

Highly Stable localized surface plasmon resonance of Cu nanoparticles obtained via oxygen plasma irradiation

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1. Fig. S1. The sketch showing the structures of Cu, Cu₂O and CuO.

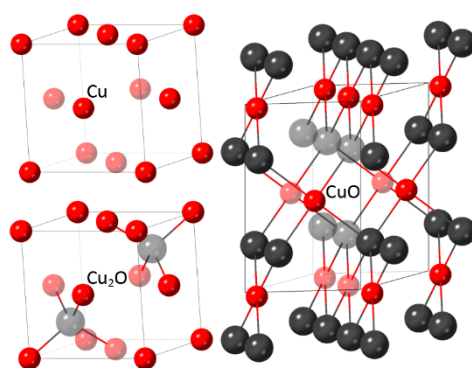


Fig. S1

2. Fig. S2. The TEM images of CuNPs before (a) and after (b) OPI for 2 s. Fig. S2 (c) and (d) are the amplified images of the selected areas in (a) and (b), respectively. In both figures, nanoparticles are uniformly distributed on substrates. After OPI for 2 s (Fig. S2d), a notable feature is that nearly all the nanoparticles are covered by a thin shell.

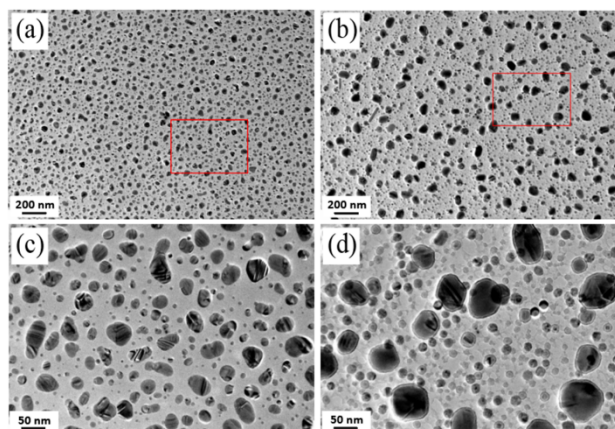


Fig. S2

3. **Tables S1 and S2 related to Fig. 2c, d in the main text.** Since the errors between the measured and the ones recorded in PDF cards # 04-0836 of Cu, # 45-0937 of CuO, are less than 5%, according to ref (J. Am. Chem. Soc. 130 (2008) 6949-6951), the attribution in the main text is reasonable.

Table S1. The measured d-spacing values, the standard values, and the corresponding errors of the CuNPs before OPI (Fig. 2c).

Measured d/Å	PDF# d/Å	Faces	Error
2.0226	2.0880	Cu (111)	3.1%
2.0622	2.0880	Cu (111)	1.2%
2.0796	2.0880	Cu (111)	0.4%
1.7553	1.8080	Cu (200)	2.9%
1.8003	1.8080	Cu (200)	0.4%

Table S2. The measured d-spacing values, the standard values, and the corresponding errors of the CuNPs after OPI for 2 s (Fig. 2d).

Measured d/Å	PDF# d/Å	Faces	Error
2.0651	2.0880	Cu (111)	1.1%
2.0670	2.0880	Cu (111)	1.0%
2.3094	2.3100	CuO (200)	0.00%
2.3158	2.3230	CuO (111)	0.03%

4. **Fig. S3. The Diffraction rings of CuNPs before (a) and after (b) OPI for 2 s.**

The diameters of the diffraction rings are measured and indicated. According to PDF cards # 04-0836 of Cu and # 45-0937 of CuO, before OPI, the rings with $d=2.0818$, 1.8048 , 1.2757 , 1.0818 , and 0.8098 are corresponding to Cu (111), Cu (200), Cu (220), Cu (311), and Cu (420), respectively. After OPI for 2 s, a new ring with a $d=2.3137$ Å appears. It is corresponding to CuO(111).

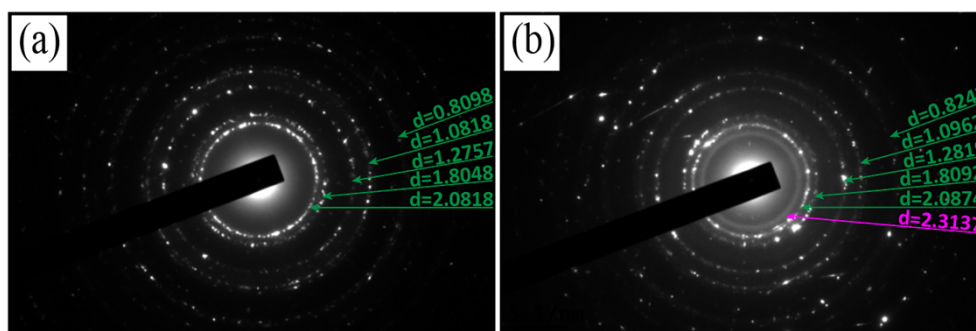


Fig. S3

5. Table S3. The spectral fitting data of XPS of Cu₂p_{1/2}

Table S3			
	BE(eV)	FWHM(eV)	Component
OPI-0s	932.7eV	1.15	Cu
	932.7eV	1.15	Cu
	934.2eV	3.00	CuO
OPI-2s	941.4eV	2.50	
	942.5eV	3.00	Cu ²⁺
	944.3eV	1.80	

6. Fig. S4. The Cu₂p spectra of different Cu(II) compounds from Avantage.

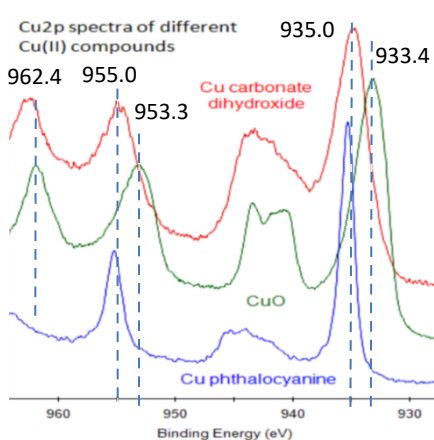


Fig. S4

7. Fig. S5. The spectrum and the line scan result by EDS.

Fig. S5(a) quantitatively shows the atomic contents of Cu and O. Figs. S5(b) and (c) are the element distribution of Cu and O along the line shown in Fig. 4a.

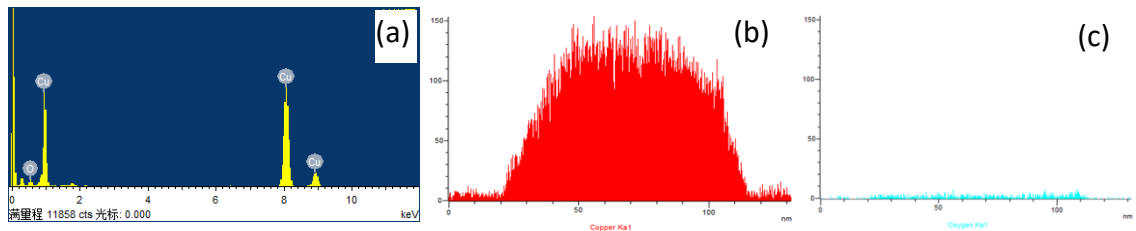


Fig. S5