Supporting Information For

An Environmentally Friendly Route to Synthesize the Cu Micro/Nanomaterials with "Sustainable Oxidation Resistance" and Promising Catalytic Performance

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S 1

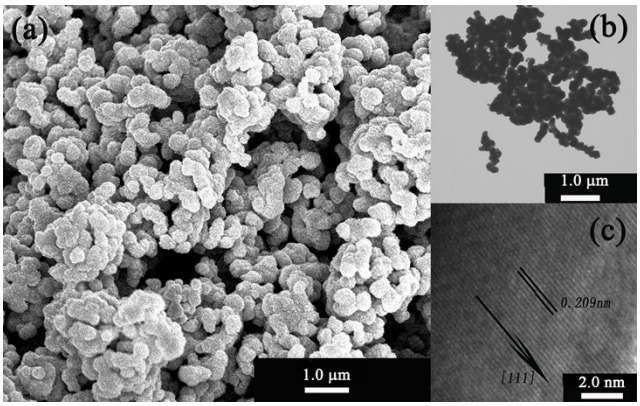

Fig S1. (a) FESEM; (b) STEM; and (c) HRTEM image of as-prepared Cu.

S 2

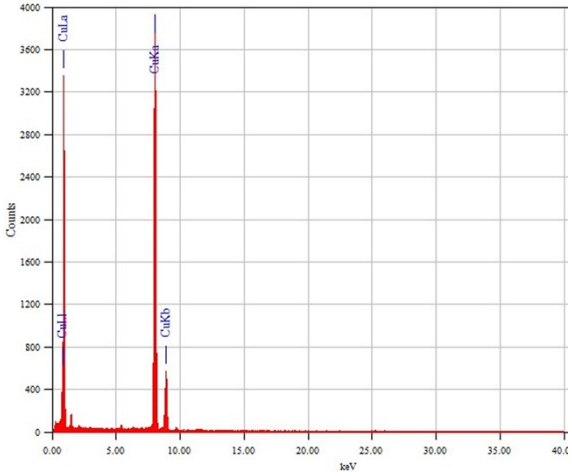

Fig S2. EDX of the as-prepared products.

S 3

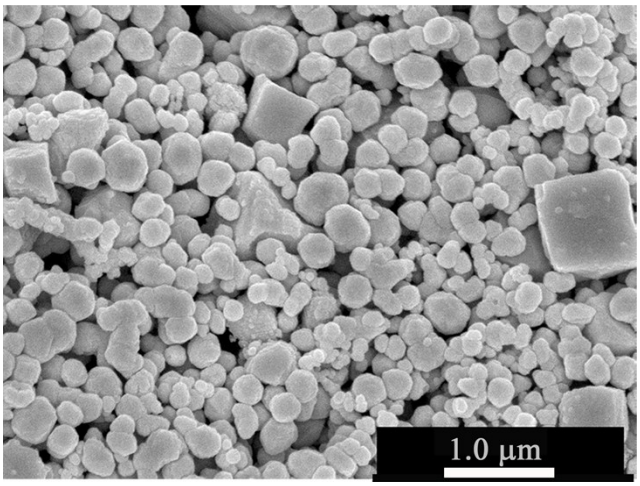

Fig S3. Typical FESEM image of products prepared by no additive.

S 4

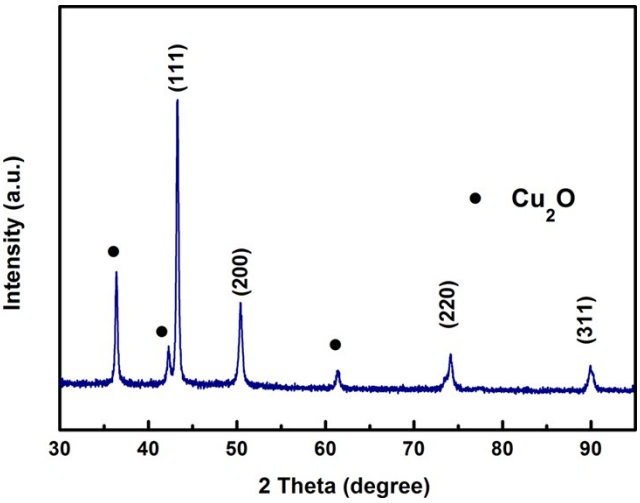

Fig S4. XRD patterns of the resulting product when no sodium citrate was involved.

S 5

Here, potassium citrate, potassium carbonate and potassium chloride are instead of sodium citrate, sodium carbonate and sodium chloride. When we replace all sodium ions with potassium ions, the resulting product is Cu. And the product has no tendency to be oxidized even upon 30 days air exposure.

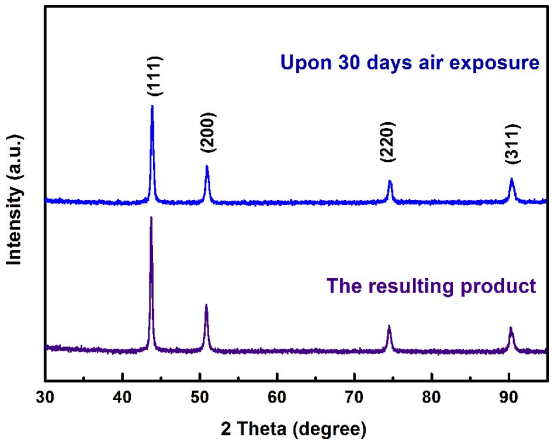

Fig S5. XRD patterns of the resulting product when all sodium salts were replace by potassium salts.

S 6

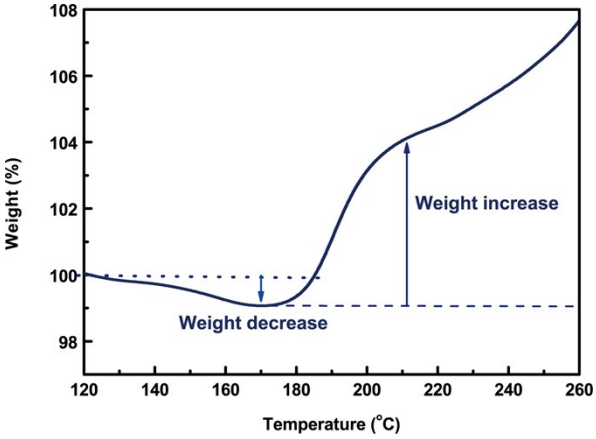

Fig S6. TG curve for the resulting Cu particles

S 7

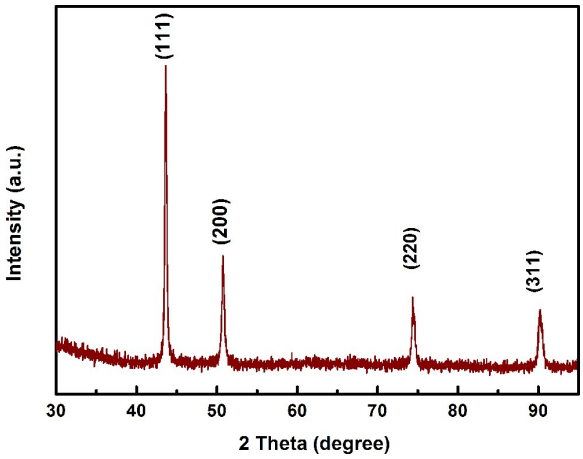

Fig S7. XRD patterns of the obtained product when the sodium citrate was replaced by potassium sodium tartrate.

S 8

As shown in Fig 8, the conversion can be accelerated with the stirring of solution, which the oxidized Cu particles can restore their unoxidized state in 3 days.

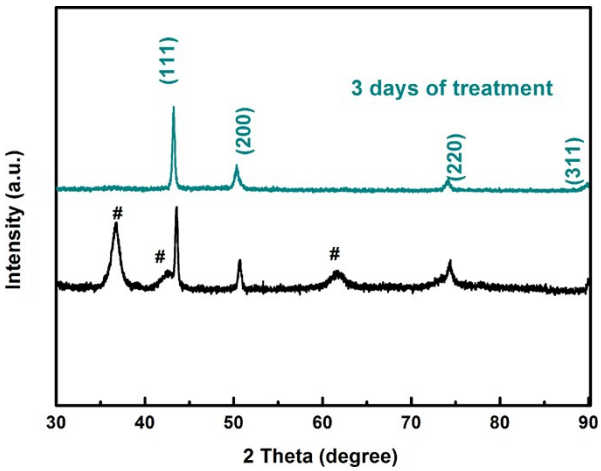

Fig S8. XRD patterns of the annealed Cu particle and the sample upon the 3 days of stirring treatment.

S 9

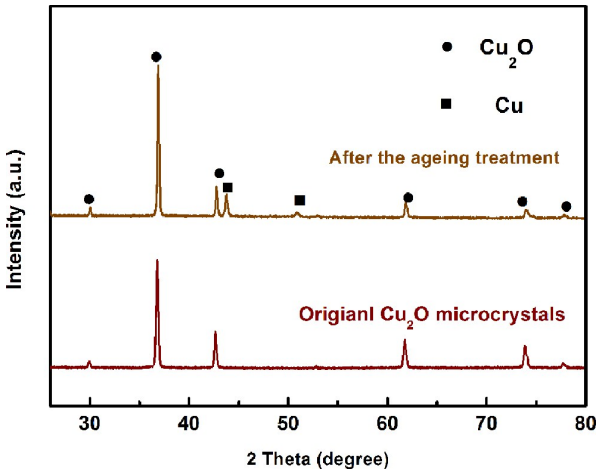

Fig S9. XRD patterns of the original Cu_2O microcrystals and the product after being aged in the reaction solution for 3 days.

S 10

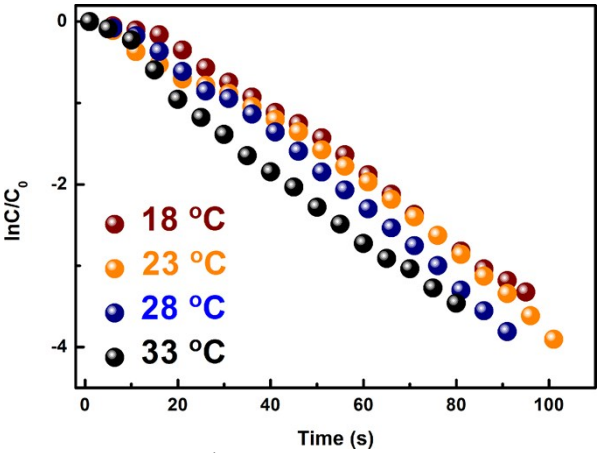

Fig S10. The polt of ln (C/C_0) versus time for the reduction of 4-NP that catalyzed by the Cu particles at different temperature

Table S1 Reaction rate constants in the presence of the Cu particles at different temperatures

Temperature (°C)	Reaction rate constants (s^{-1})
18	0.0385 ± 0.0003
23	0.0388 ± 0.0004
28	0.0437 ± 0.0003
33	0.0464 ± 0.0009

S 11

According to the Arrhenius equation (ln k=ln A –Ea /RT), the activation energy (Ea) can be obtained from the slope for the linear fitting of ln k versus 1000/T. As shown the linear fitting in Fig. S11, slope of ln k versus 1000/T is -1.269. We can thus obtain the Ea .

Ea /R=1.269*1000;

Ea /R=1.269*1000; Ea=10.55*10^3J·mol =10.55 KJ·mol;

Intercept for ln k versus 1000/T is 1.07525. Therefore, we can estimate the pre-exponential factor (A).

ln A= 1.07525; A=2.93 s^{-1};

Entropy of activation (ΔS) can be obtained from the equation ln A =ΔS/R.

ΔS=1.07525*8.314=8.94 J/mol · K

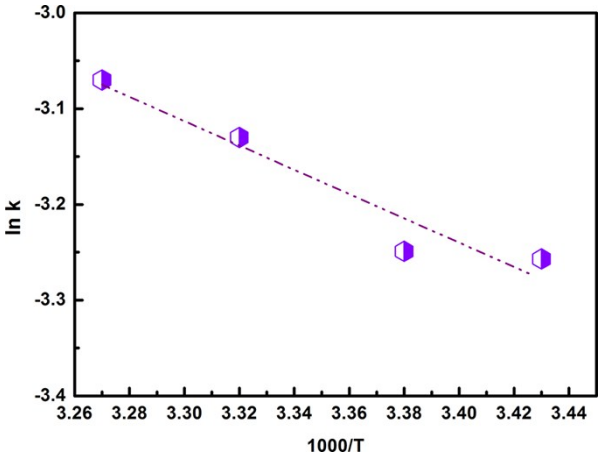

Fig S11. Arrhenius plots for the reduction reaction of 4-NP with sodium borohydride carried out at temperatures of 18, 23, 28 and 33 °C.

S 12

In this synthesis, we chose $AgNO_3$ and $AuCl_3$·HCl·$4H_2O$ as the precursor to obtain Ag and Au, respectively. The purity and crystallinity of as-prepared products were examined using powder XRD measurement. Similar to Cu particles, all the prepared noble metals are aggregation of nano-particles.

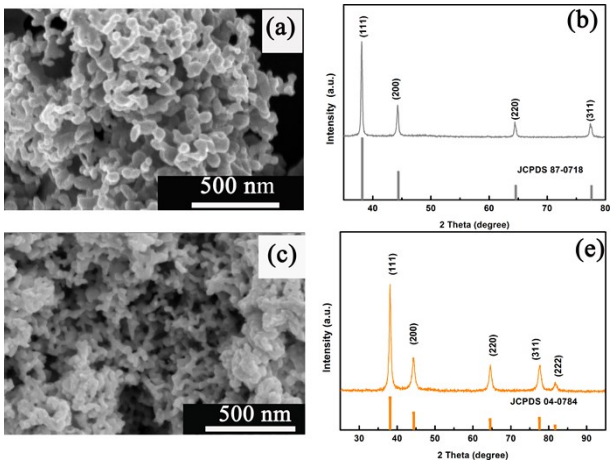

Fig S12. FESEM images of the obtained: a) Ag particles and c) Au particles. XRD patterns of obtained: b) Ag particles and d) Au particles.

S 13

Only in the presence of $NaBH_4$, Methyl orange would be degraded to 33% after 60 hours. Nevertheless, this degradation could not proceed even after another 90 hours reaction time. This result indicates the Methyl orange cannot be degraded completely without catalyst.

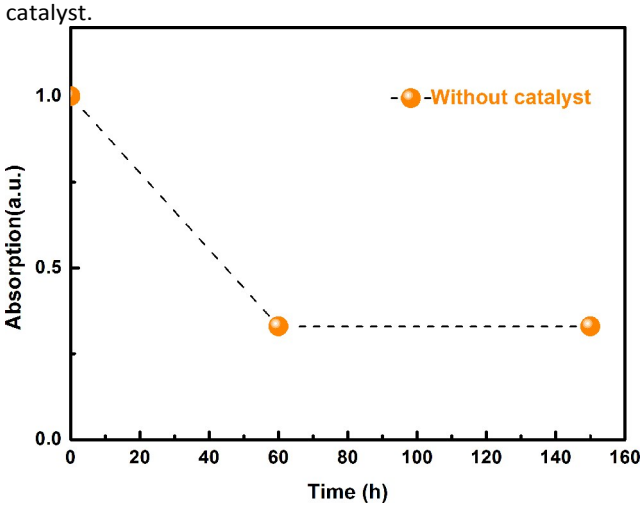

Fig S13. Polts of maximum absorption peak for Methyl orange versus the reaction time when no catalyst used.

S 14

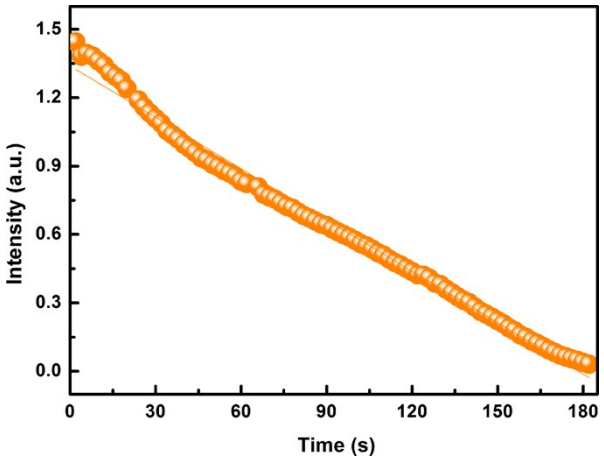

Fig S14. Polts of maximum absorption peak for Methyl orange versus the reaction time.

S 15

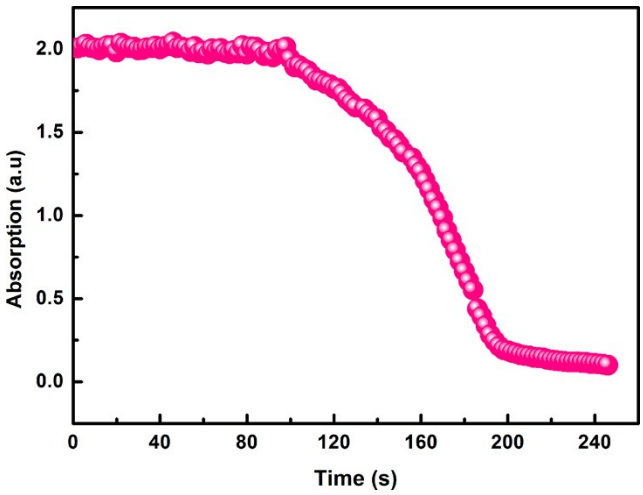

Fig S15. Polts of maximum absorption peak for Rhodamine B versus the reaction time.