

Supporting Materials

Table S1. UV-vis and XRD characterization results of the samples.

Sample ID	pH	ΔCu^{2+} M	$I_{\text{Cu}_2\text{O}}/(I_{\text{Cu}} + I_{\text{Cu}_2\text{O}})$
1	3.75	0.0021	0
2	3.85	0.0017	0.54
3	3.9	0.0038	0.82
4	3.9	0.0027	0.25
5	4	0.0048	0.97
6	4	0.0033	0.69
7	4.1	0.0048	0.98
8	4.2	0.0058	1
9	4.2	0.0044	0.64
10	4.2	0.0048	0.97
11	4.25	0.0041	0.95
12	4.3	0.0051	0.99
13	4.4	0.0054	0.98

To have more evidence for distinguishing between the Cu and Cu₂O particles the sample 2 which $I_{\text{Cu}_2\text{O}}/(I_{\text{Cu}} + I_{\text{Cu}_2\text{O}})$ is 0.54 (shown in Table S1) has been characterized by SEM-EDS mapping, Cu_{K α} peak and O_{K α} peak was detected at 8.040 KeV and 0.525 KeV, respectively^{s1}. The results were shown in Fig. S1. The four octahedron-shaped particles were labeled with 1, 2, 3 and 4 on the SEM image in Fig. S1 (a). As for the O K α SEM-EDS mapping, there is no significant oxygen concentration difference can be found between the particles. This could be due to the sample has been stored in air condition and Cu particles could be oxidized. A visible difference can be observed in Cu K α SEM-EDS mapping Fig. S1 (c) which shows Cu is less concentrated on the labeled octahedron-shaped particles area than the other areas. This indicated the octahedron-shaped particles have lower Cu ratio than unlabeled particles. Furthermore, the XRD result of sample 2 (shown in Fig. 1) shows two different copper species, one is Cu the other one is Cu₂O. In this case, the labeled octahedron-shaped particles with low Cu concentration and unlabeled particles could be logically reorganized as Cu₂O and Cu, respectively.

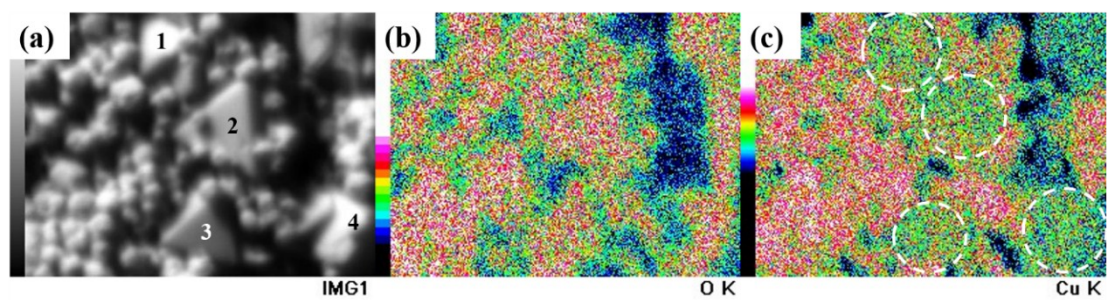


Fig. S1 SEM image of the synthesized particles by γ -radiation induced method at pH value of 3.85 (a) SEM-EDS mapping for O $K\alpha$ (b) and SEM-EDS mapping for Cu $K\alpha$ (c).

Reference S1: J. A. Bearden, *Bull. Am. Phys. Soc.*, 1964, **9**, 387.