Supporting Information

# Facile synthesis of aqueous-dispersible $Cu_2O$ nanocrystal-reduced graphene oxide hybrid as a promising cancer therapeutic agent

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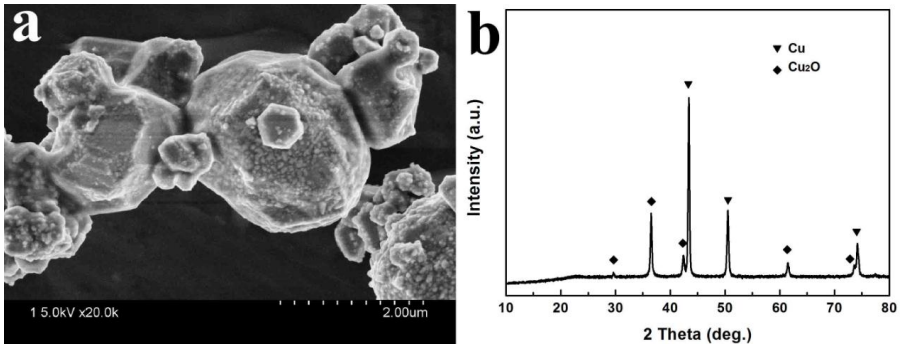


Figure S1. FESEM image (a) and XRD pattern of the over-reduced product.

The over-reduced product is Cu@$Cu_2O$ ($Cu_2O$ nanocrystals deposited on Cu particles), confirmed through the FESEM and XRD analysis.

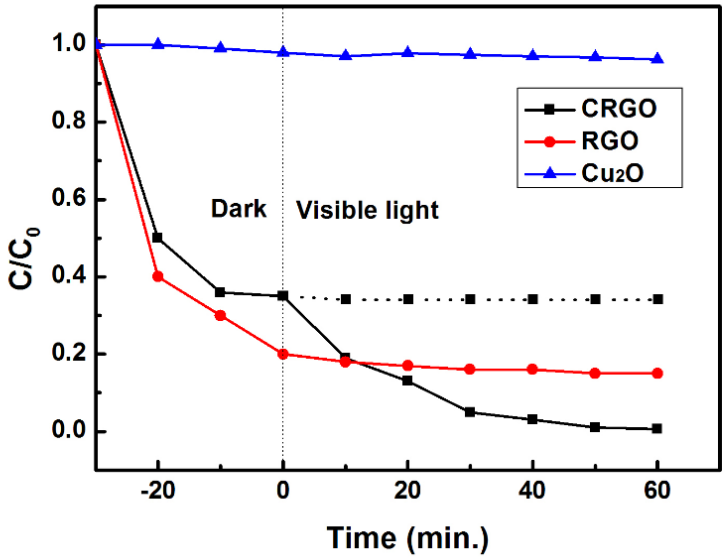


Figure S2. Concentration changes of MB during the photodegradation under visible light irradiation.

The photocatalytic activity of the CRGO hybrid was measured by the decontamination of methylene blue (MB) as model reaction under visible light. The normalized temporal concentration changes ($C/C_0$) of MB during the decontamination

were derived from the changes in the dye's absorption profile (λ=660 nm) at a given time interval [S1]. As shown in Figure S2, the adsorption behaviours of MB dyes on bare $Cu_2O$, RGO, and CRGO, as well as the photodegradation results are very different. The adsorption of MB on bare $Cu_2O$ in the dark is negligible. In contrast, the MB removal is 85% and 62% at equilibrium after about 30 and 60 min (dotted line) for RGO and CRGO, respectively. The results show that the adsorptivity of RGO was reduced by compositing $Cu_2O$ nanocrystals. MB is a typical basic (cationic) heterocyclic aromatic chemical dye containing amide groups. MB molecules could transfer from the solution to the CRGO surface and be adsorbed with offset face-to-face orientation *via* π-π conjugation between MB and aromatic regions of the graphene [S2], and thus be photodegraded by CRGO under visible light. In contrast, MB will hardly be absorbed with bare $Cu_2O$, owing to the positive zeta potential (about +20 mV) of $Cu_2O$. After equilibrium, the effective MB removal (100%) is attributed to the high photocatalytic activity of CRGO under visible light. Under irradiation, the $Cu_2O$ were excited and the photogenerated carriers could transfer on RGO sheets to nearby organic molecules and take part in the redox reaction, leading to the photocatalytic degradation of organic pollutants. Among organics pollutants, the aromatic benzene commonly occurs in urban ambient environment and is of significant concern regarding environmental health because of its toxic, mutagenic, or carcinogenic properties [S3–S5]. Degradation of toxic benzene into harmless $H_2O$ and $CO_2$ by high-performance semiconductor based photocatalysis such as the as-prepared CRGO would present a green and ideal route to eliminate the benzene pollution

[S1,S6].

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