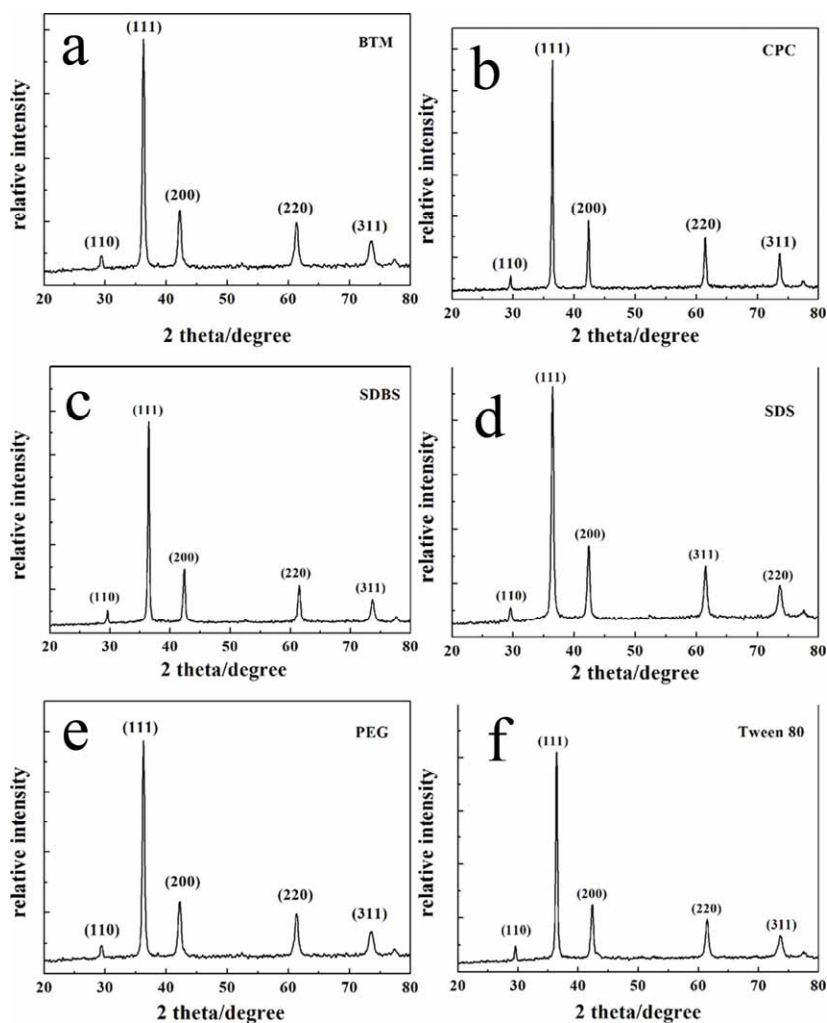
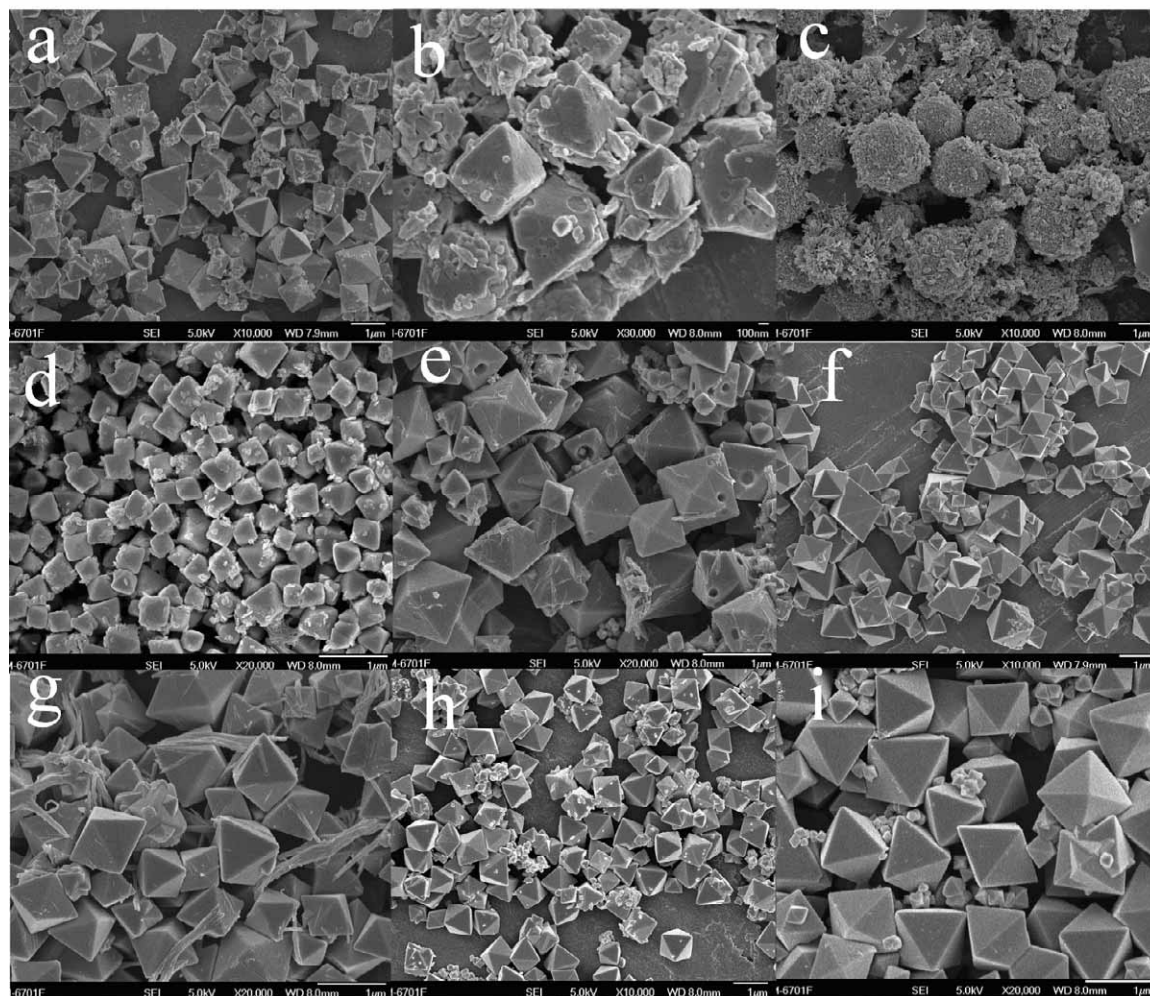


Supporting information



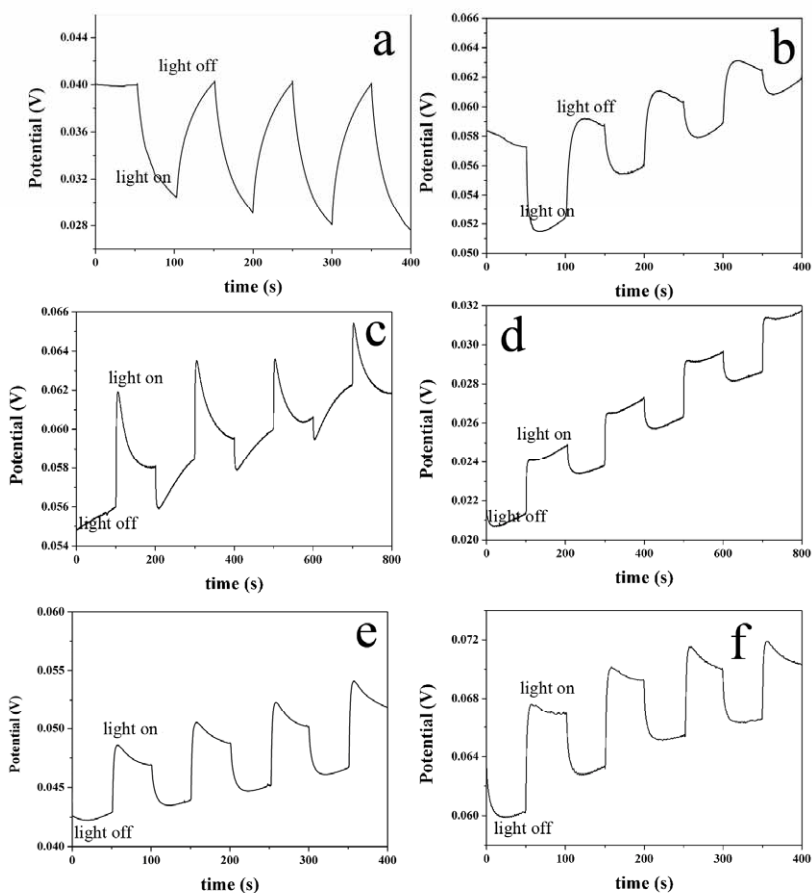
S Figure.1. XRD of Cu₂O products in different surfactant: (a) BTM; (b)CPC; (c)SDBS; (d) SDS; (e) PEG and (f) Tween 80.

The XRD patterns of Cu₂O obtained in other surfactant have been showed in S Figure 1. There was no big difference between different samples formed by different surfactant indicating that the surfactant did not influence the final production (S Figure1).



S Figure. 2. SEM images of Cu₂O products prepared with different surfactant: (a) :SDBS; (b) : SDS; (c) :AOT; (d) :CTAB; (e) :BTM; (f) CPC; (g) PEG; (h) PVP; (i) : Tween 80.

The SEM images of Cu₂O formed in surfactant were shown in S Figure 2, It can be clearly found that the morphologies of Cu₂O formed in different surfactant were almost same except AOT. The morphologies of Cu₂O formed by wet chemical reduction in the solution containing AOT surfactant are spherical, while the morphologies of Cu₂O formed in other surfactant solution are octahedron. The morphologies formed in AOT were spherical which was made with some small particles.



S Figure 3. Photo-electronic activity of Cu₂O production in different surfactant: (a) BTM; (b)CPC; (c)SDBS; (d)SDS; (e) PEG (f) Tween 80;

From the S Figure 3, it can be clearly seen that the open circuit potential of Cu₂O production formed in cationic surfactant showed negative potential under light illumination. While the open circuit potential of Cu₂O formed in anionic surfactant or non-ionic surfactant showed positive potential under illumination. The results of V_{OC} can formed that the type of Cu₂O formed in SDBS, AOT, PEG, PVP or tween 80 was p-type semiconductor. While Cu₂O formed in BTM or CPS surfactant was n-type semiconductor.