Electronic Supplementary Information

Direct Formation of Small Cu_2O Nanocubes, Octahedra, and Octapods for Efficient Synthesis of Triazoles

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Table S1 Average particle sizes and relative standard deviations of the synthesized Cu_2O nanocrystals.

Sample	Morphology	Average Particle Size in Edge Length	Relative Standard Deviation
a	cubes	37 ± 4 nm	10%
b	octahedra	67 ± 7 nm	10%
c	octapods	135 ± 13 nm	9%

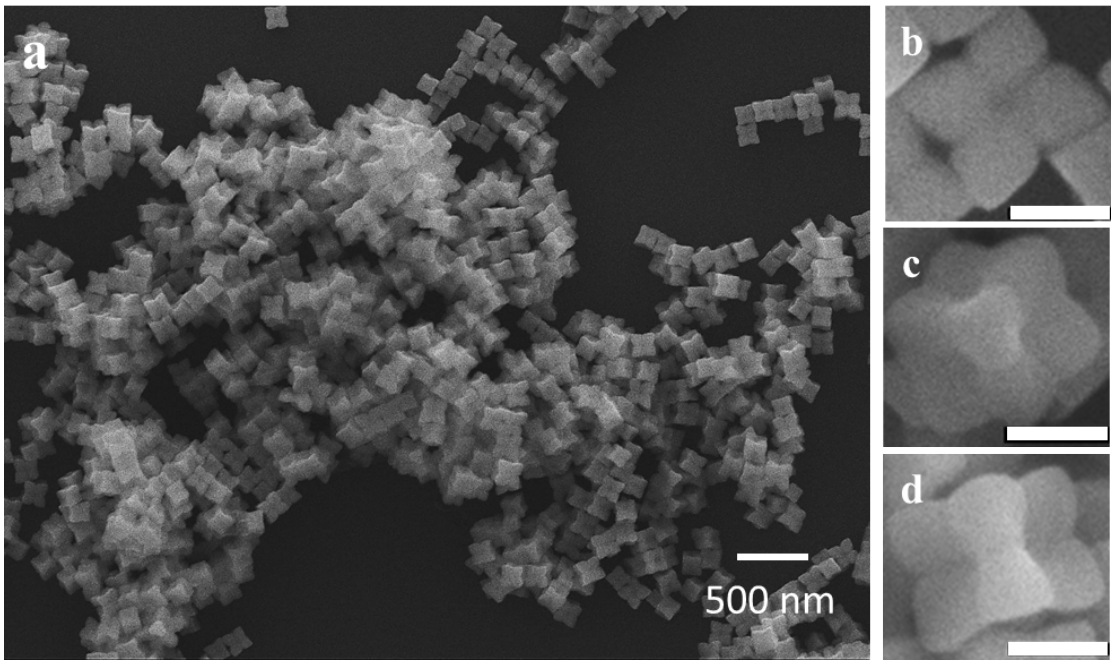


Fig. S1 Large-area SEM image of (a) Cu_2O octapods. (b–d) SEM images of a single Cu_2O octapod viewed along the (b) <100>, (c) <111>, and <110> directions. Scale bars are all equal to 100 nm.

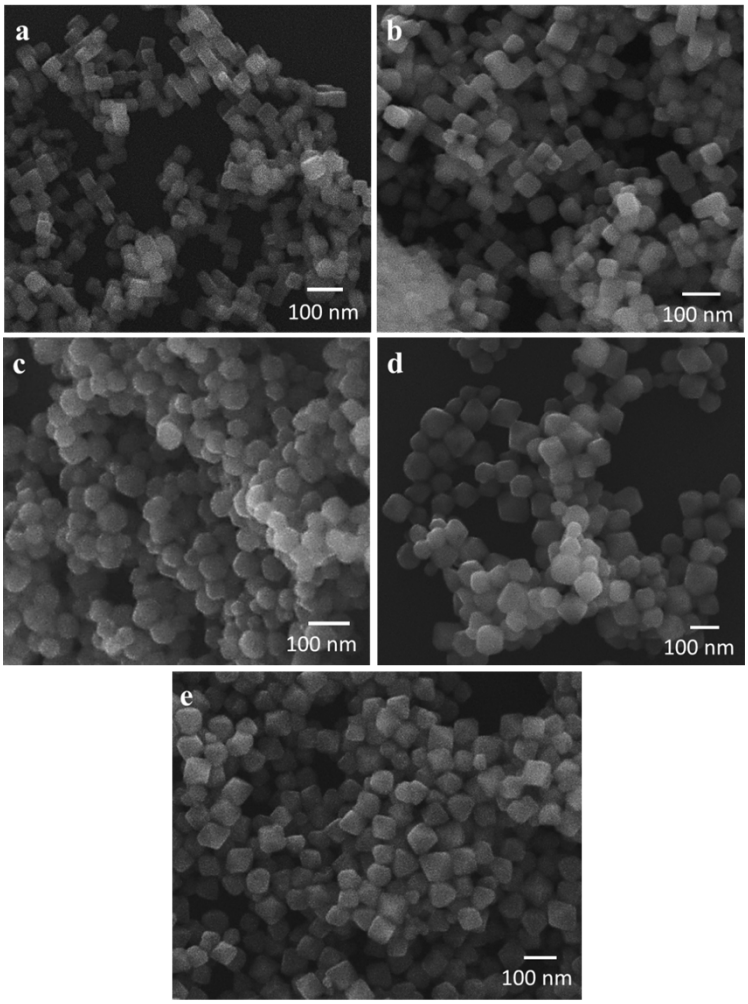


Fig. S2 SEM images of the small Cu_2O (a, b) nanocubes, (c) cuboctahedra, (d) truncated octahedra, and (e) octahedra synthesized by adding (a) 0.1, (b) 0.2, (c) 0.8, (d) 1.8, and (e) 2.8 mL of 0.2 M N_2H_4 solution.

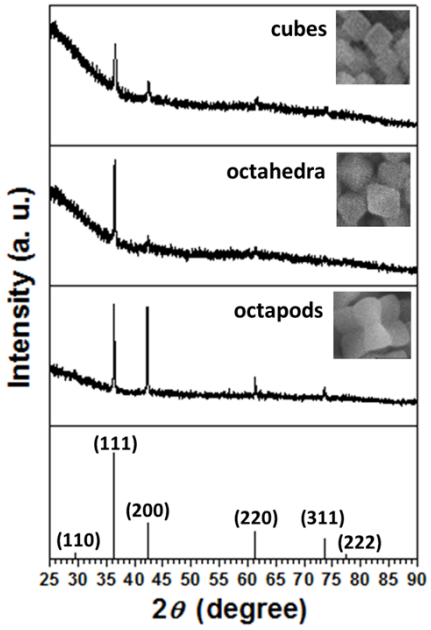


Fig. S3 XRD patterns of the small Cu_2O nanocrystals. A standard pattern is given.

Table S2 Calculations for the determination of the volumes of concentrated nanocrystal solutions needed to perform the cycloaddition reaction. Here slightly larger edge lengths were assumed when doing the calculations.

Morphology	Cube	Octahedron	Octapod
Edge length (nm)	40	68	140
Cu_2O particle weight in 1 mL solution (g)	0.00035	0.00060	0.00053
Volume of a single particle (cm^3)	a^3 $= 6.40 \times 10^{-17}$	$\frac{\sqrt{2}}{3}a^3$ $= 1.482 \times 10^{-16}$	a^3 $= 2.744 \times 10^{-15}$
Density of Cu_2O (g/cm^3)	6.0		
Weight of a particle (g)	3.84×10^{-16}	8.892×10^{-16}	1.646×10^{-14}
Number of particles per mL	9.11×10^{11}	6.75×10^{11}	3.22×10^{10}
Surface area of a single particle (cm^2)	$6a^2$ $= 9.60 \times 10^{-11}$	$2\sqrt{3}a^2$ $= 1.601 \times 10^{-10}$	$6a^2$ $= 1.176 \times 10^{-9}$
Total surface area in 1 mL solution (cm^2)	87	108	37.9
Volume needed for a total surface area of 87 cm^2 (mL)	1.00	0.81	2.30

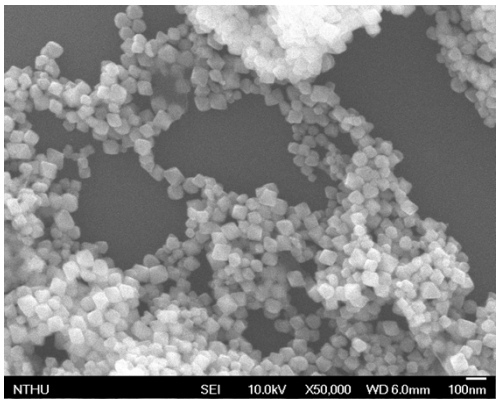
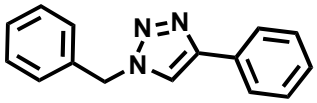


Fig. S4 SEM image of the Cu_2O octahedra after two cycles of cycloaddition reaction.

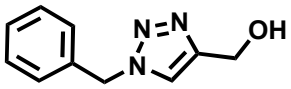
Spectral data of all synthesized compounds 3a–3c

1-Benzyl-4-phenyl-1*H*-1,2,3-triazole (3a)



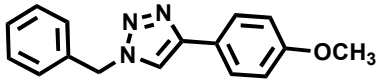
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.77 (dd, J = 8.2, 1.1 Hz, 2H), 7.63 (s, 1H), 7.38–7.35 (m, 5H), 7.29–7.28 (m, 3H), 5.56 (s, 2H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 148.2, 134.7, 130.5, 129.1, 128.8, 128.1, 128.0, 125.7, 119.4, 54.2; MS (EI) *m/z*: 235 (M^+).

(1-Benzyl-1*H*-1,2,3-triazol-4-yl)methanol (3b)



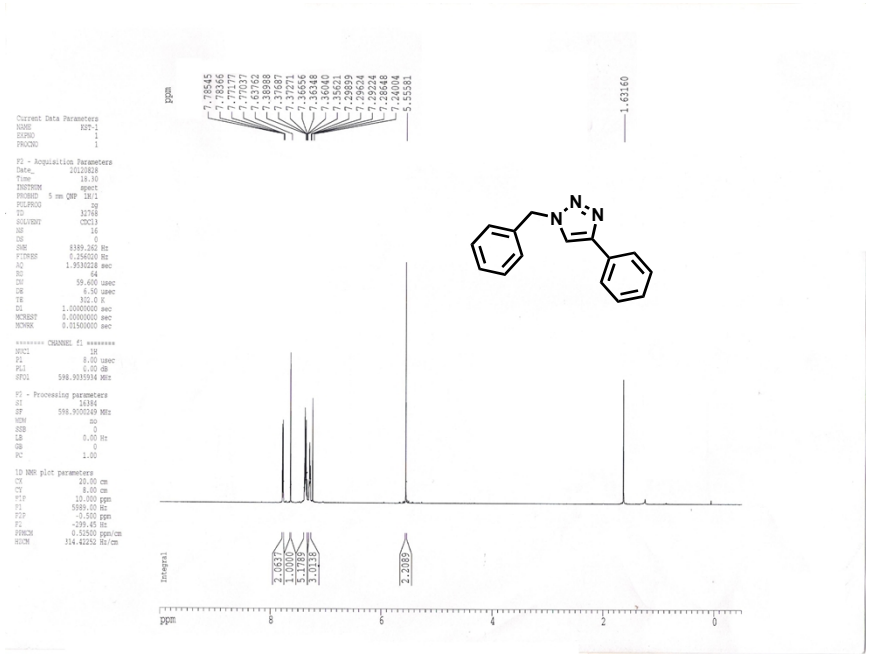
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.43 (s, 1H), 7.31–7.29 (m, 3H), 7.20 (dd, J = 7.7, 1.8 Hz, 1H), 5.43 (s, 2H), 4.67 (s, 2H), 3.98 (brs, OH); ^{13}C NMR (150 MHz, $CDCl_3$) δ 148.2, 134.5, 128.9, 128.6, 128.0, 121.8, 55.9, 54.0; MS (EI) *m/z*: 189 (M^+).

1-Benzyl-4-(4-methoxyphenyl)-1*H*-1,2,3-triazole (3c)

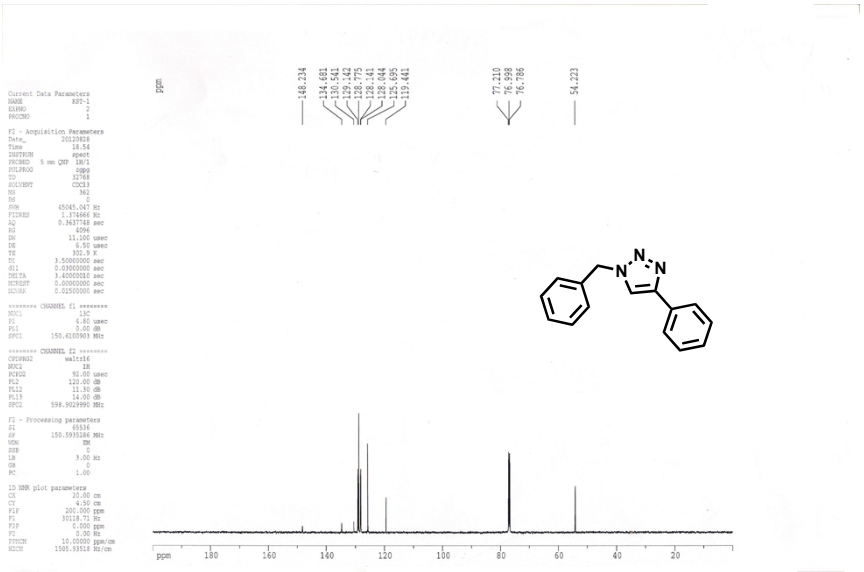


^{1}H NMR (600 MHz, $CDCl_3$) δ 7.70 (dd, J = 6.8, 1.9 Hz, 2H), 7.56 (s, 1H), 7.36–7.33 (m, 3H), 7.29–7.27 (m, 2H), 6.90 (dd, J = 6.8, 1.9 Hz, 2H), 5.54 (s, 2H), 3.80 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 159.5, 148.0, 134.7, 129.0, 128.1, 128.0, 126.9, 123.1, 118.7, 114.3, 55.3, 54.2; MS (EI) *m/z*: 265 (M^+).

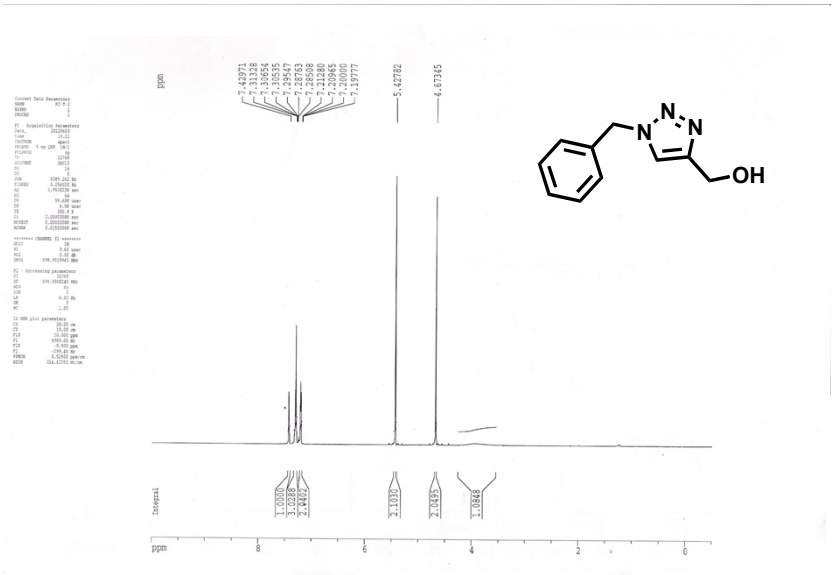
^{1}H NMR and ^{13}C NMR Spectra



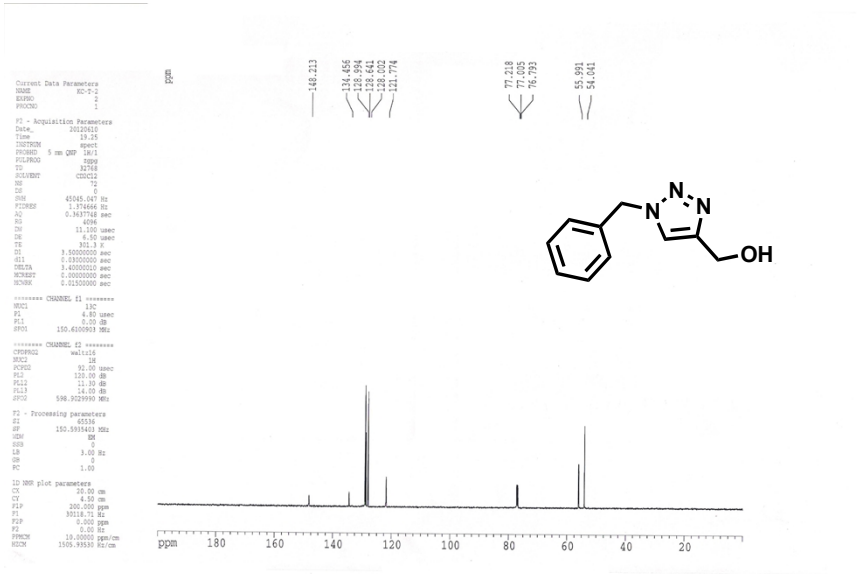
^{1}H NMR spectra of Compound 3a in $CDCl_3$



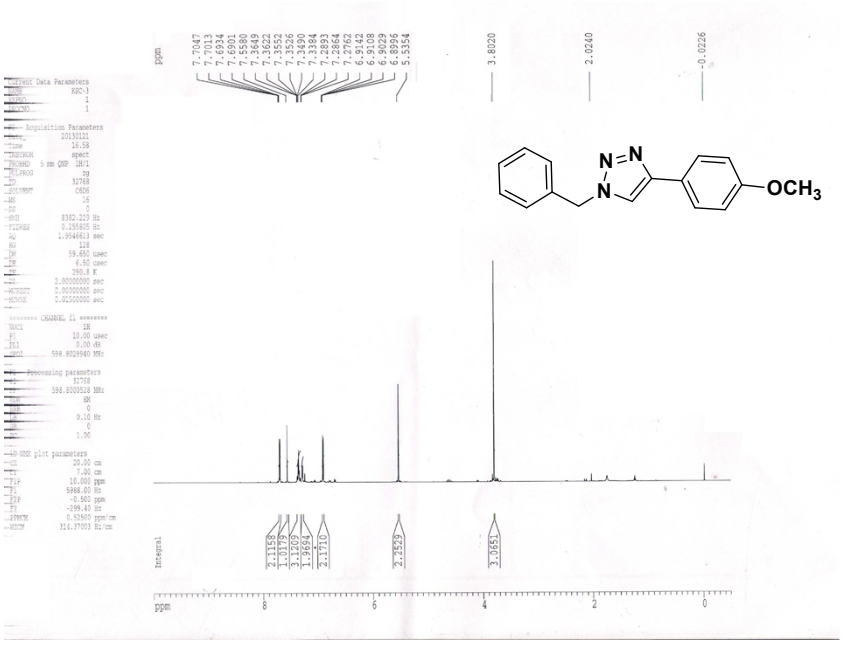
^{13}C NMR spectra of Compound 3a in $CDCl_3$



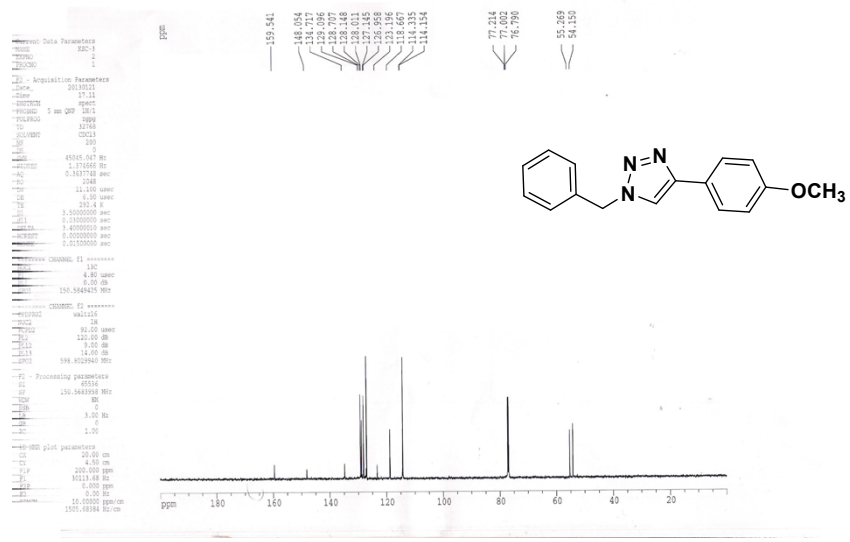
^{1}H NMR spectra of Compound 3b in $CDCl_3$



^{13}C NMR spectra of Compound 3b in $CDCl_3$



^{1}H NMR spectra of Compound 3c in $CDCl_3$



^{13}C NMR spectra of Compound 3c in $CDCl_3$