Electronic Supplementary Material (ESI) for RSC Advances.

Precise control of Cu_2O nanostructures and LED-assisted photocatalysis

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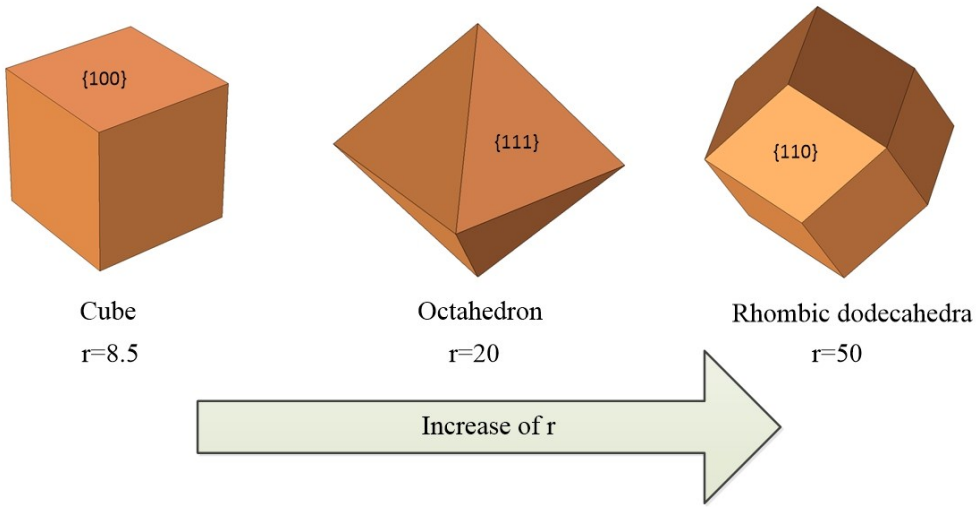

Fig.S1 Schematic illustration of the synthesis procedure of Cu_2O nanocrystals of various morphologies. The morphologies can be precisely controlled by adjusting the molar ratio 'r' of hydroxylamine hydrochloride and copper salt.

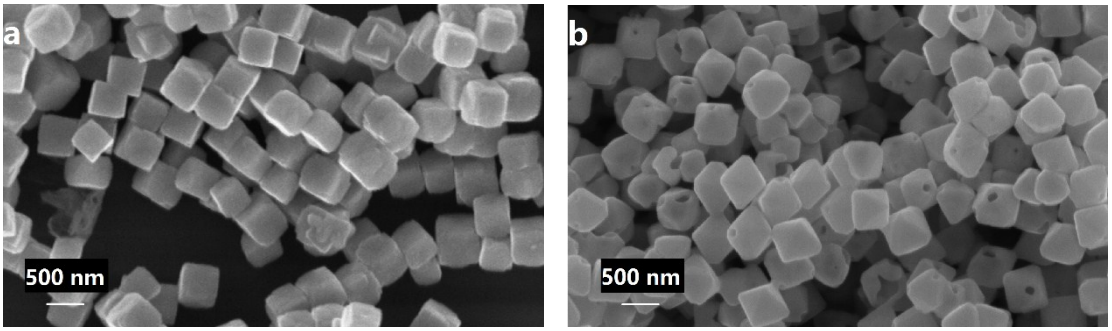

Fig.S2 SEM images of cubic and octahedral Cu_2O nanocrystals: (a) SEM image of cubic Cu_2O nanocrystals. (b) SEM image of octahedral Cu_2O nanocrystals.

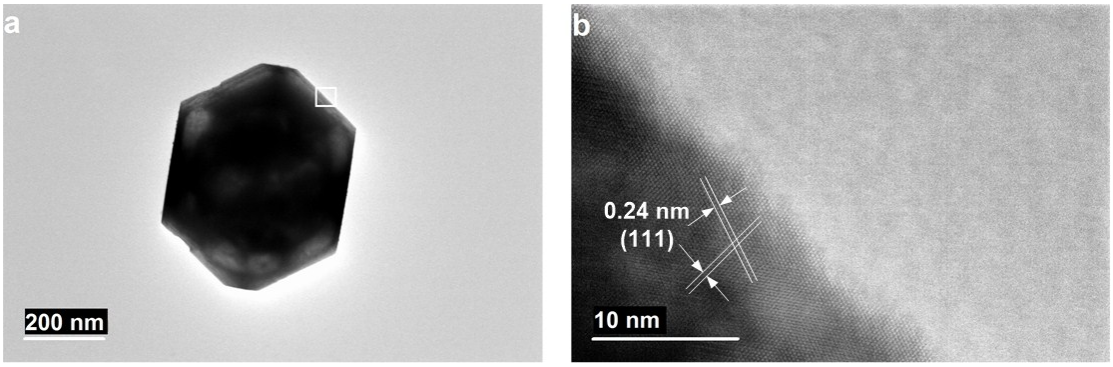

Fig.S3 TEM images of rhombic dodecahedral Cu_2O nanocrystals: (a) TEM image viewed along [110] direction. (b) High-resolution TEM image of the square region of Cu_2O nanocrystals.

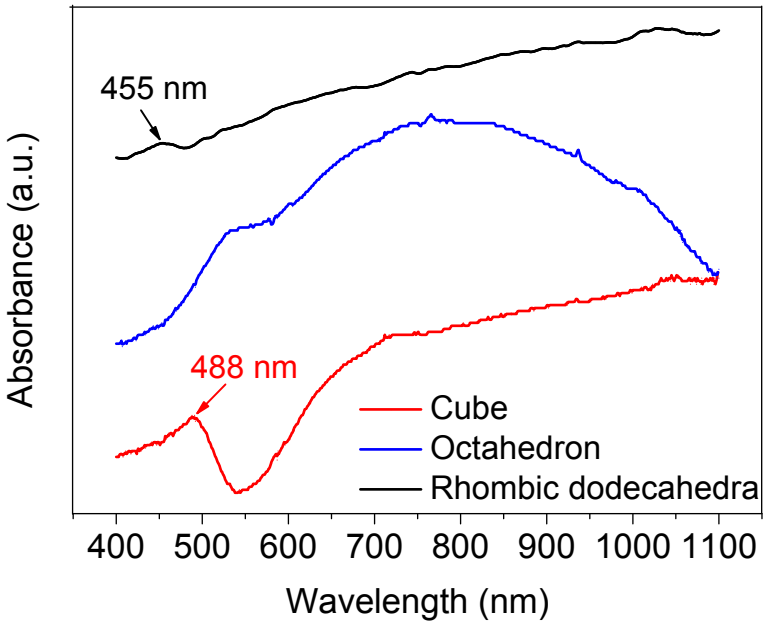

Fig.S4 UV-vis spectra of Cu_2O nanocrystals. Cu_2O nanocrystals with various morphologies show different wavelength peaks.

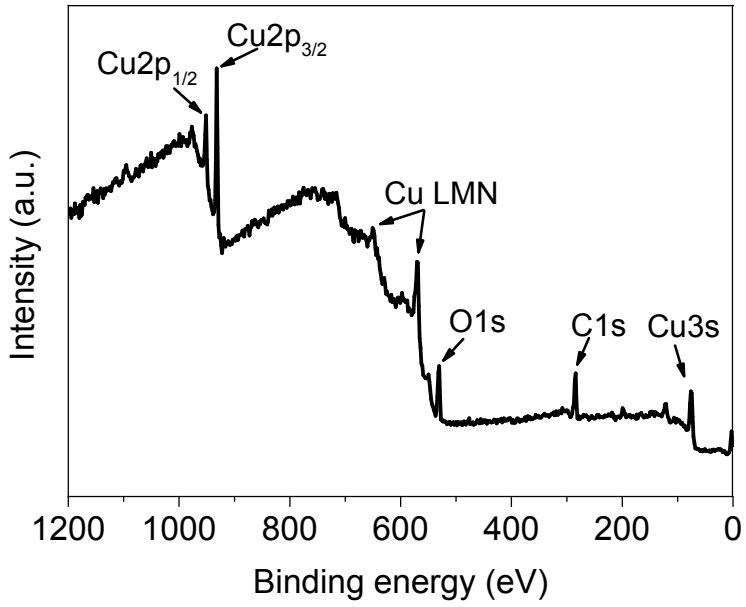

Fig.S5 XPS spectra of rhombic dodecahedral Cu_2O nanocrystals.

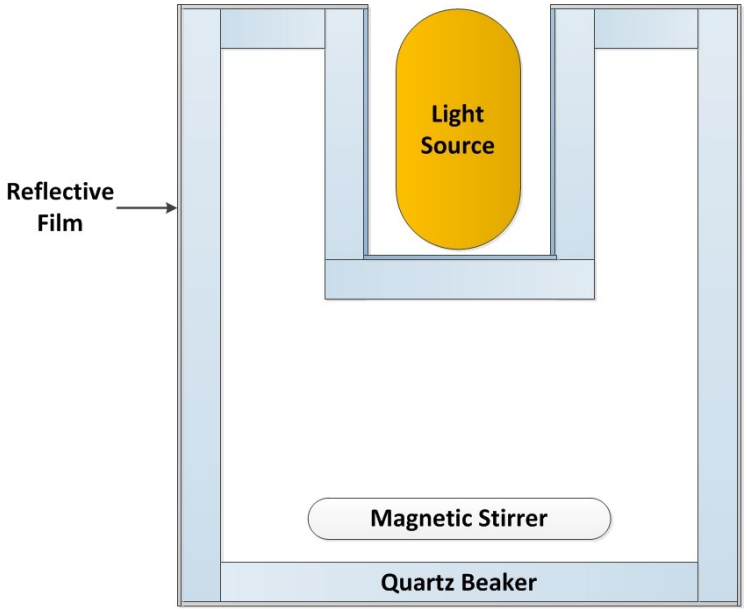

Fig.S6 Cross section of photocatalytic reactor.

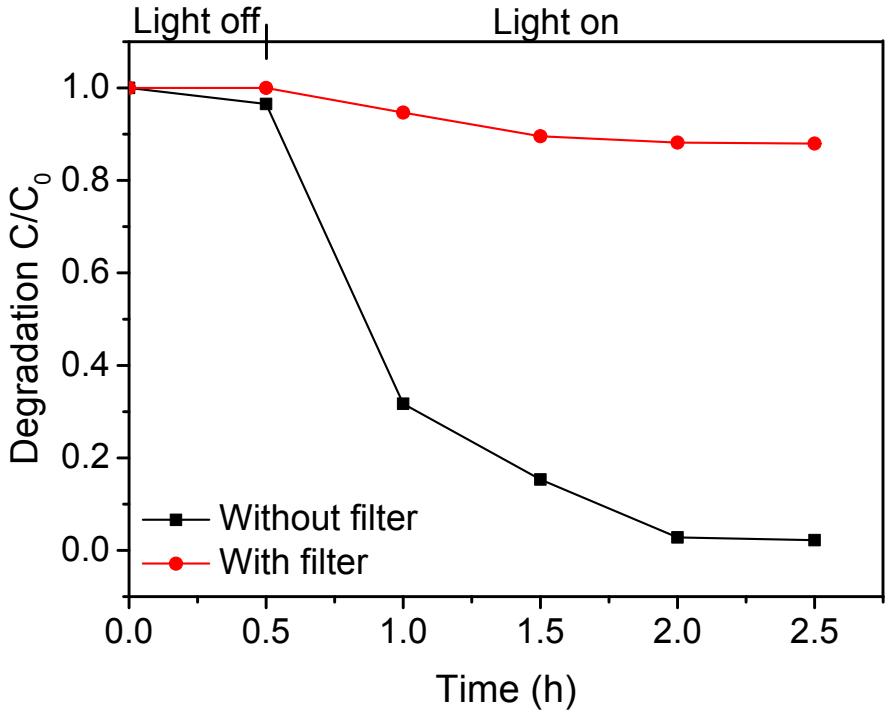

Fig.S7 Degradation of MO by rhombic dodecahedral Cu_2O photocatalysts with and without 500-nm filter.

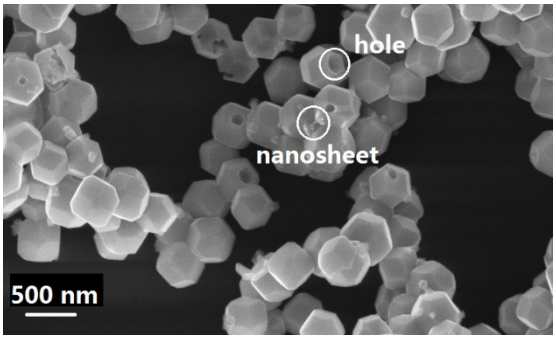

Fig.S8 SEM image of rhombic dodecahedral Cu_2O photocatalysts after five cycles of photocatalytic reactions. Some holes and nanosheets can be observed on the surface of Cu_2O nanocrystals, indicating the {110} facets gradually transforming into nanosheets during photocatalytic degradation**.**

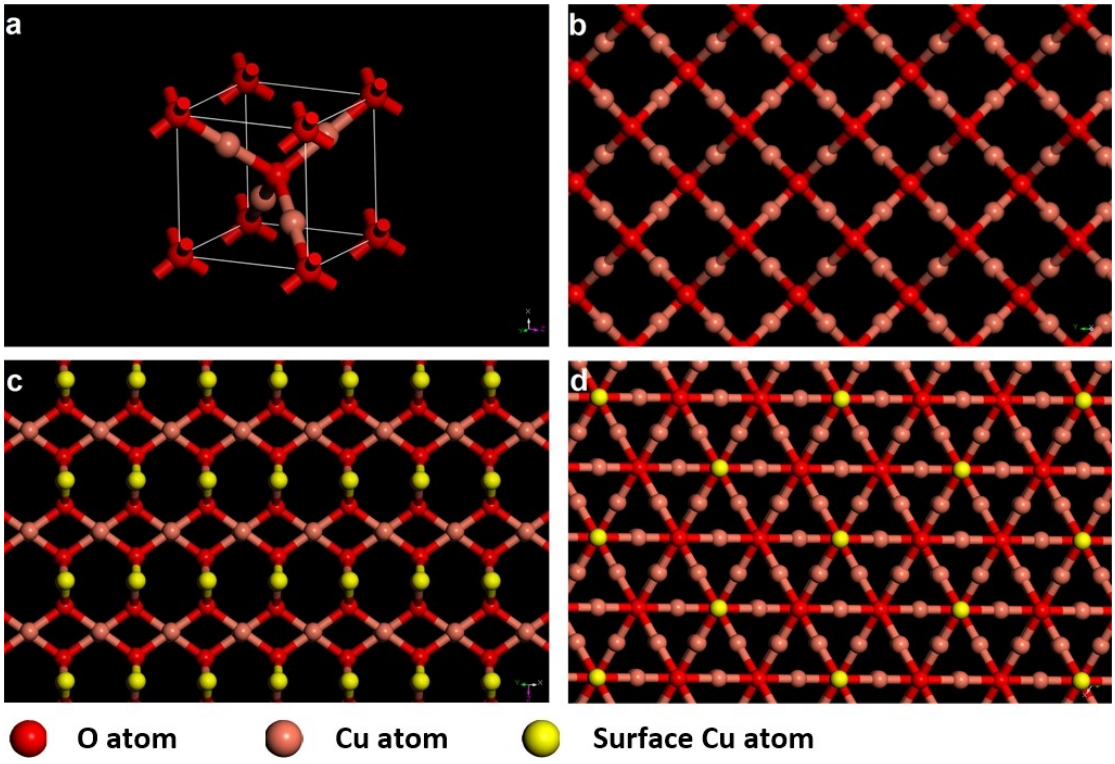

Fig.S9 Structure and atomic arrangement of Cu_2O nanocrystals: (a) unit cell of Cu_2O. (b) atomic arrangement of {100} plane. (c) atomic arrangement of {110} plane. (d) atomic arrangement of {111} plane.

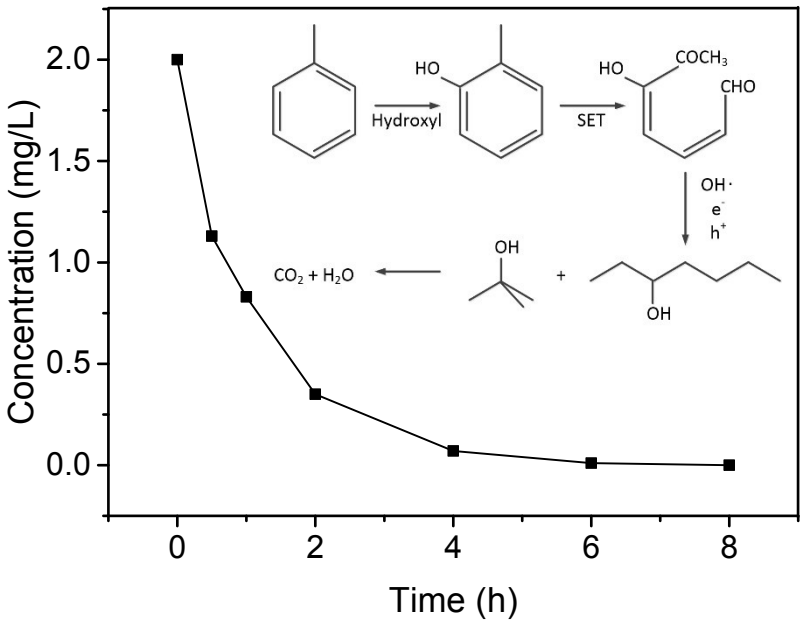

Fig.S10 Concentration of toluene versus reaction time using rhombic dodecahedral Cu_2O photocatalysts. Inset: degradation mechanism of toluene. Toluene is degraded by hydroxyl-like chemistry and SET chemistry to form molecules including 3-heptanol and 2-methyl-2-propanol. The intermediate products further react with electrons, holes and hydroxyl species to form carbon dioxide and water.