figure S3. The band gap diagram of Cu_2O

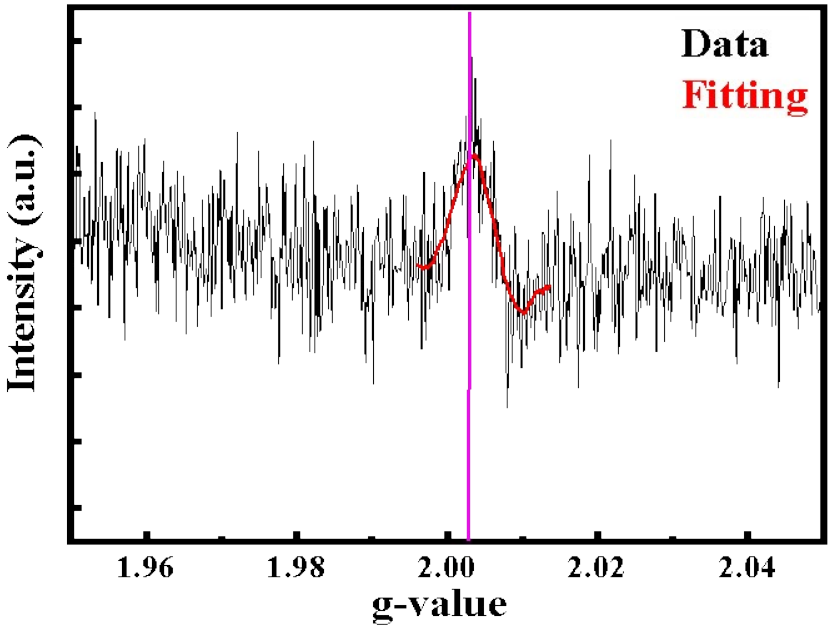

Figure S4. ESR spectra of Cu/Cu_2O film

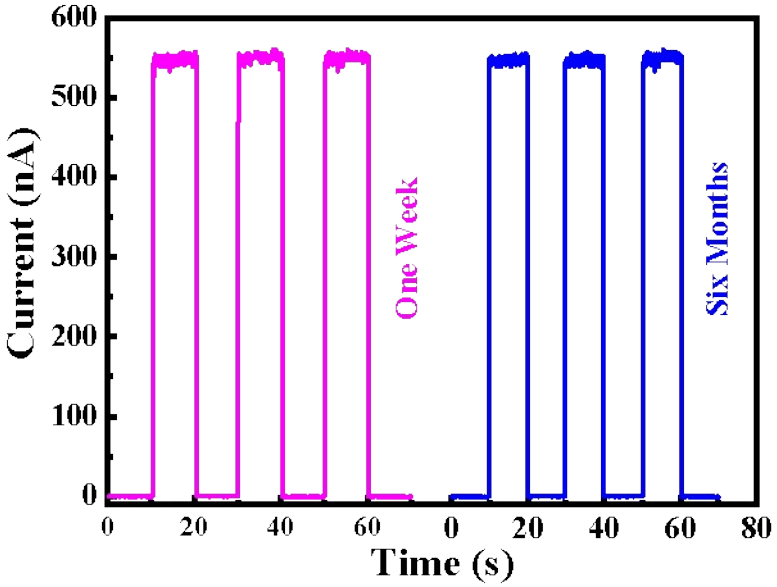

Figure S5 The stability test of the graphene/Cu_2O/Cu photodetector

Figure S5 shows the response to 550 nm light at zero bias voltage after 6 month storage in ambient without packaging. The responsivity remains almost the same value as before, indicating that the graphene/Cu_2O/Cu photodetector has very good stability.

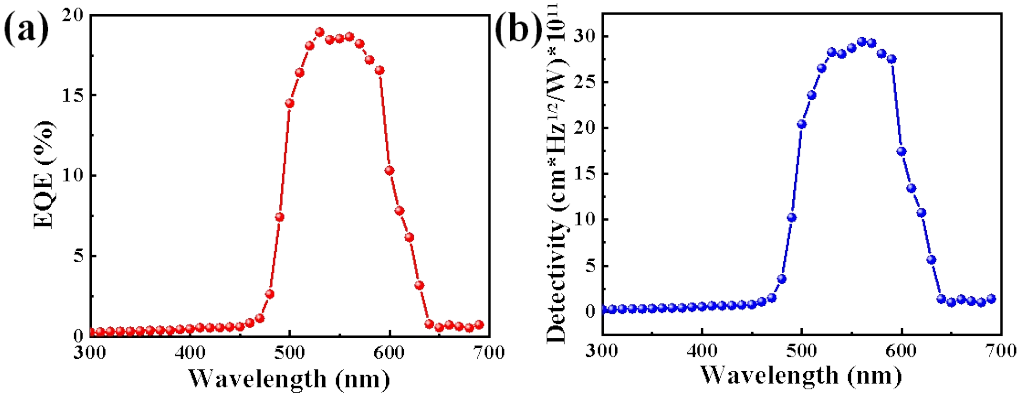

Figure S6 The external quantum efficiency（EQE）and detectivity (D^*) of the graphene/Cu_2O/Cu photodetector

REFERENCES

[1]. M. D. S. L. Wimalananda, J.-K. Kim, and J.-M. Lee, “Effect of annealing dependent surface free energy change of Cu foil during graphene growth on quality of monolayer continuous graphene,” Carbon **108**, 127–134 (2016).