Supplementary information

Recyclable Lead-Free Perovskite/Metal-Organic Framework Catalyst for Efficient Click Reaction

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Characterization section

X-ray diffraction patterns were obtained using Cu Kα radiation on a Philips X'Pert MRD diffractometer (Netherlands). Field emission scanning electron microscopy (FESEM) images, energy dispersive X-ray (EDX) analysis, and elemental mapping measurements were performed on a TESCAN MIRA3 scanning electron microscope (Czech Republic). Thermogravimetric analysis (TGA) tests were conducted on a Mettler Toledo TGA/DSC instrument under air atmosphere. Nitrogen adsorption/desorption isotherms (BET) at -196 °C were obtained on a Micromeritics ASAP apparatus. NMR spectra of the products were recorded on a Bruker Avance DPX-250 NMR spectrometer (300 MHz for ^{1}H and 75 MHz for ^{13}C NMR) in deuterated solvents.

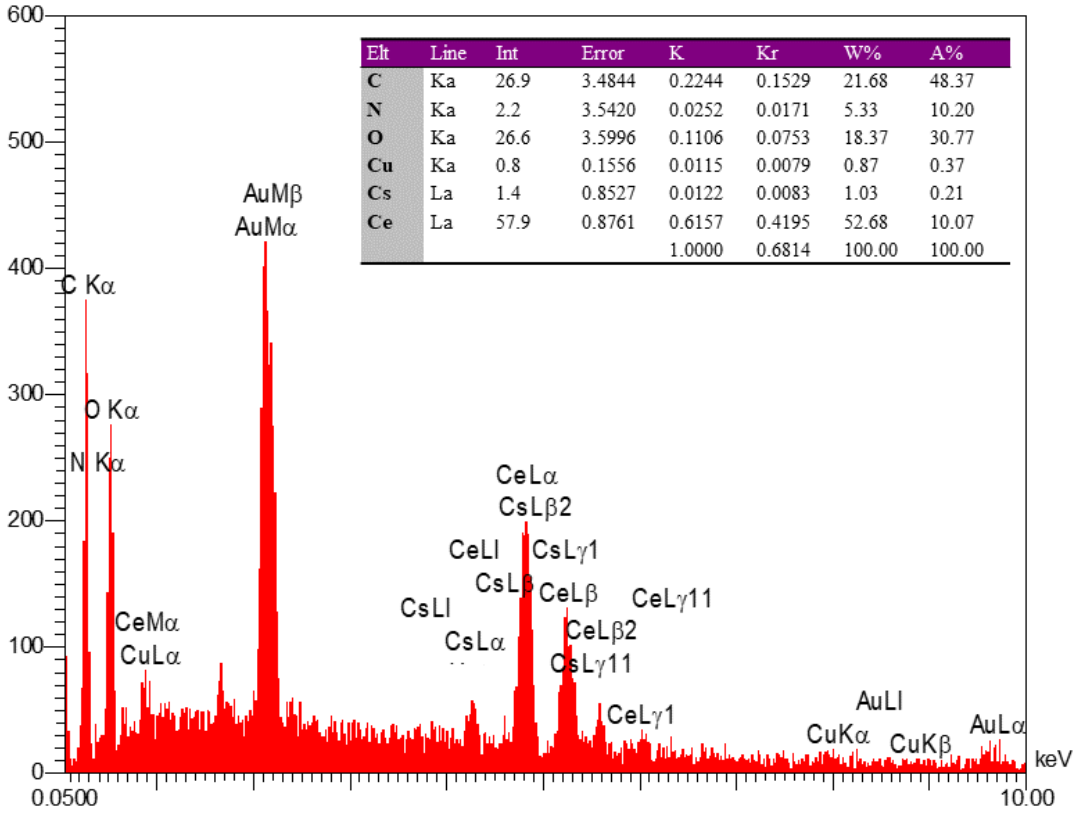


Figure S1. EDS analysis of $CsCu_2I_3$@UiO-66(Ce)-NH_2.

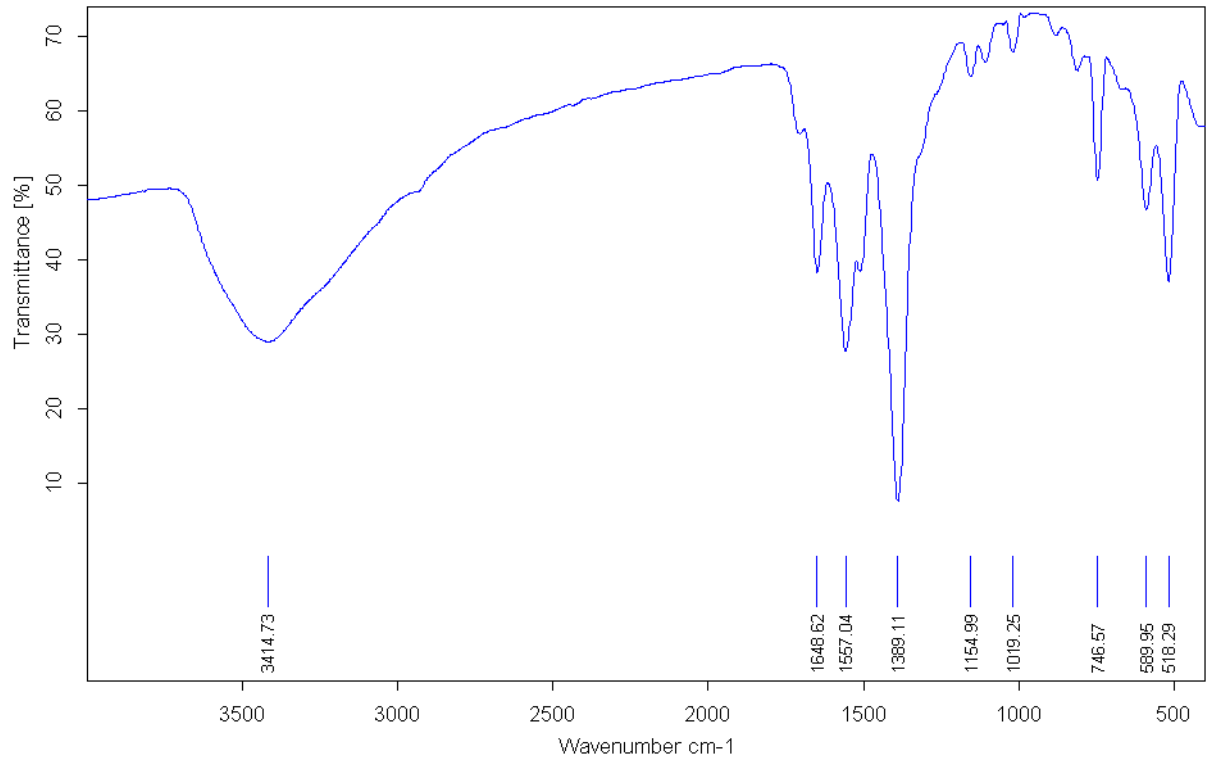


Figure S2. FT-IR spectrum of UiO-66(Ce).

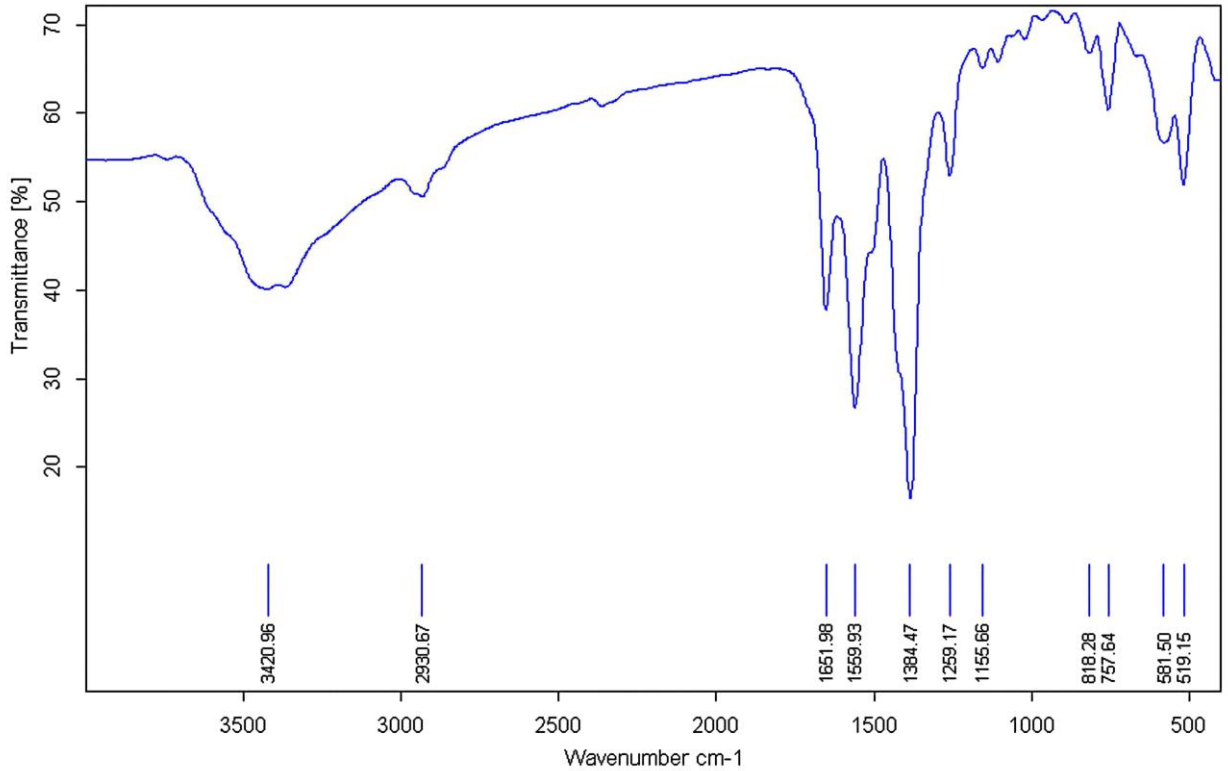


Figure S3. FT-IR spectrum of UiO-66(Ce)-NH_2.

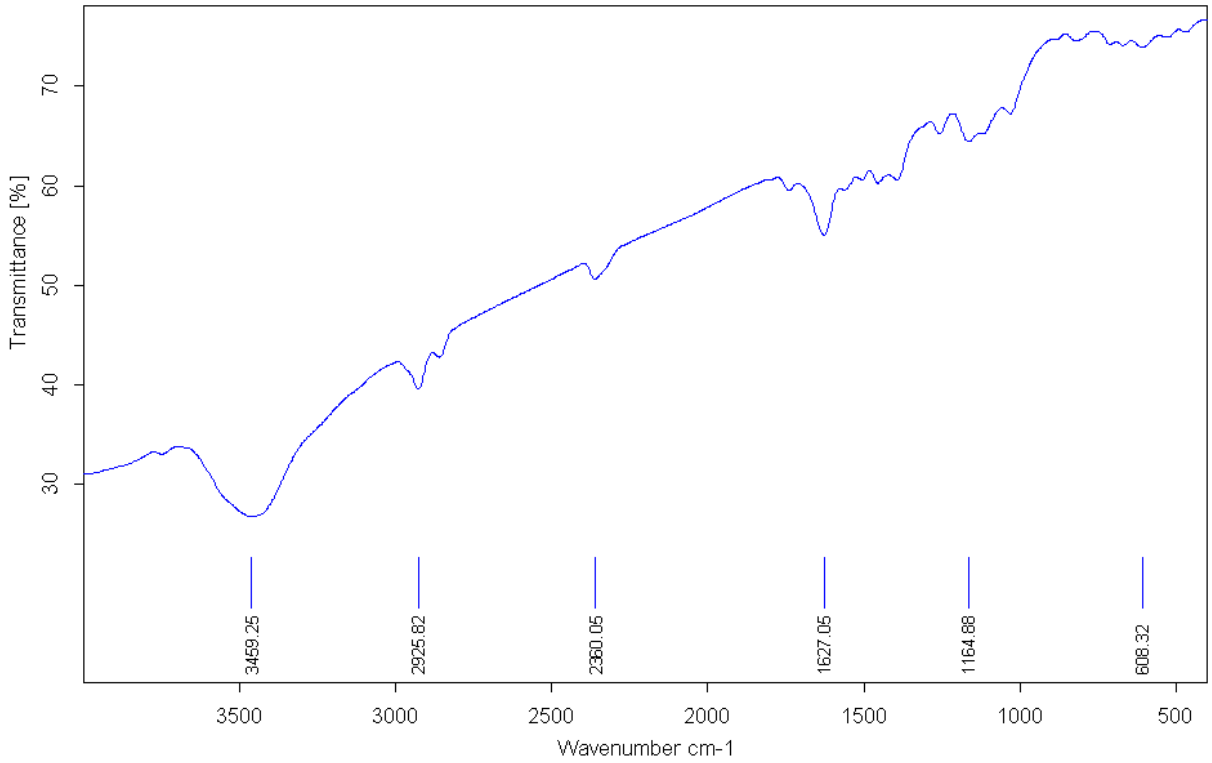


Figure S4. FT-IR spectrum of the prepared $CsCu_2I_3$.

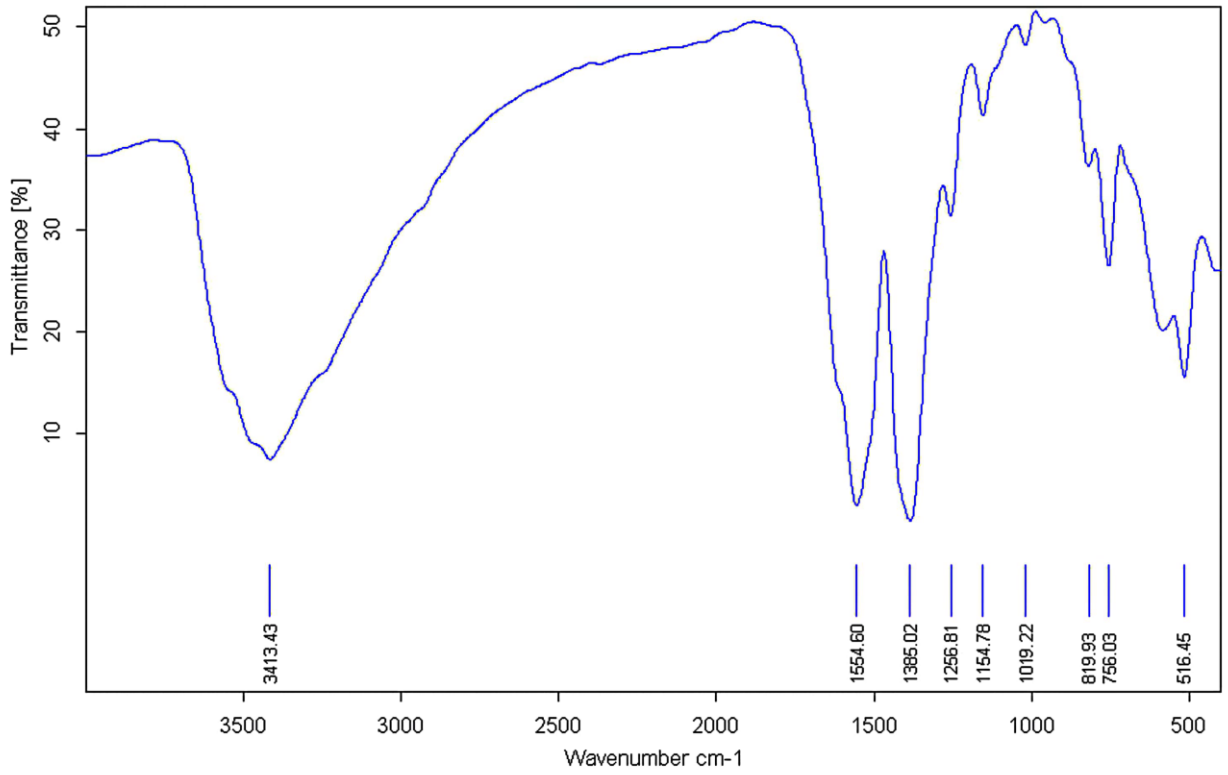


Figure S5. FT-IR spectrum of $CsCu_2I_3$@UiO-66(Ce)-NH_2.

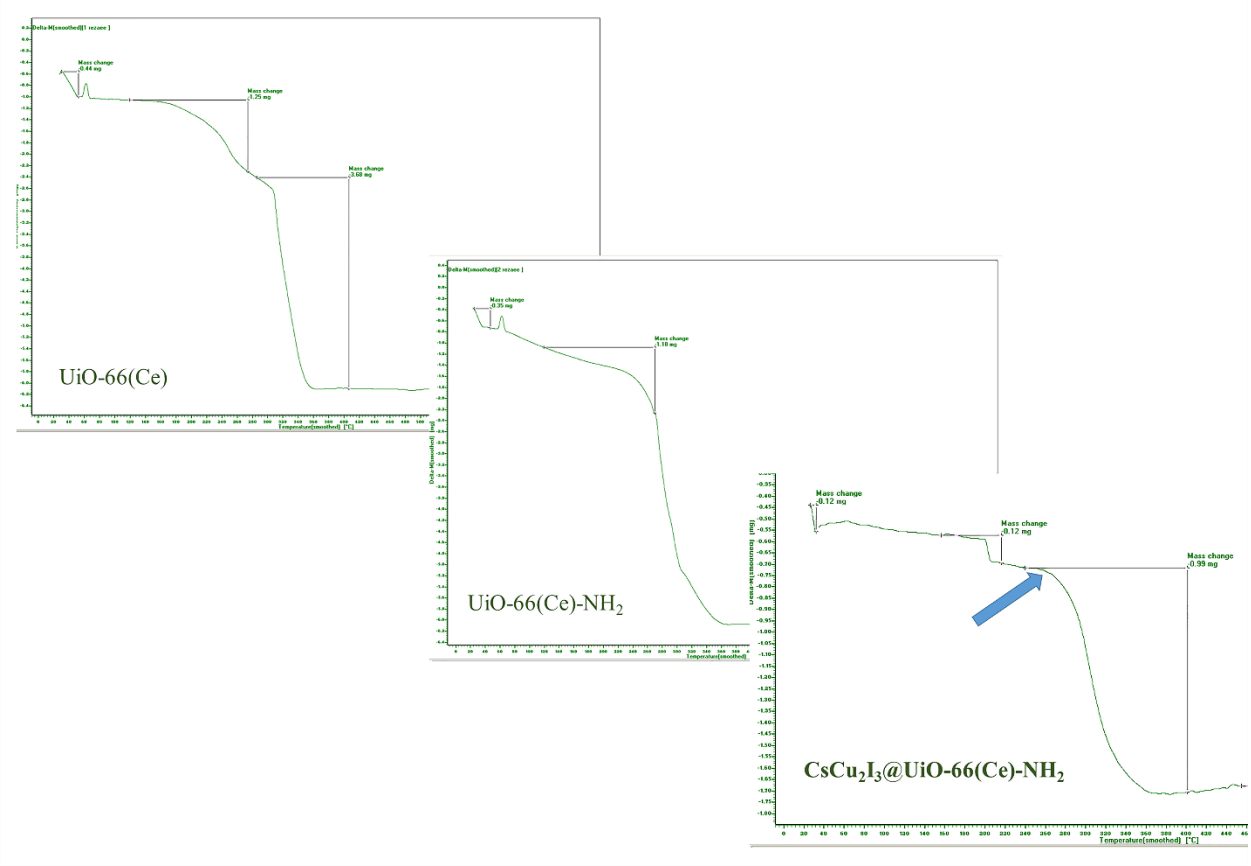


Figure S6. TGA profiles of UiO-66(Ce), UiO-66(Ce)-NH_2, and $CsCu_2I_3$@UiO-66(Ce)-NH_2.

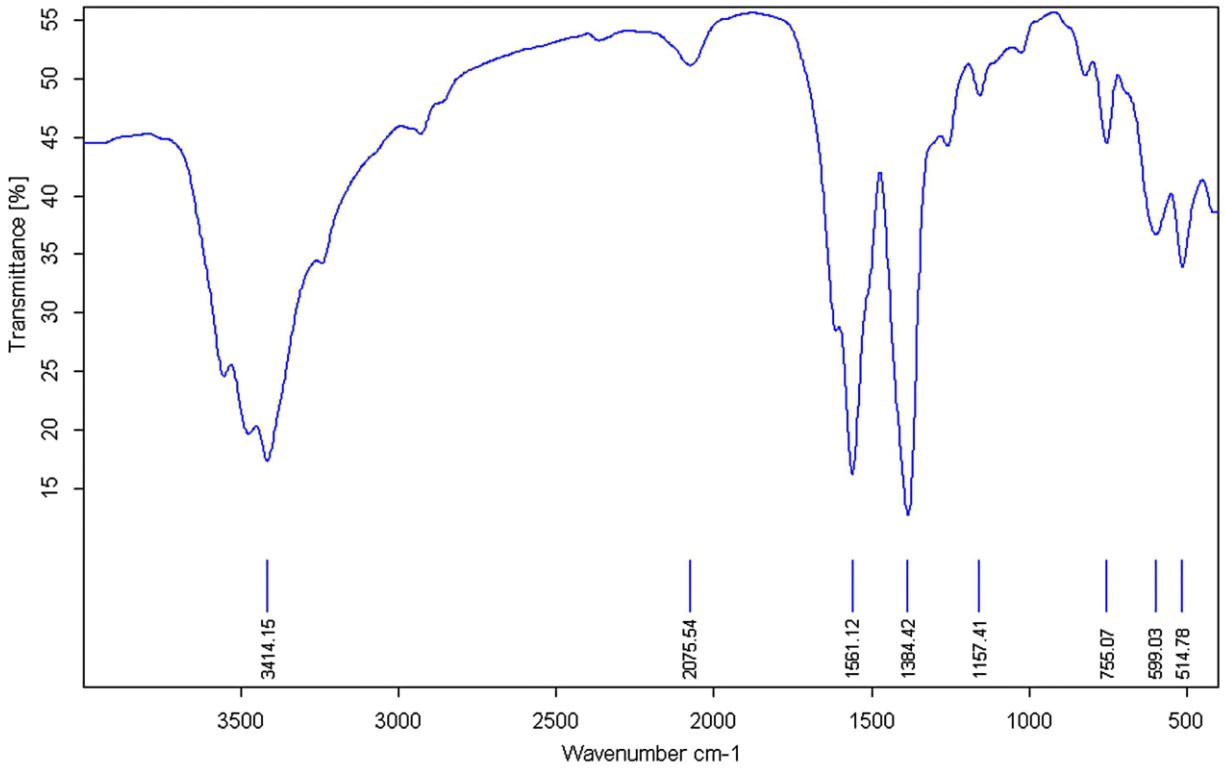


Figure S7. FT-IR spectrum of the reused $CsCu_2I_3$@UiO-66(Ce)-NH_2.

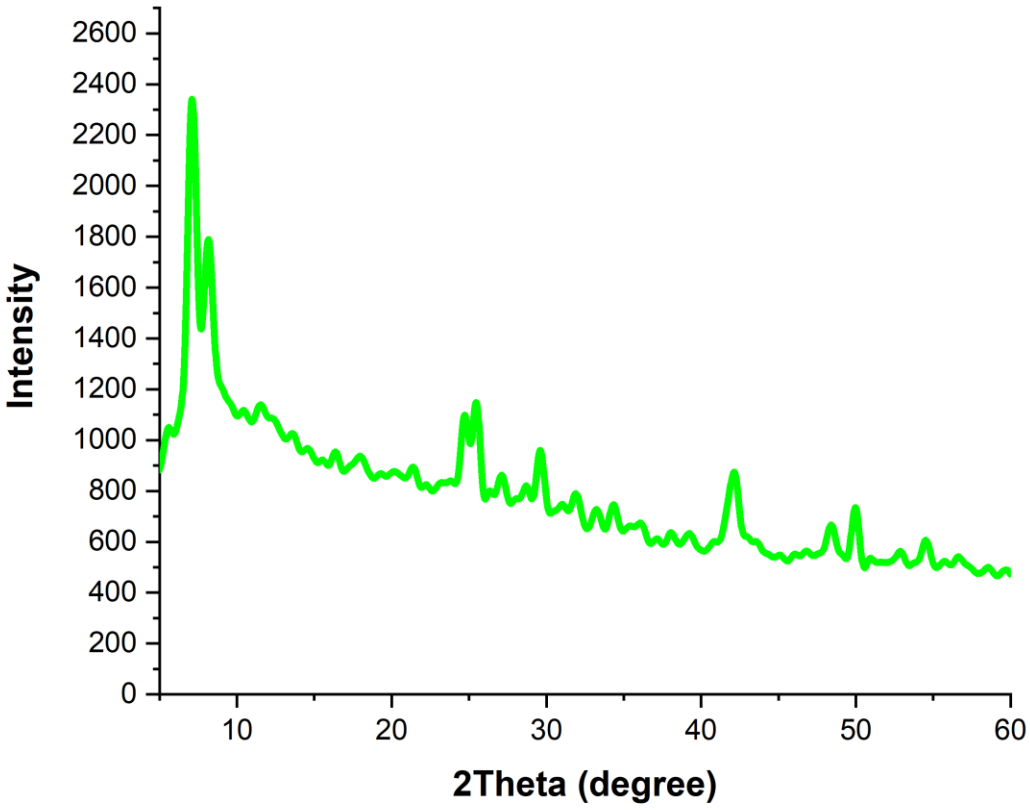


Figure S8. PXRD pattern of the reused $CsCu_2I_3$@UiO-66(Ce)-NH_2.

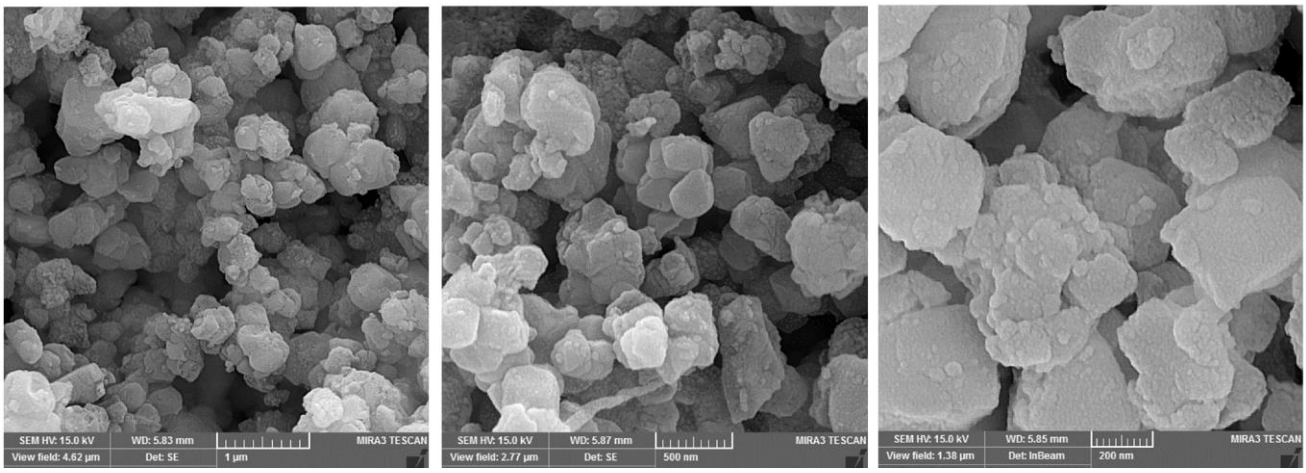
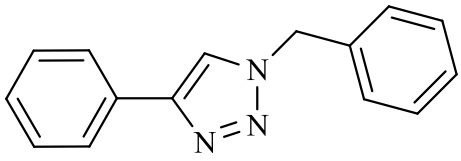


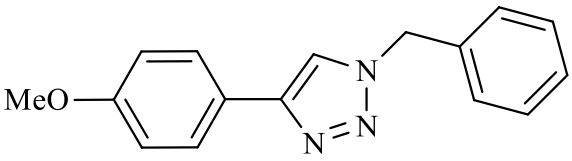
Figure S9. SEM images of the reused $CsCu_2I_3$@UiO-66(Ce)-NH_2.

Spectral data of organic products



1-Benzyl-4-phenyl-1*H*-1,2,3-triazole

White Solid; mp: 127-128 °C [1], IR (KBr $\mathcal{V}_{max}$ cm^{-1}): 3140, 3027, 1453, 1359, 1282, 1216, 1143, 1068, 969, 918, 857. ^{1}H NMR (300 MHz, DMSO-d_6): δ 8.65 (s, 1H), 7.84-7.87 (m, 2H), 7.30-7.46 (m, 8H), 5.65 (s, 2H). ^{13}C NMR (75 MHz, DMSO-d_6): δ 146.67, 136.03, 130.67, 128.91, 128.82, 128.18, 127.9, 125.16, 121.59, and 53.03.



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

White Solid; m.p.; 136-138 °C [2], IR (KBr $\mathcal{V}_{max}$ cm^{-1}): 3421 (OMe), 3133, 2930, 1610, 1564, 1498, 1450, 1349, 1299, 1254, 1174, 1062, 1030, 974, 831. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.61 (d, 2H, J = 6 Hz), 7.48 (s, 1H), 7.16-7.31 (m, 5H), 6.82 (d, 2H, J = 6 Hz), 5.45 (s, 2H), 3.72 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$): δ 160.10, 148.61, 135.31, 129.65, 129.36, 128.57, 127.52, 123.80, 119.25, 114.72, 55.84, and 54.71.

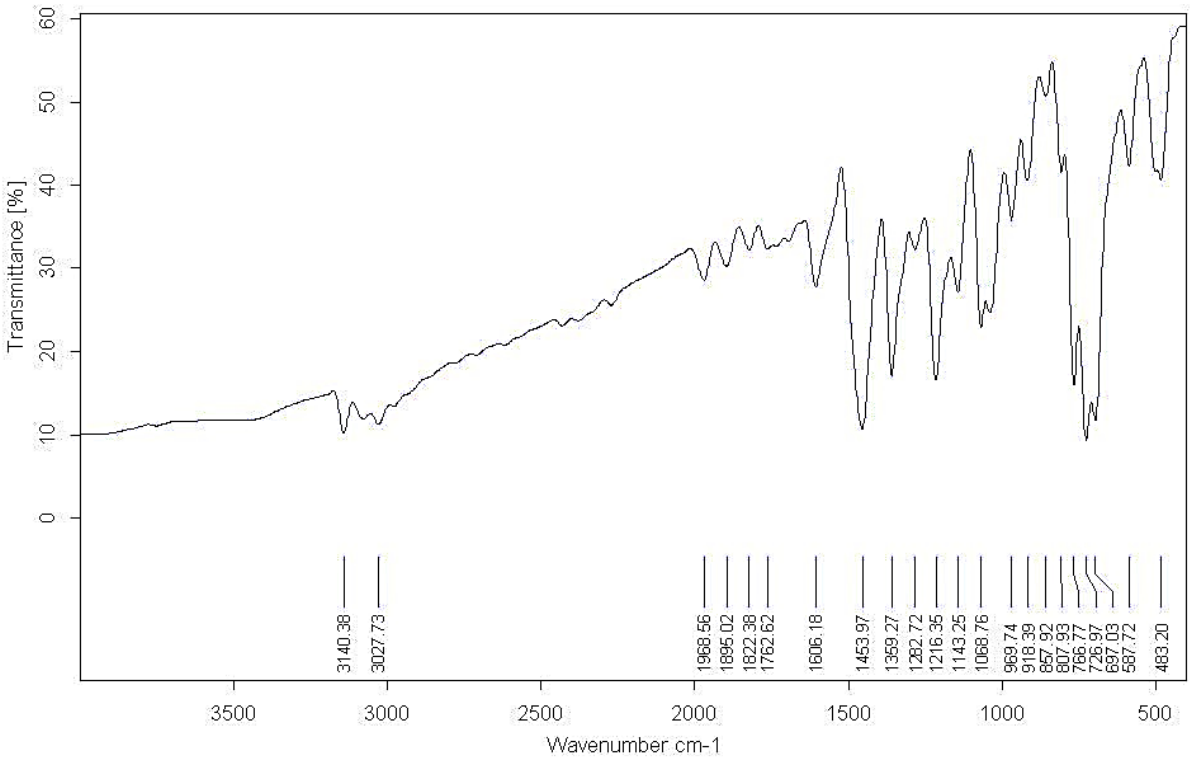


Figure S10. FT-IR spectrum of 1-benzyl-4-phenyl-1*H*-1,2,3-triazole.

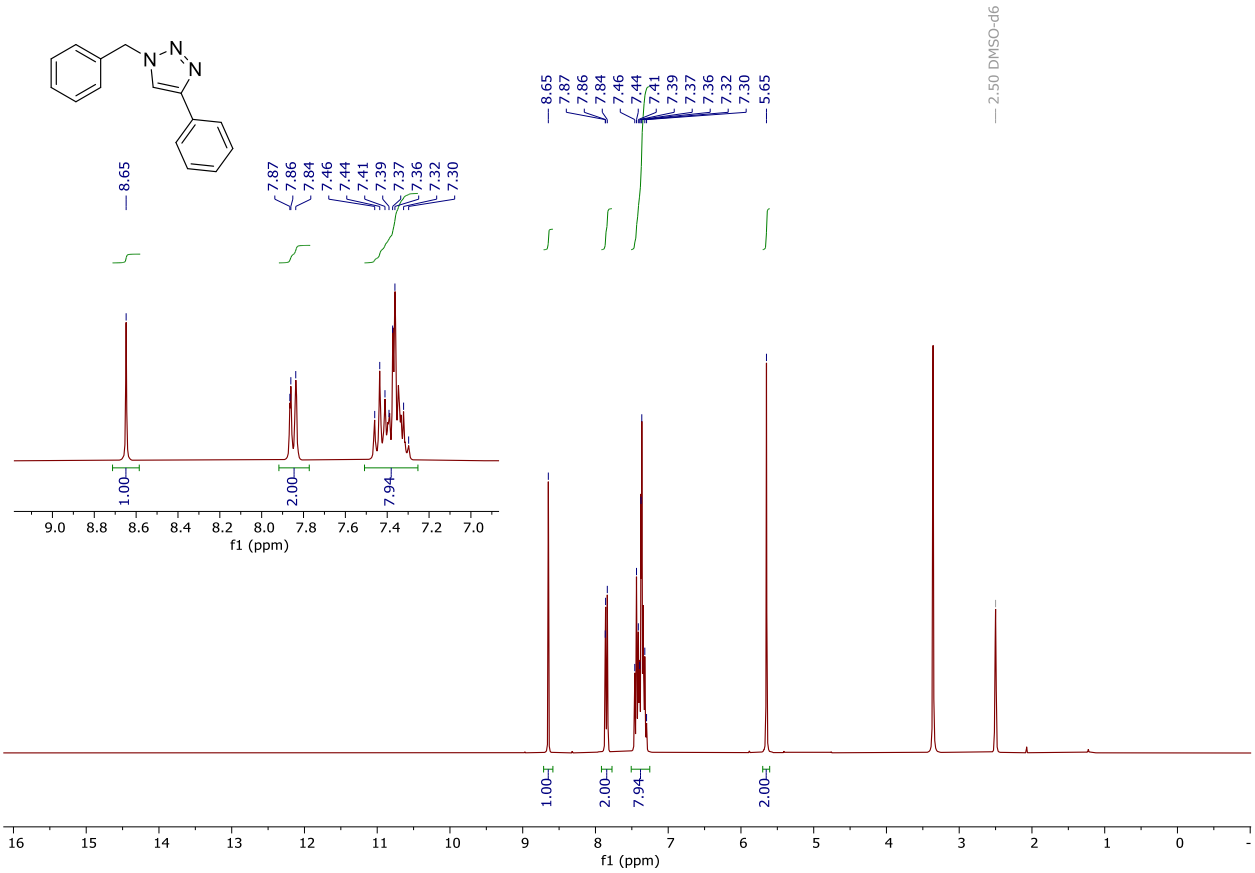


Figure S11. ^{1}H NMR of 1-benzyl-4-phenyl-1*H*-1,2,3-triazole.

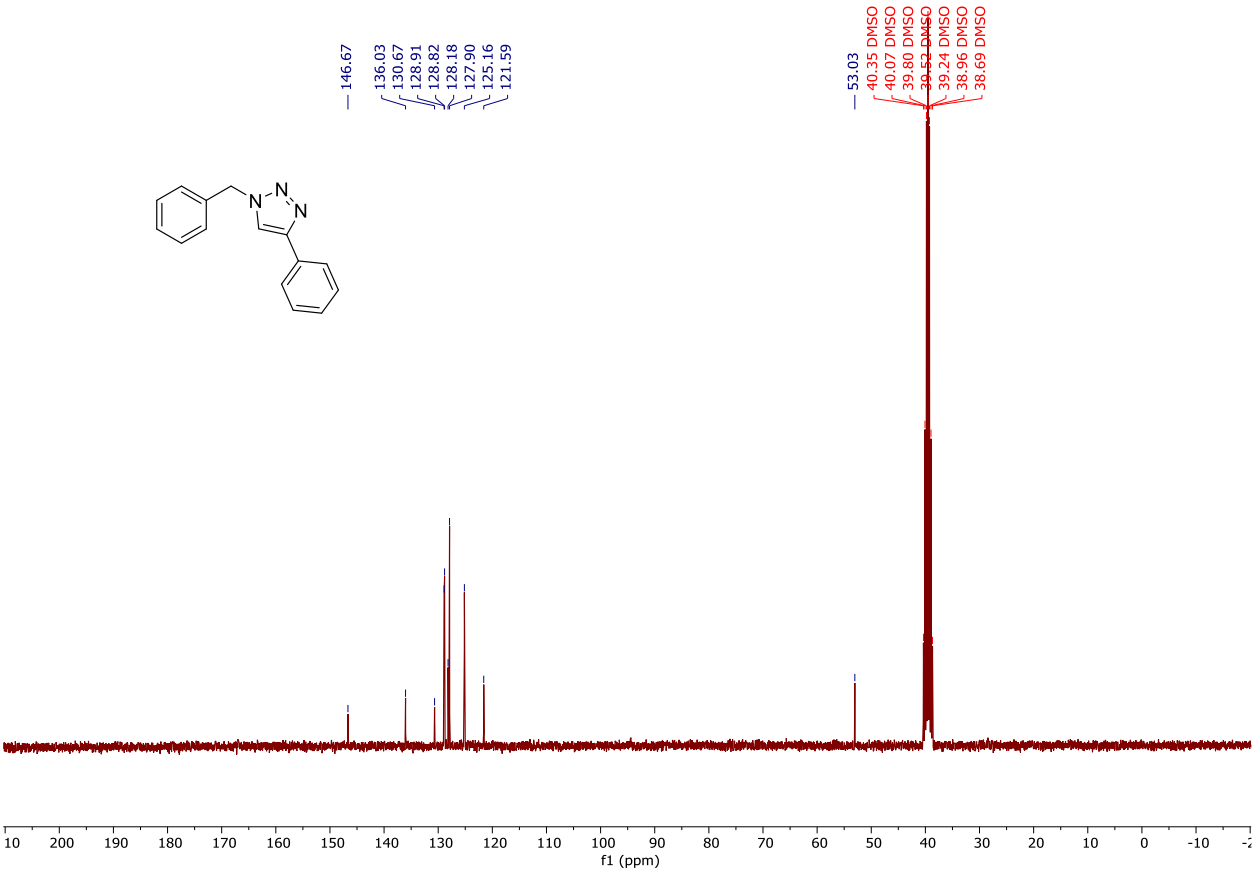


Figure S12. ^{13}C NMR of 1-benzyl-4-phenyl-1*H*-1,2,3-triazole.

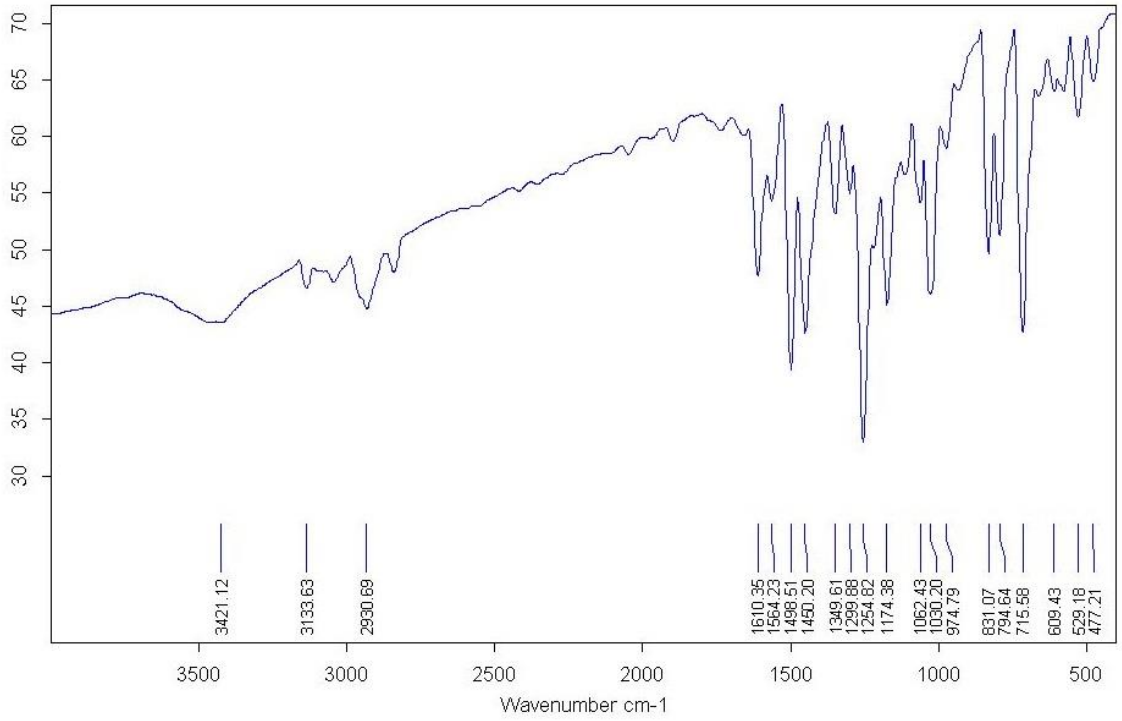


Figure S13. FT-IR spectrum of 1-benzyl-4-(4-methoxyphenyl)-1*H*-1,2,3-triazole.

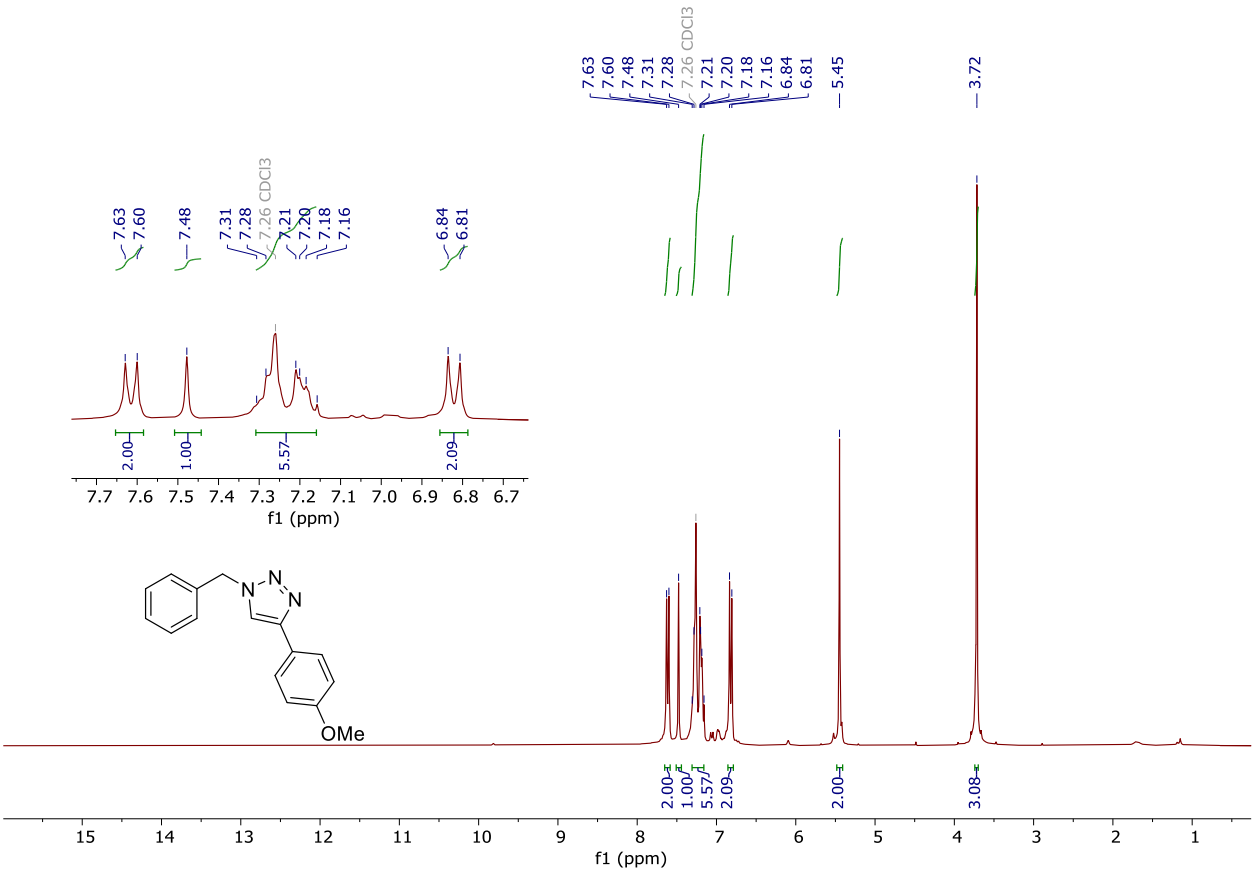


Figure S14. ^{1}H NMR of 1-benzyl-4-(4-methoxyphenyl)-1*H*-1,2,3-triazole.

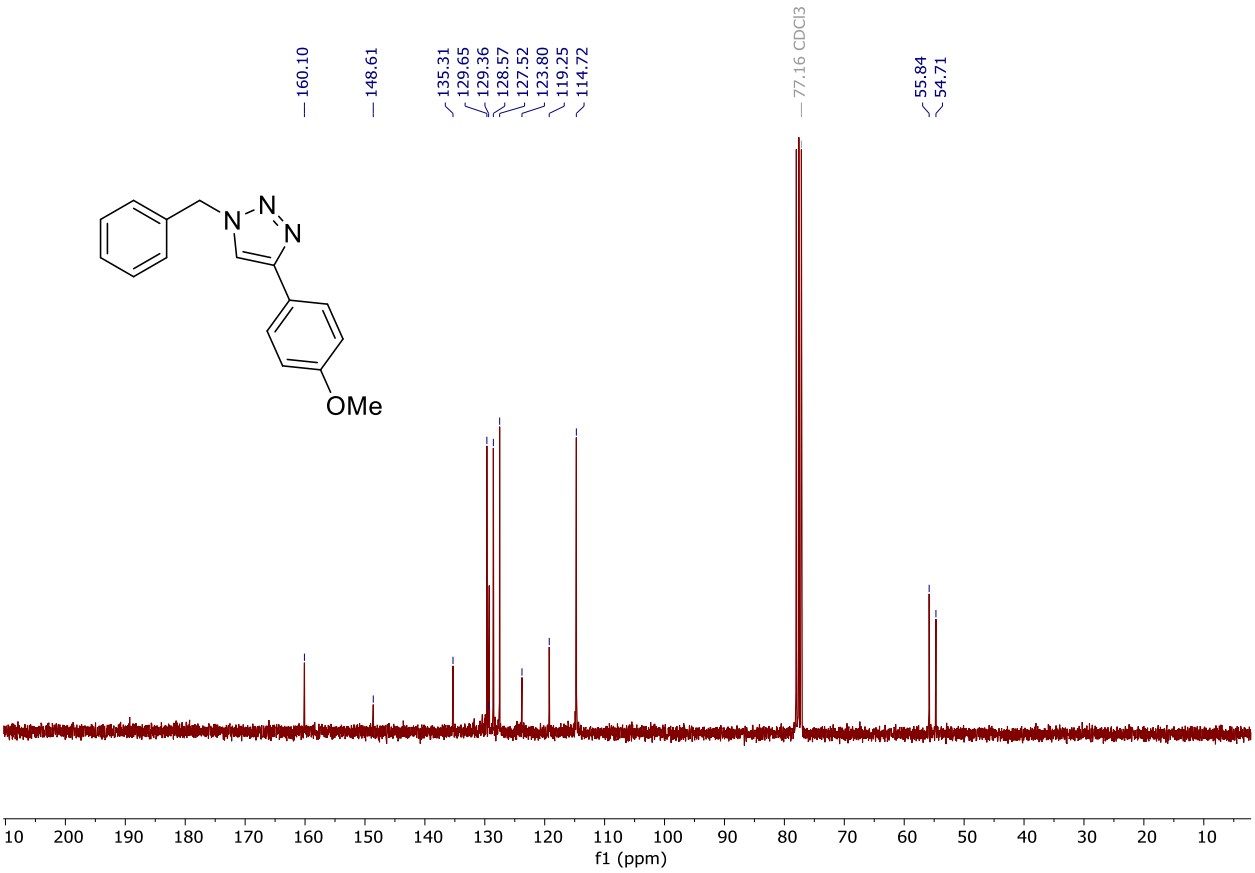


Figure S15. ^{13}C NMR of 1-benzyl-4-(4-methoxyphenyl)-1*H*-1,2,3-triazole.

References

[1] Kamata K., Nakagawa Y., Yamaguchi K., Mizuno N.: 1,3-Dipolar Cycloaddition of Organic Azides to Alkynes by a Dicopper-Substituted Silicotungstate. J. Am. Chem. Soc. **130**(46), 15304-15310 (2008)

[2] Ladouceur S., Soliman A.M., Zysman-Colman E.: One-Pot Click Synthesis of 1N-Alkyl-4-aryl-1,2,3-triazoles from Protected Arylalkynes and Alkyl Bromides. Synthesis **2011**(22), 3604-3611 (2011)