Supplementary Materials

Microwave-assisted synthesis of symmetrical 1,4-disubstituted bis-*1H*-1,2,3-triazoles using copper N-heterocyclic carbene catalysts

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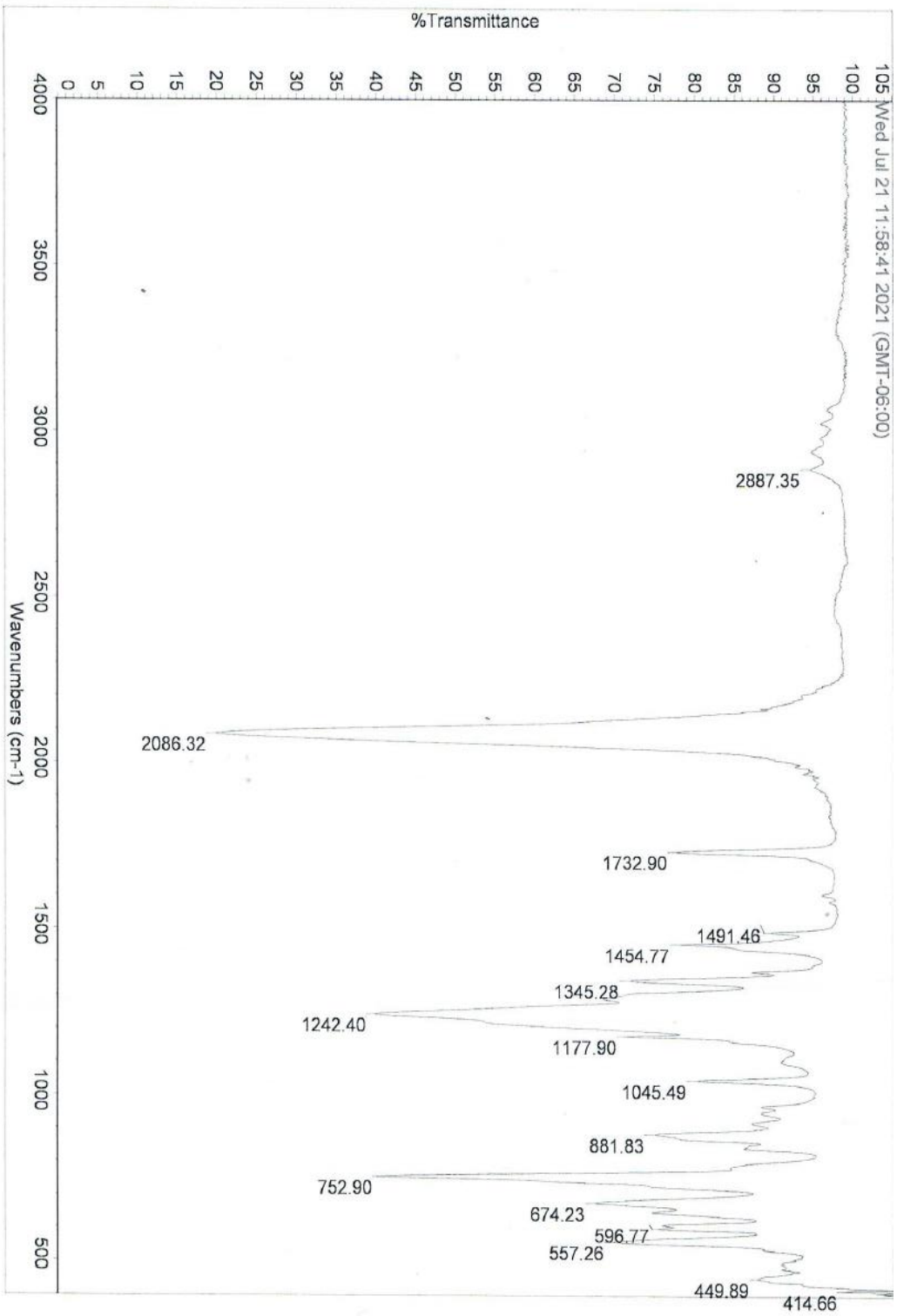
Compound Synthesized from Internal Alkyne

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S1.1

Figure S1. FTIR of *α,α*-diazido-*o*-xylene



S1.2

Figure S2. ^{1}H NMR (400 MHz) of 3a: 1,1′-[(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)methanol

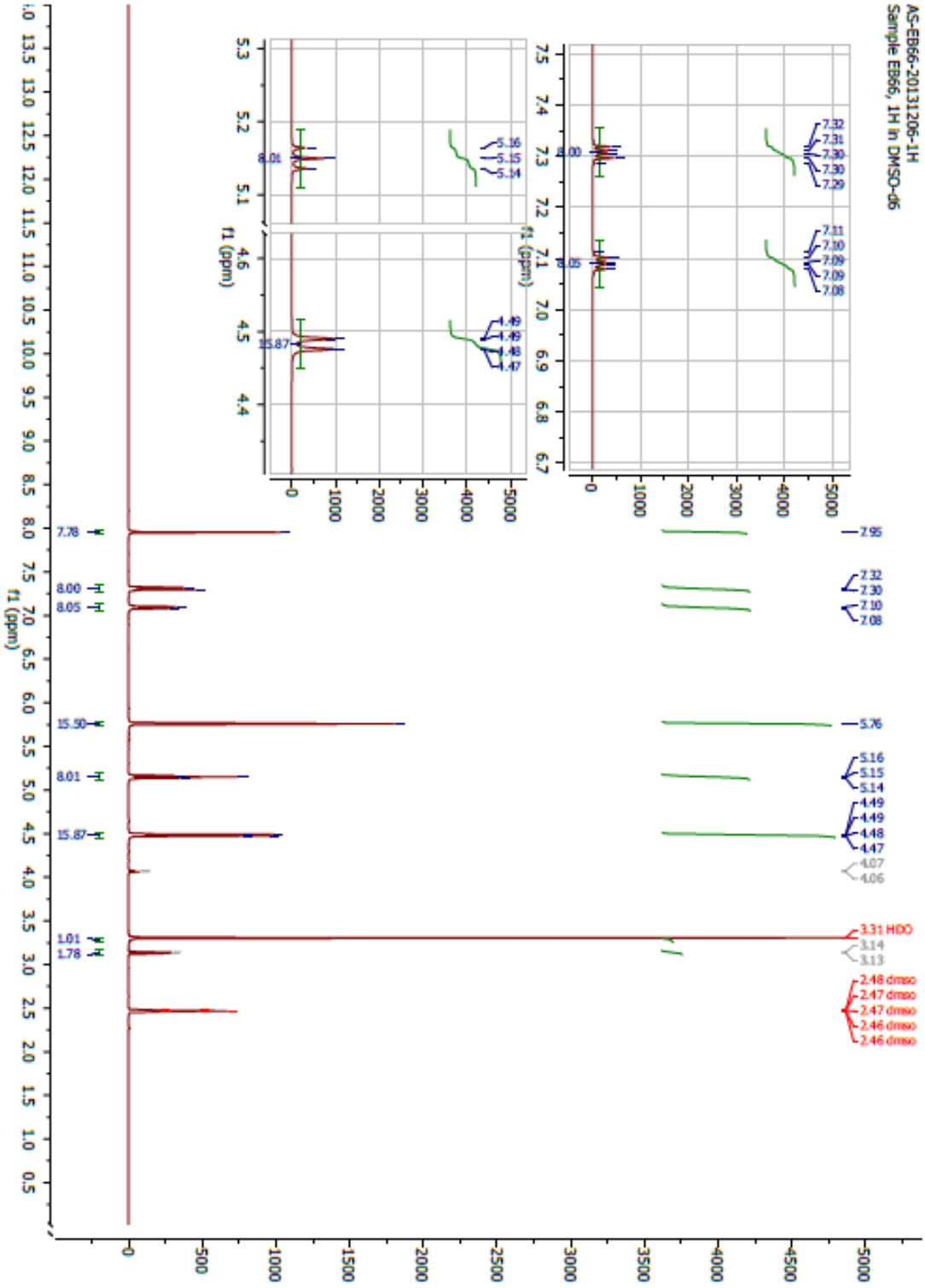


Figure S3. ^{13}C NMR (400 MHz) of 3a: 1,1′-[(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)methanol

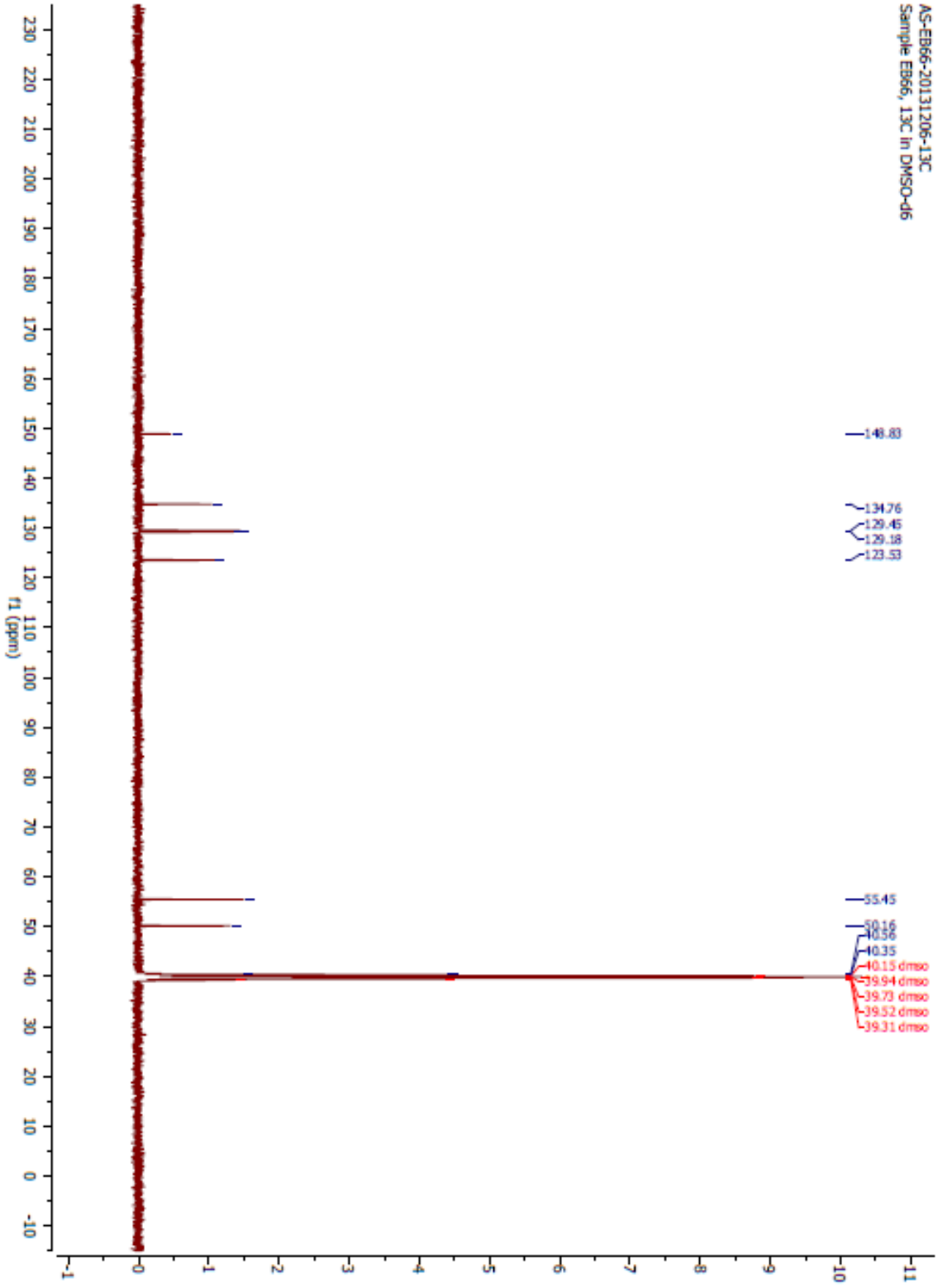
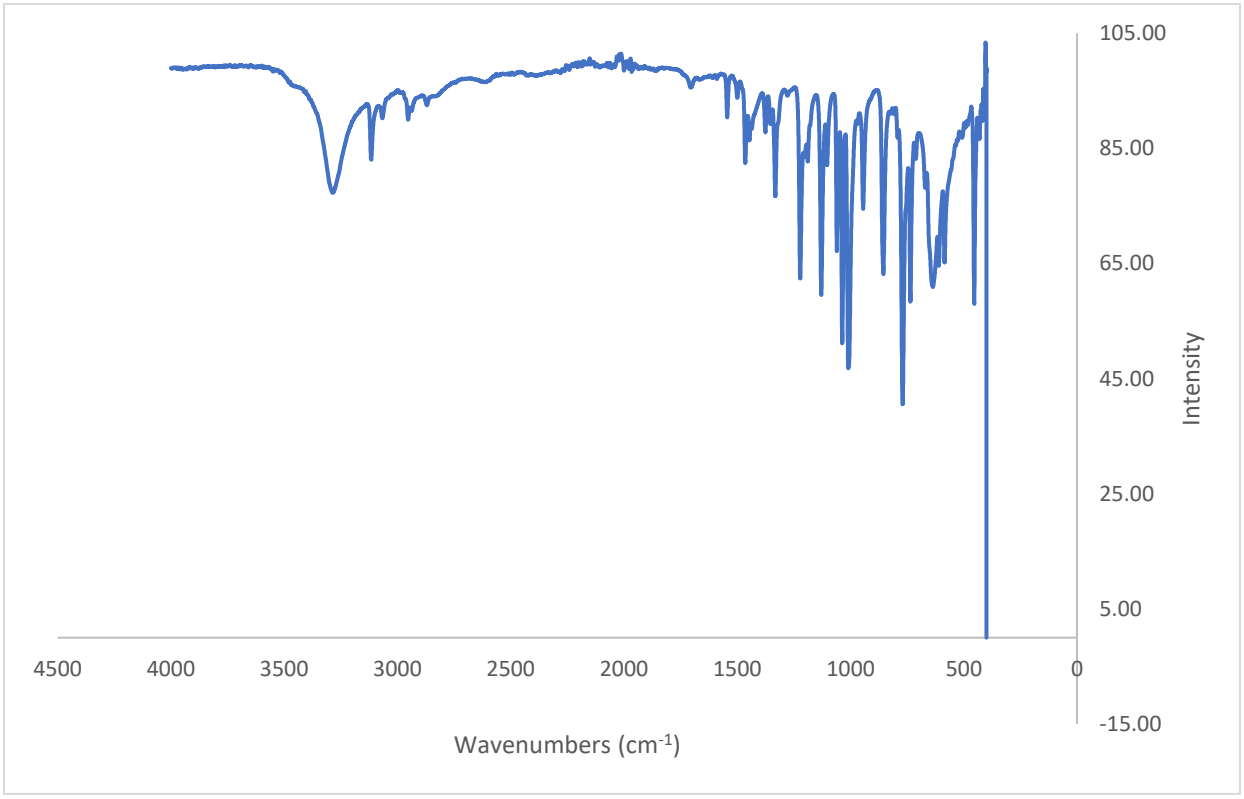


Figure S4. FTIR of 3a: 1,1′-[(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)methanol



S1.3

Figure S5. ^{1}H NMR (400 MHz) of 3b: dimethyl 1,1′-[1,2-phenylenebis(methylene)]bis-1*H*-1,2,3-triazole-4-carboxylate

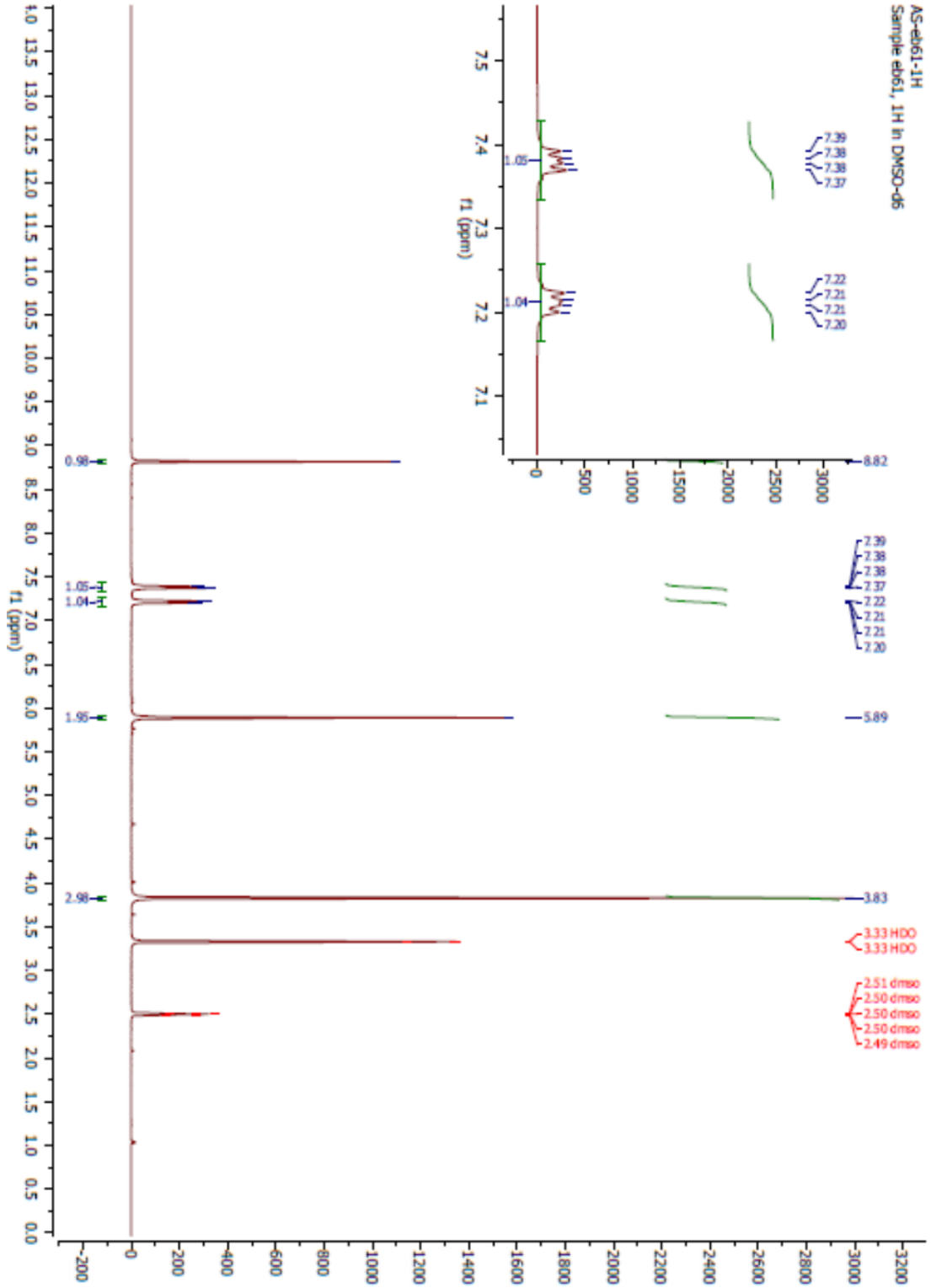


Figure S6. ^{13}C NMR (400 MHz) of 3b: dimethyl 1,1′-[1,2-phenylenebis(methylene)]bis-1*H*-1,2,3-triazole-4-carboxylate

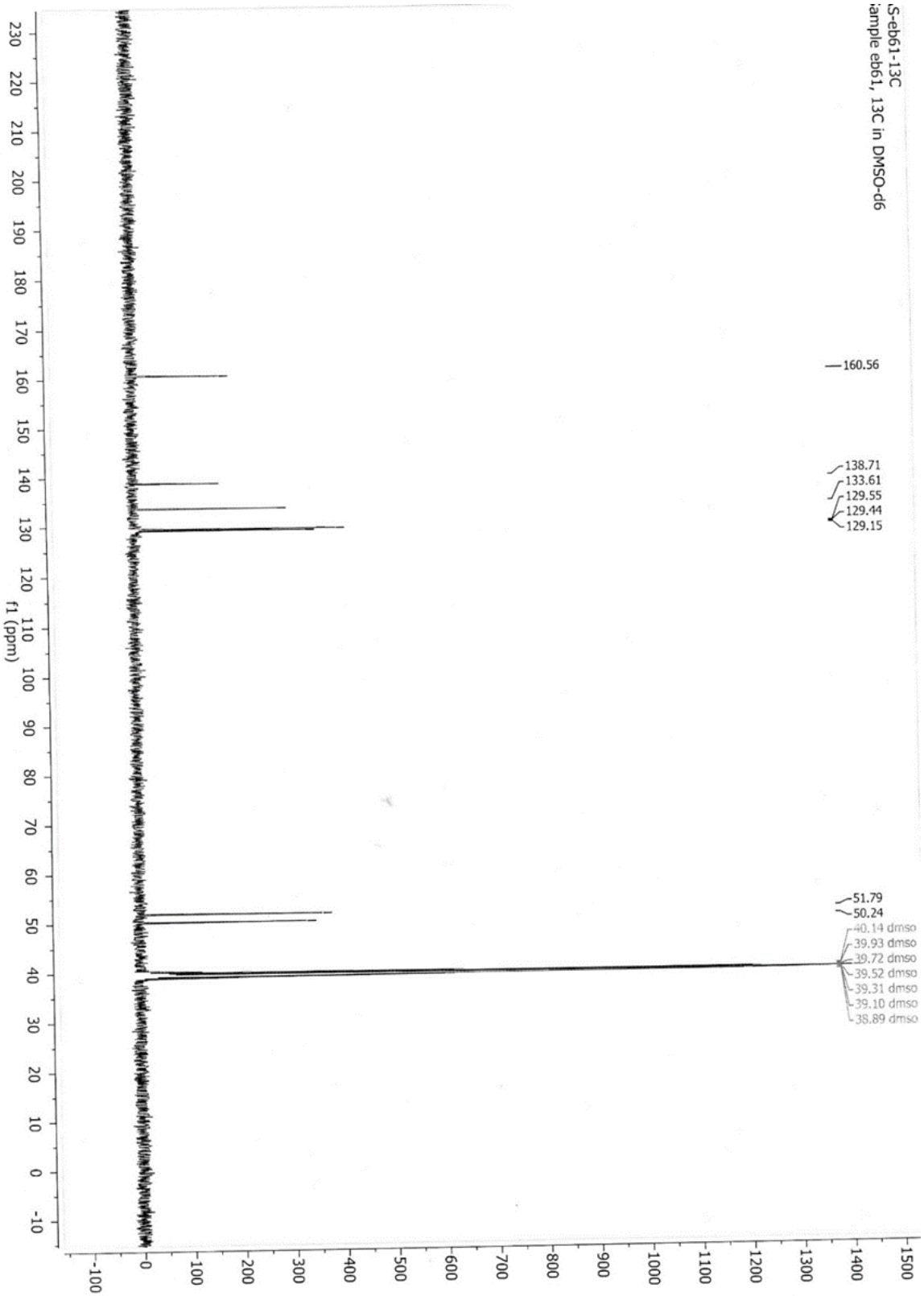
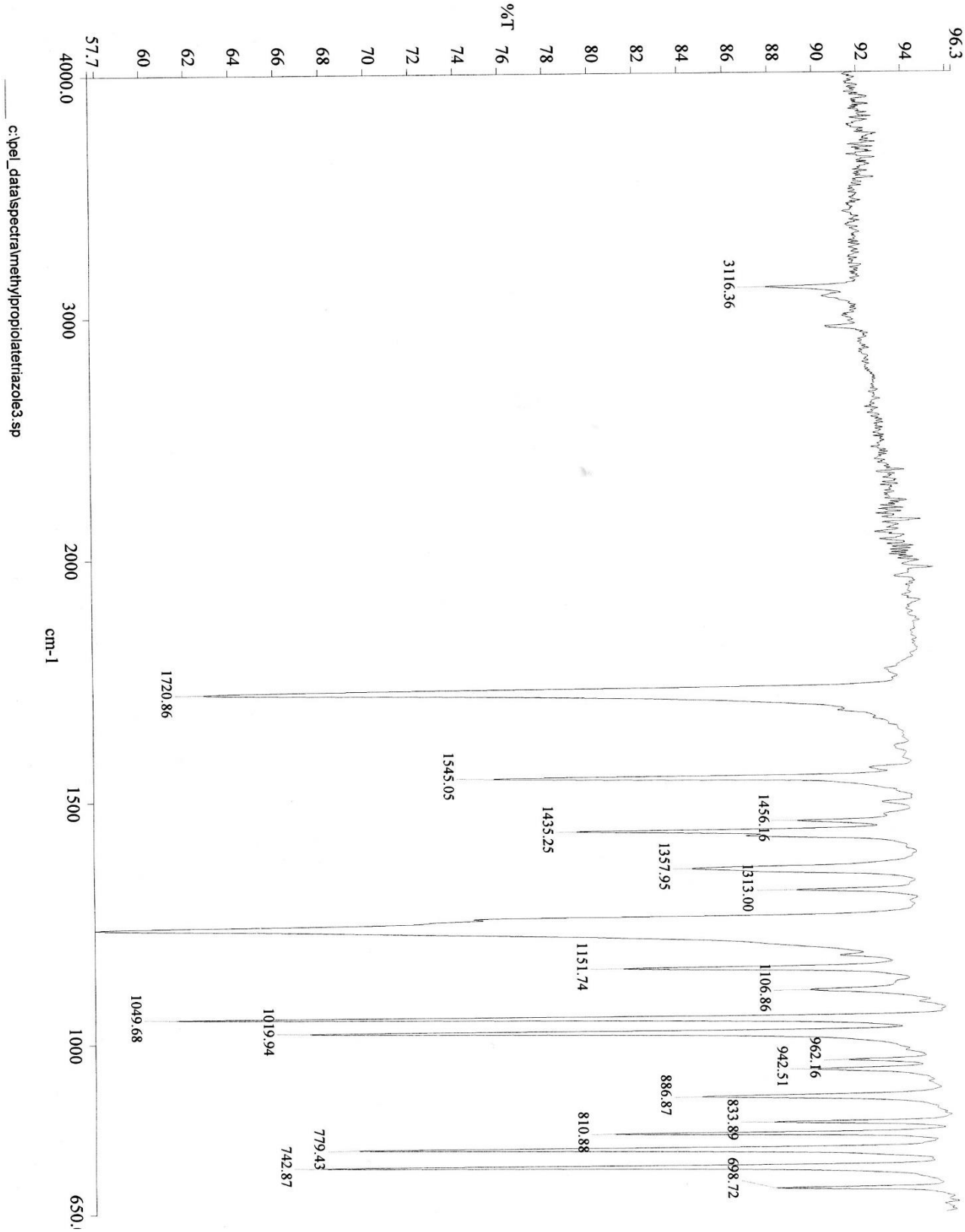
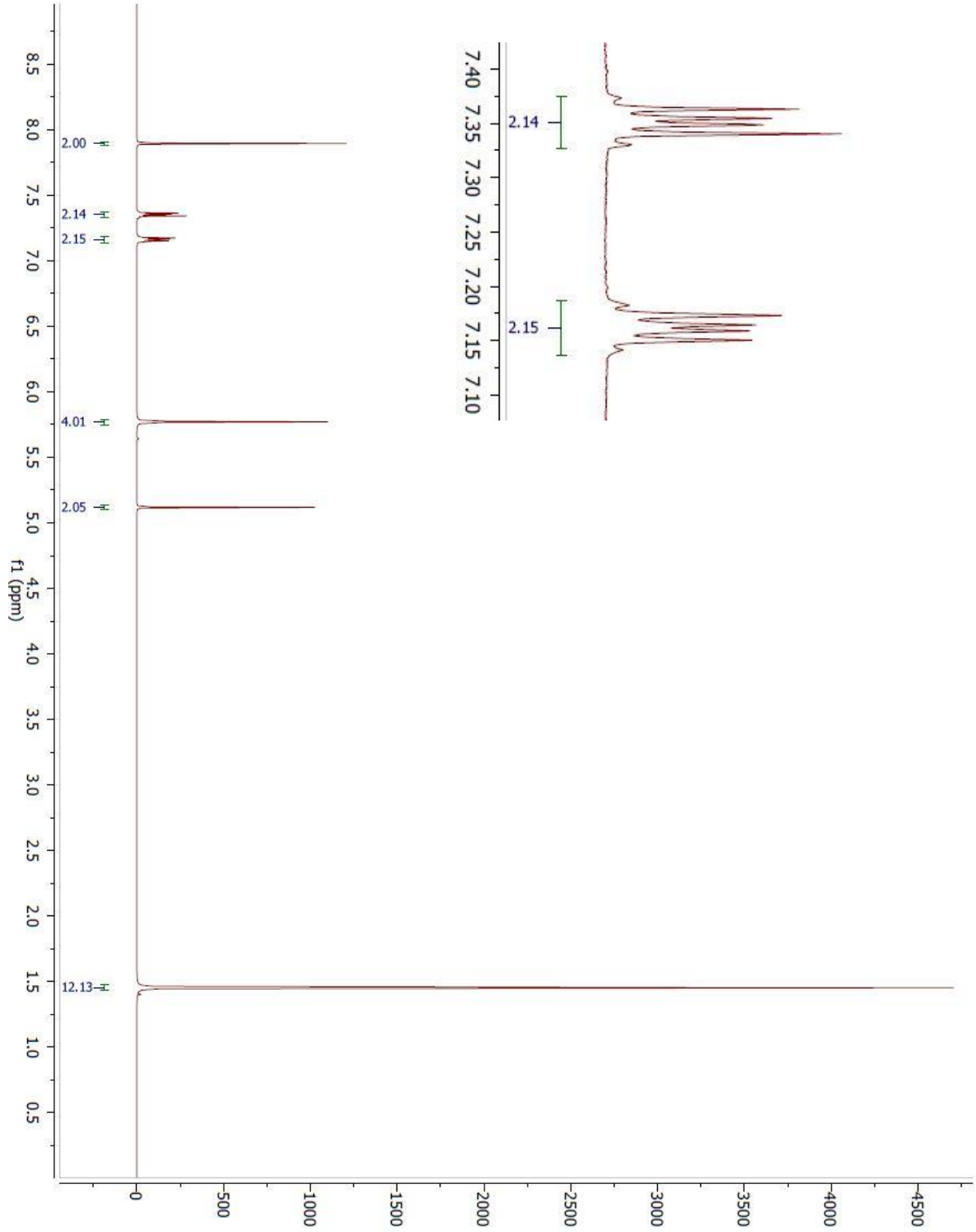


Figure S7. FTIR of 3b: dimethyl 1,1′-[1,2-phenylenebis(methylene)]bis-1*H*-1,2,3-triazole-4-carboxylate



S1.4

Figure S8. **^{1}H NMR (400 MHz) of 3c: 2-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)}-2-prop-anol**



The above spectrum has solvent peaks removed (DMSO, water, ethanol).

Figure S9. ^{13}C NMR (400 MHz) of 3c: 2-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)}-2-prop-anol

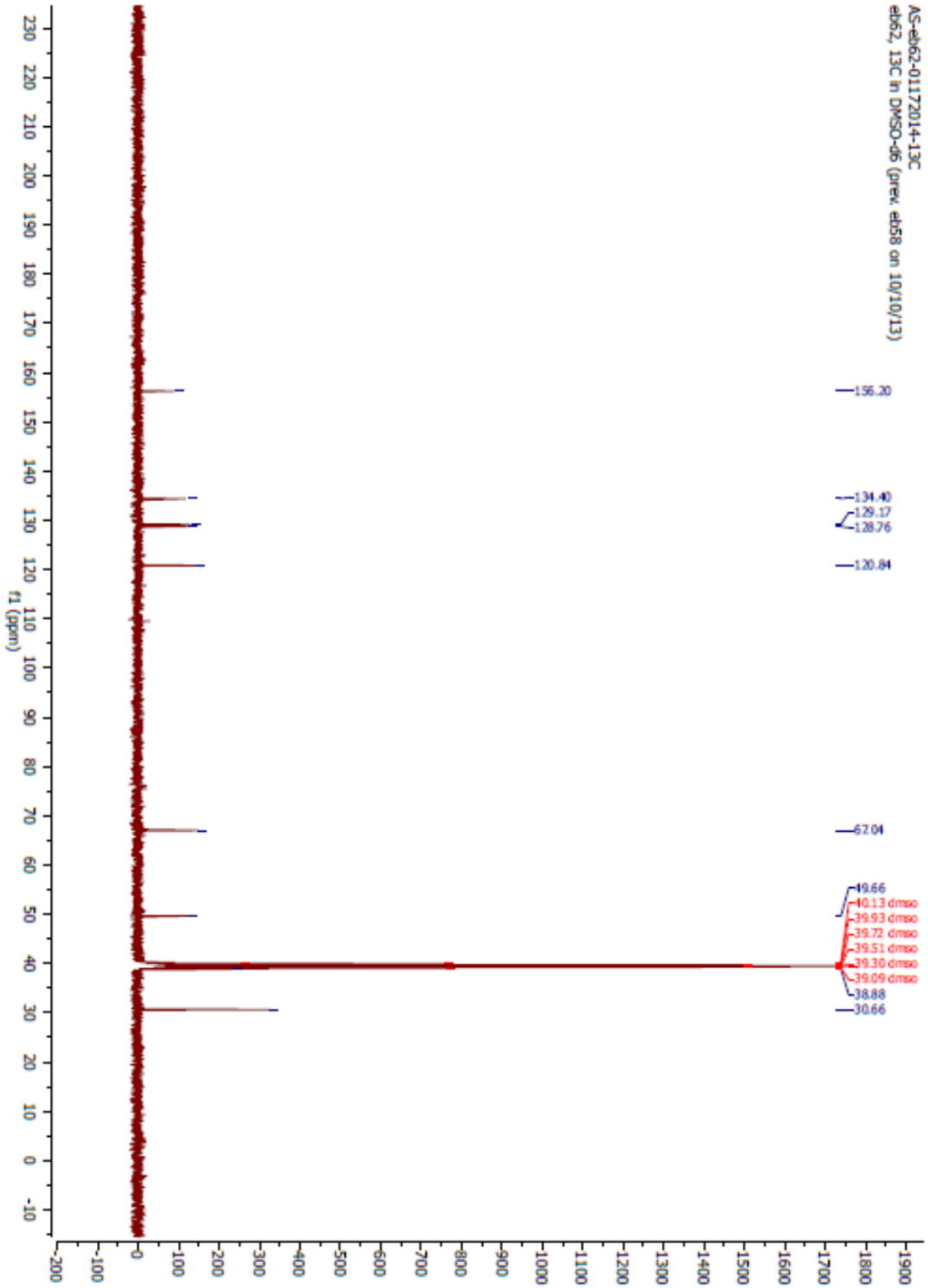
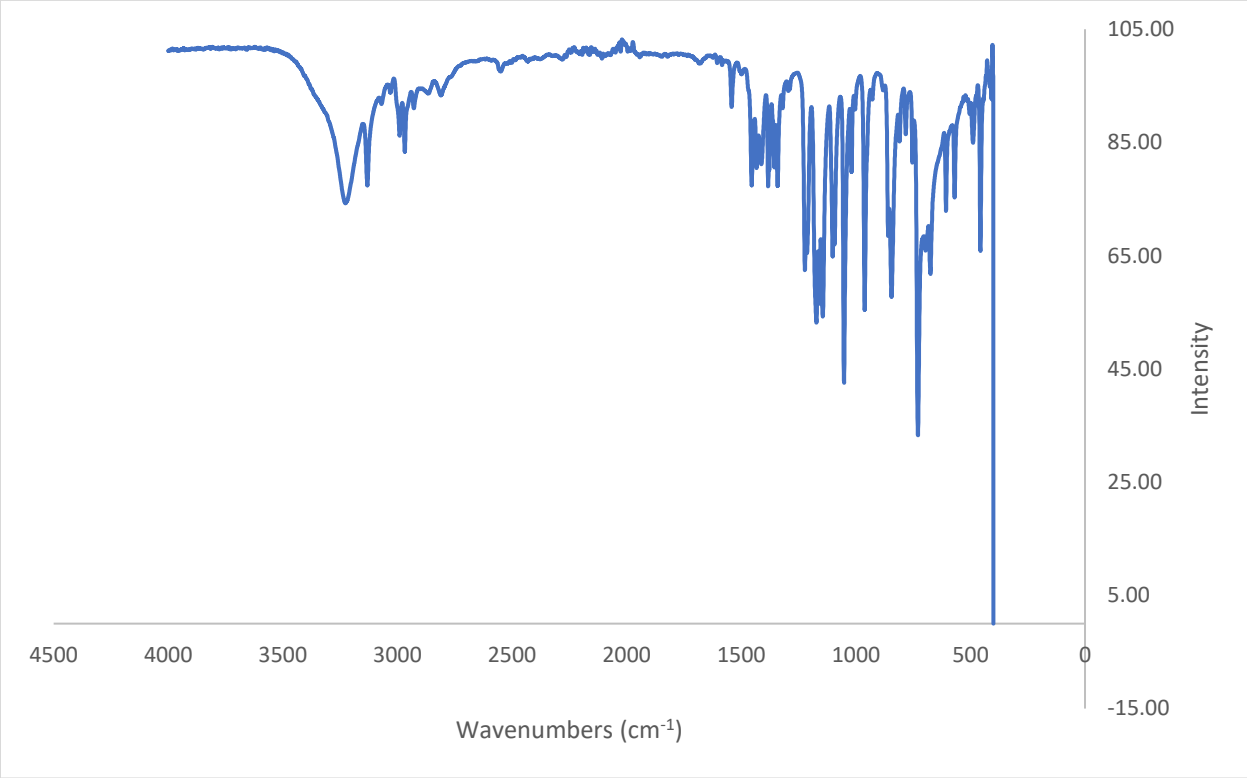
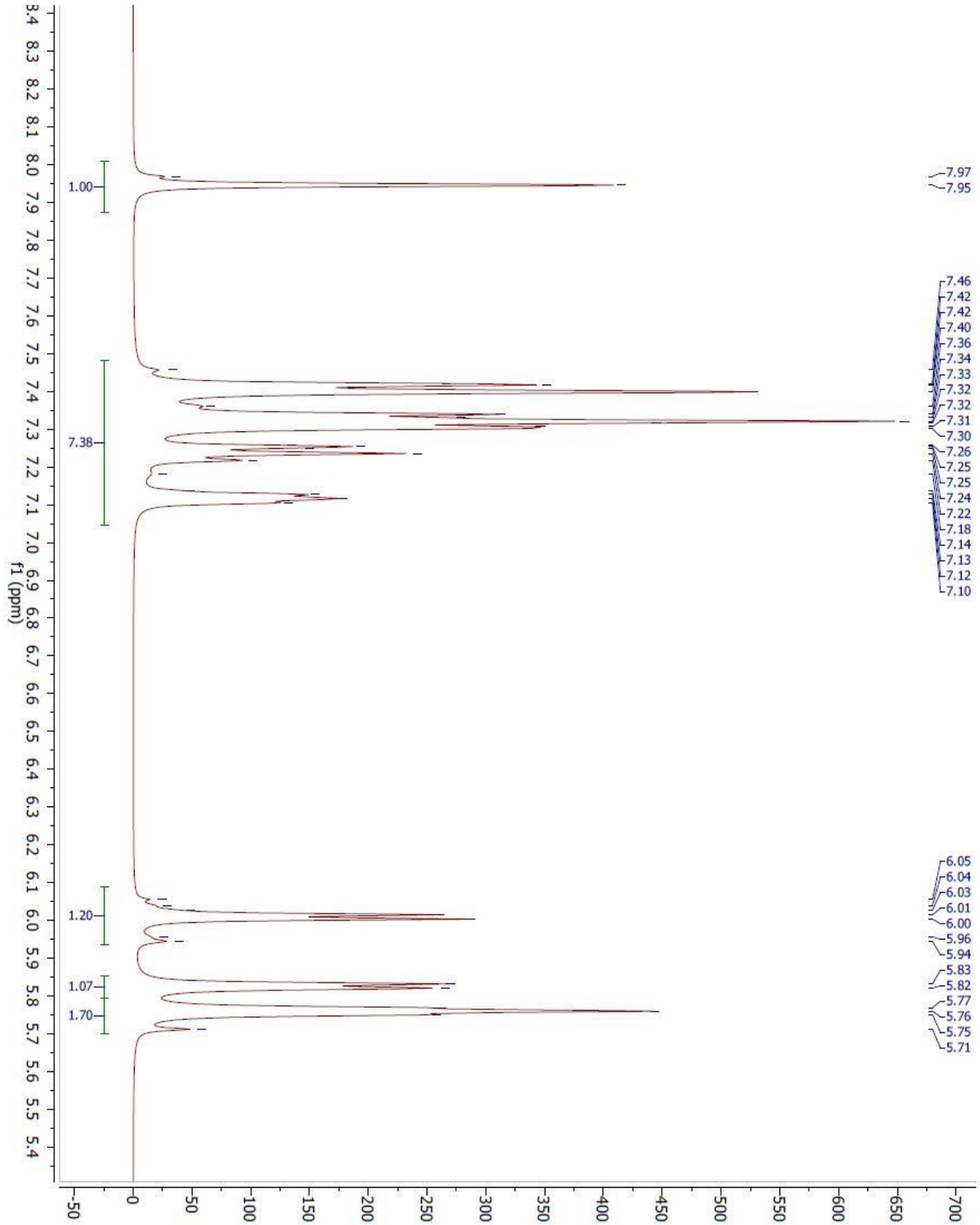


Figure S10. FTIR of 3c: 2-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)}-2-prop-anol



S1.5

Figure S11. **^{1}H NMR (400 MHz) of 3d: phenyl-[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)-methanol**



The above spectrum has solvent peaks removed (DMSO, water, ethanol).

Figure S12. ^{13}C NMR (400 MHz) of 3d: phenyl-[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)-methanol

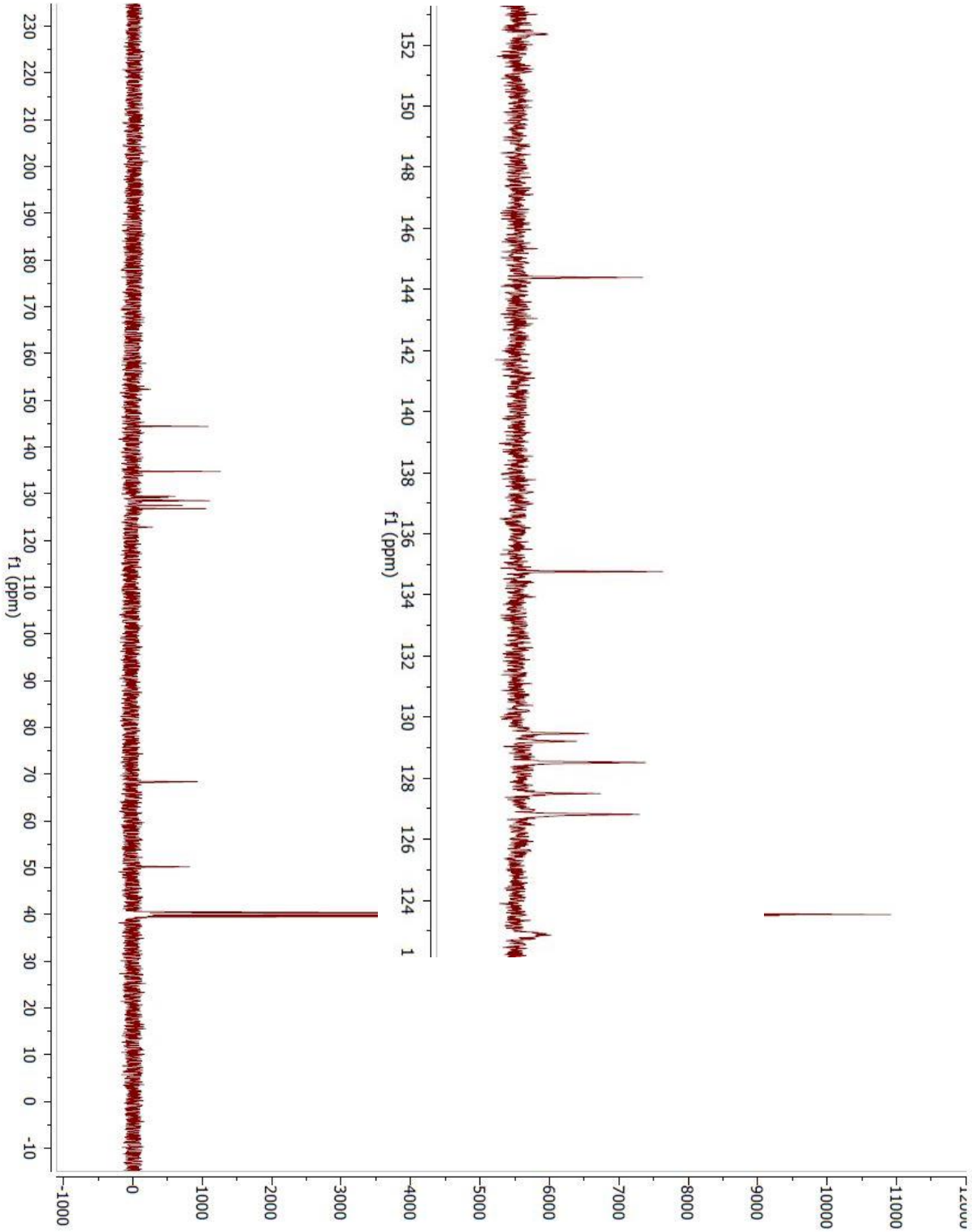
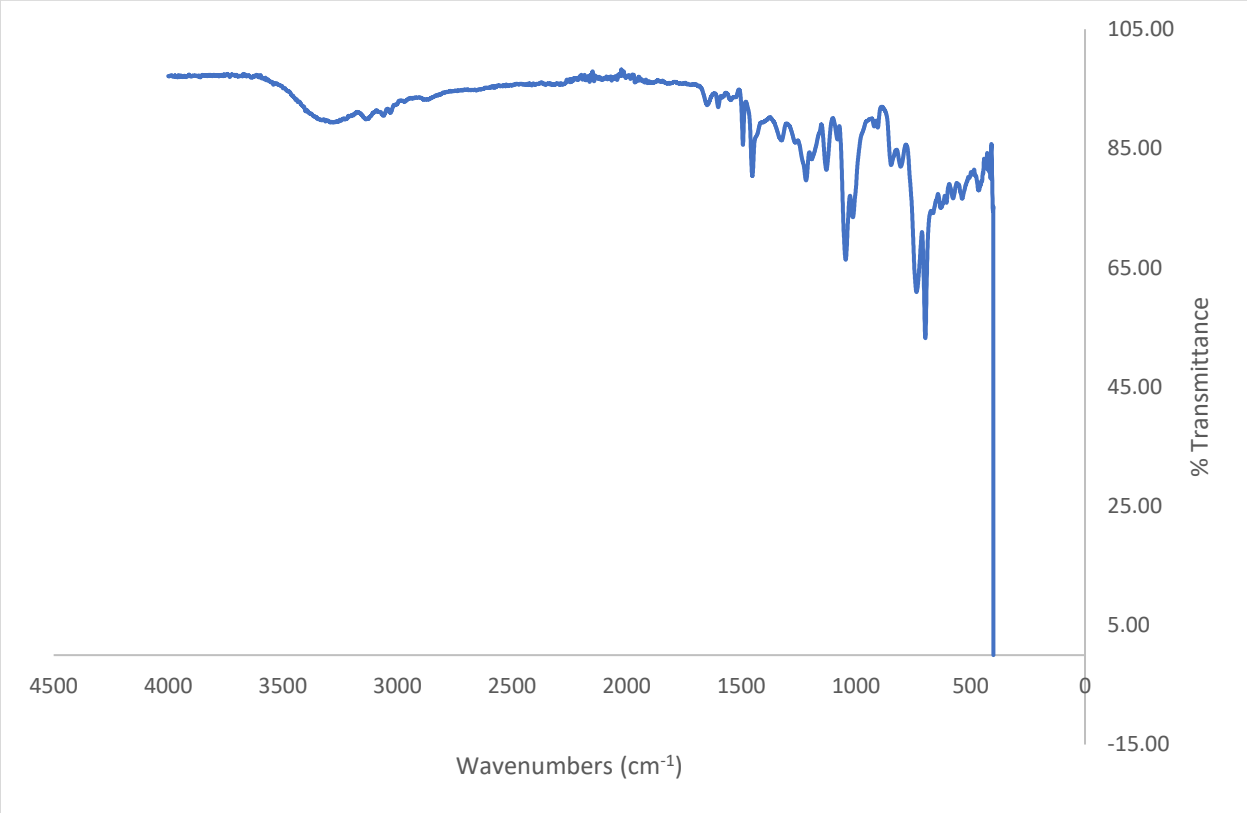
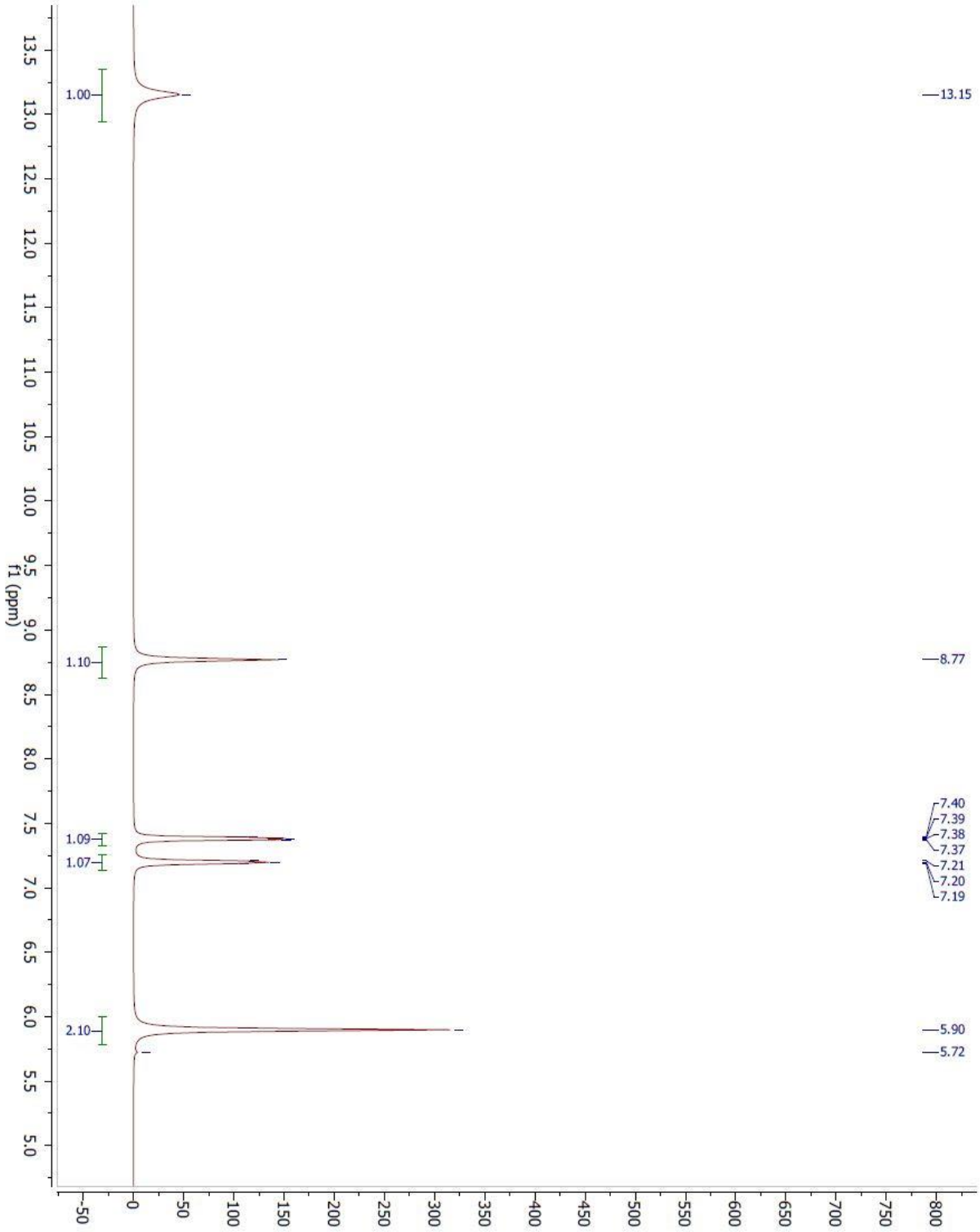


Figure S13. **FTIR of 3d: phenyl-[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)-methanol**



S1.6

Figure S14. ^{1}H NMR (400 MHz) of 3e: 1,1′-[(1,2-(phenylene)bis(methylene)]bis-1*H*-1,2,3-triazole-4,4′-carboxylic acid



The above spectrum has solvent peaks removed (DMSO, water, ethanol).

Figure S15. ^{13}C NMR (400 MHz) of 3e: 1,1′-[(1,2-(phenylene)bis(methylene)]bis-1*H*-1,2,3-triazole-4,4′-carboxylic acid

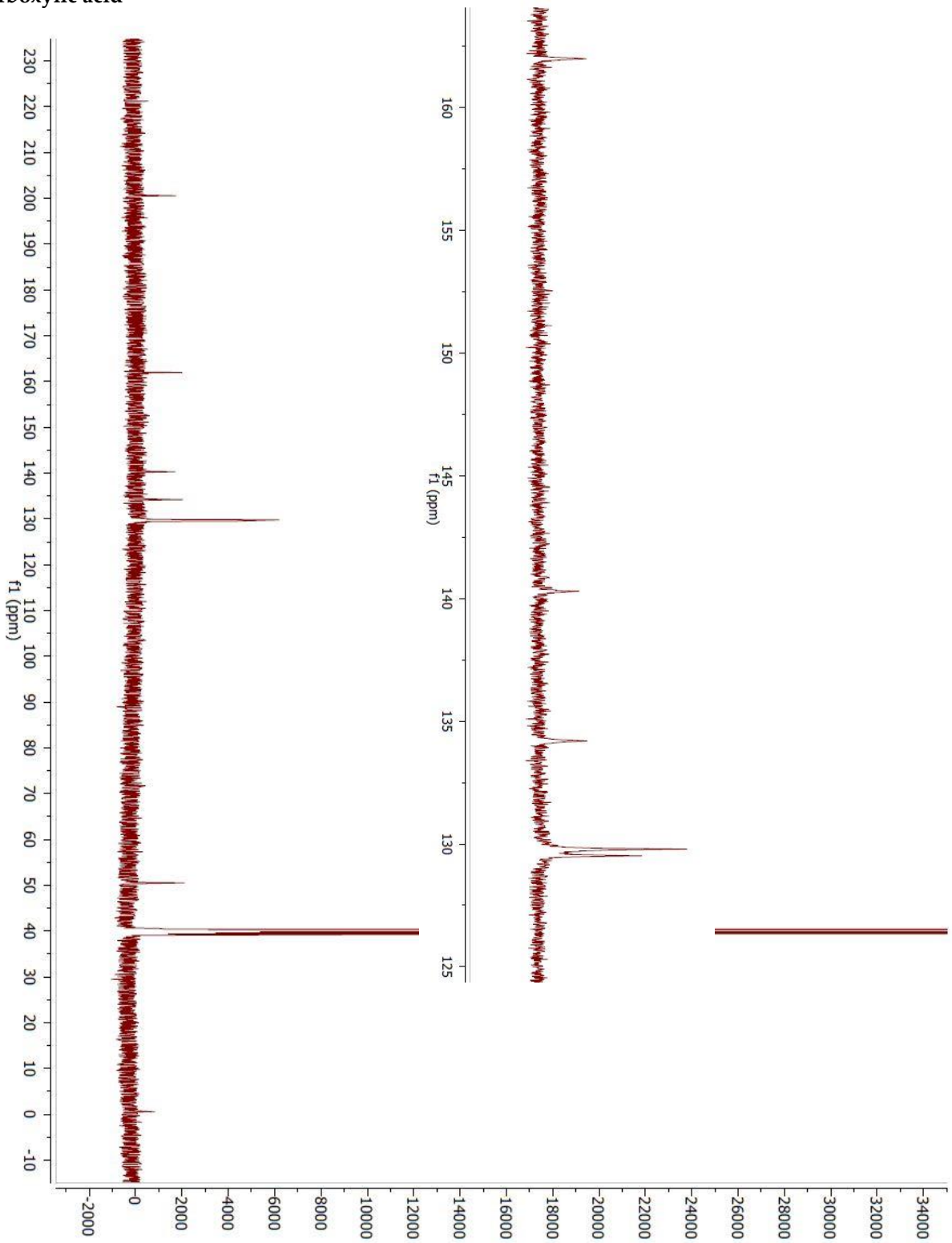
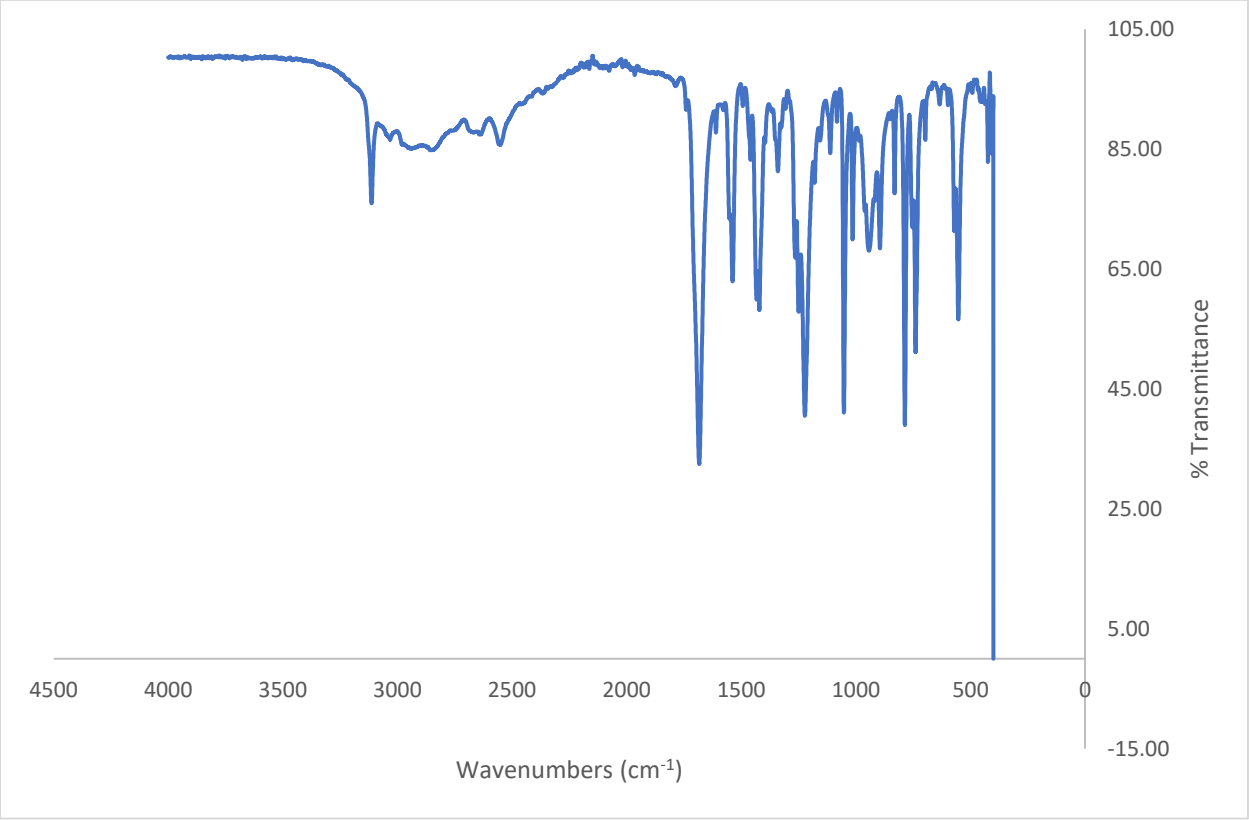


Figure S16. FTIR of 3e: 1,1′-[(1,2-(phenylene)bis(methylene)]bis-1*H*-1,2,3-triazole-4,4′-carboxylic acid



S1.7

Figure S17. ^{1}H NMR (400 MHz) of 3f: 2-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl}ethanol

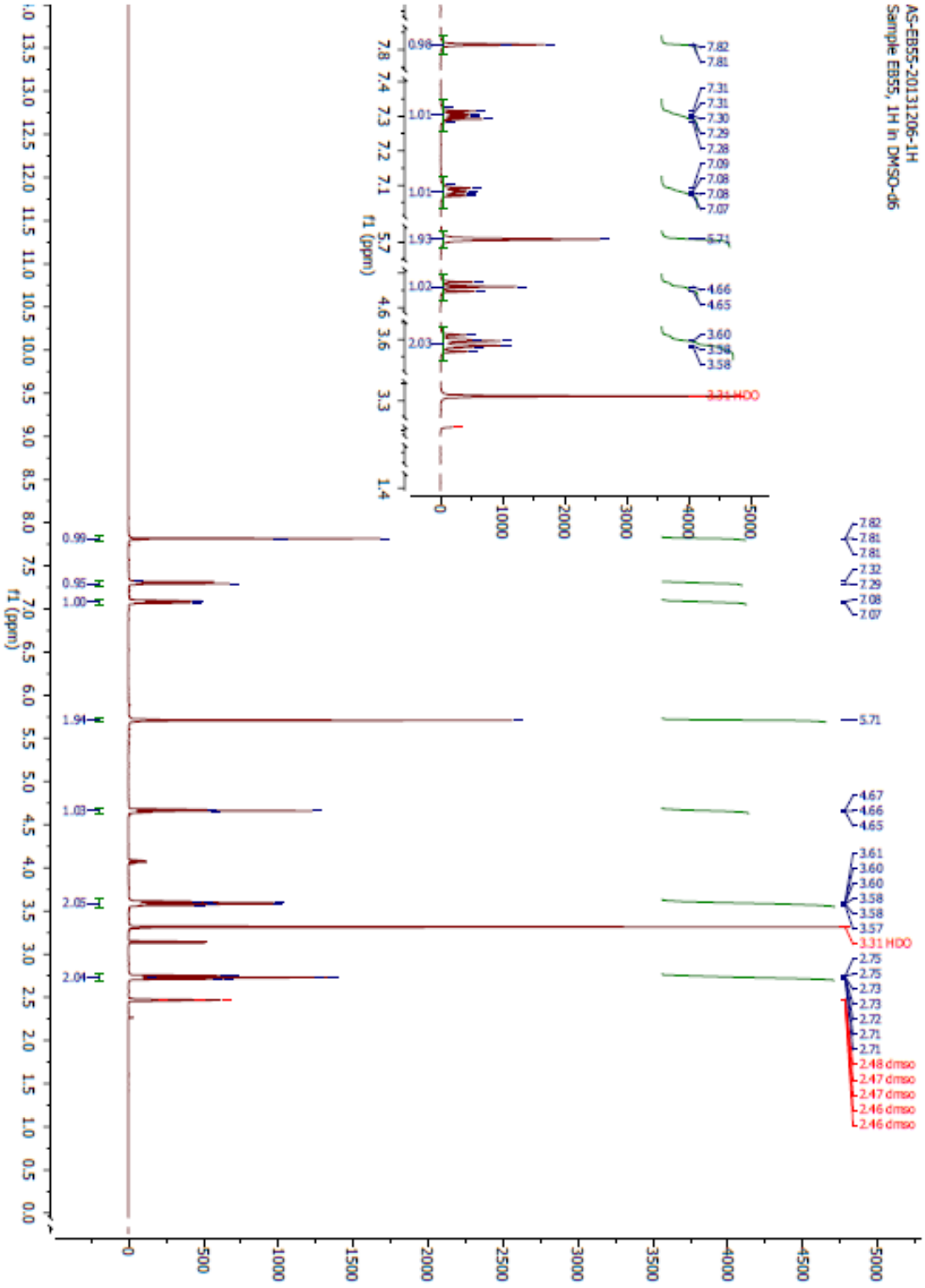


Figure S18. ^{13}C NMR (400 MHz) of 3f: 2-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl}ethanol

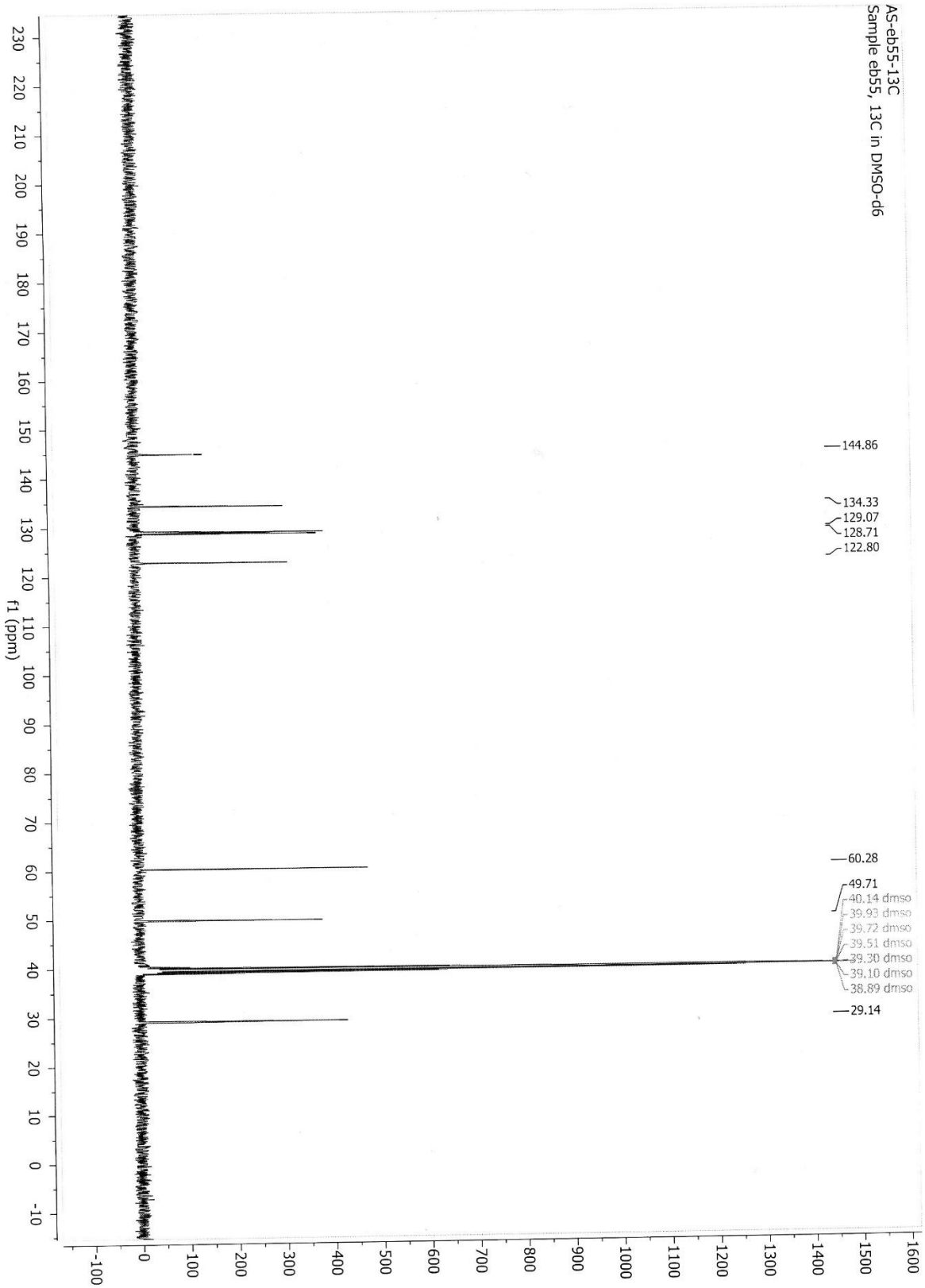
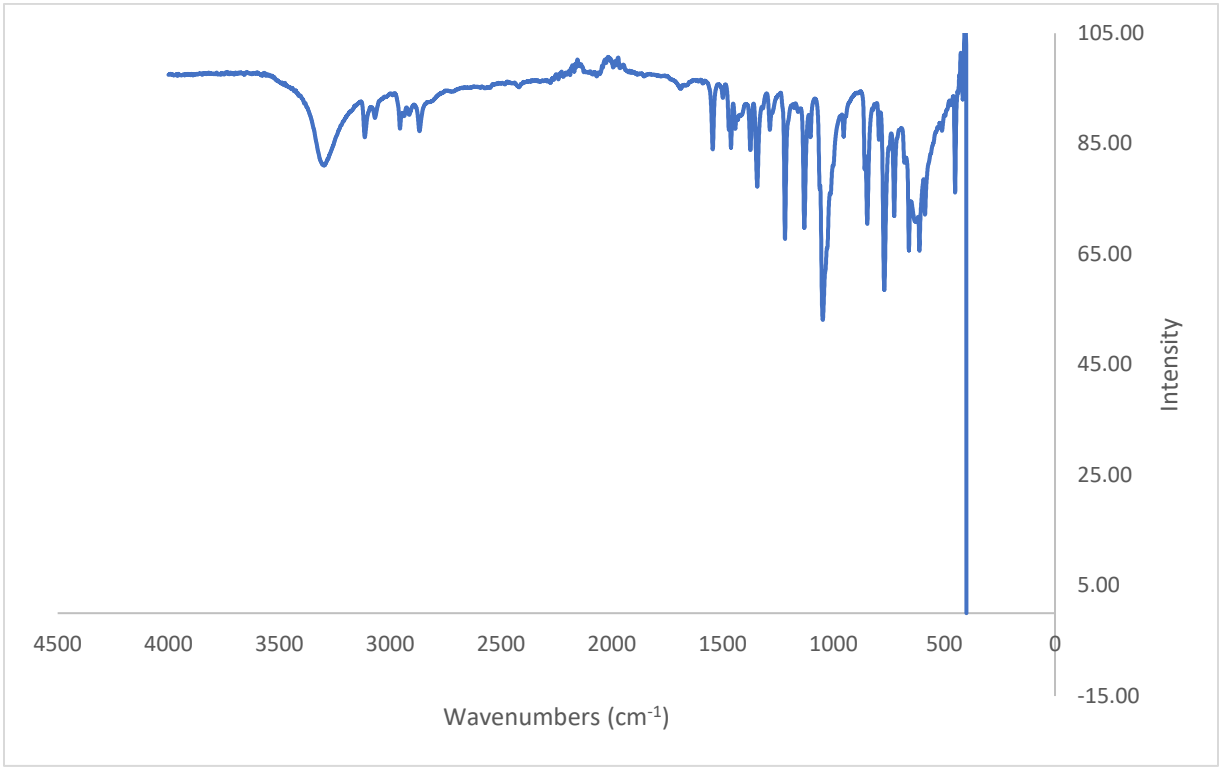


Figure S19. FTIR of 3f: 2-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl}ethanol



S1.8

Figure S20. ^{1}H NMR (400 MHz) of 3g: 1-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)}ethanol

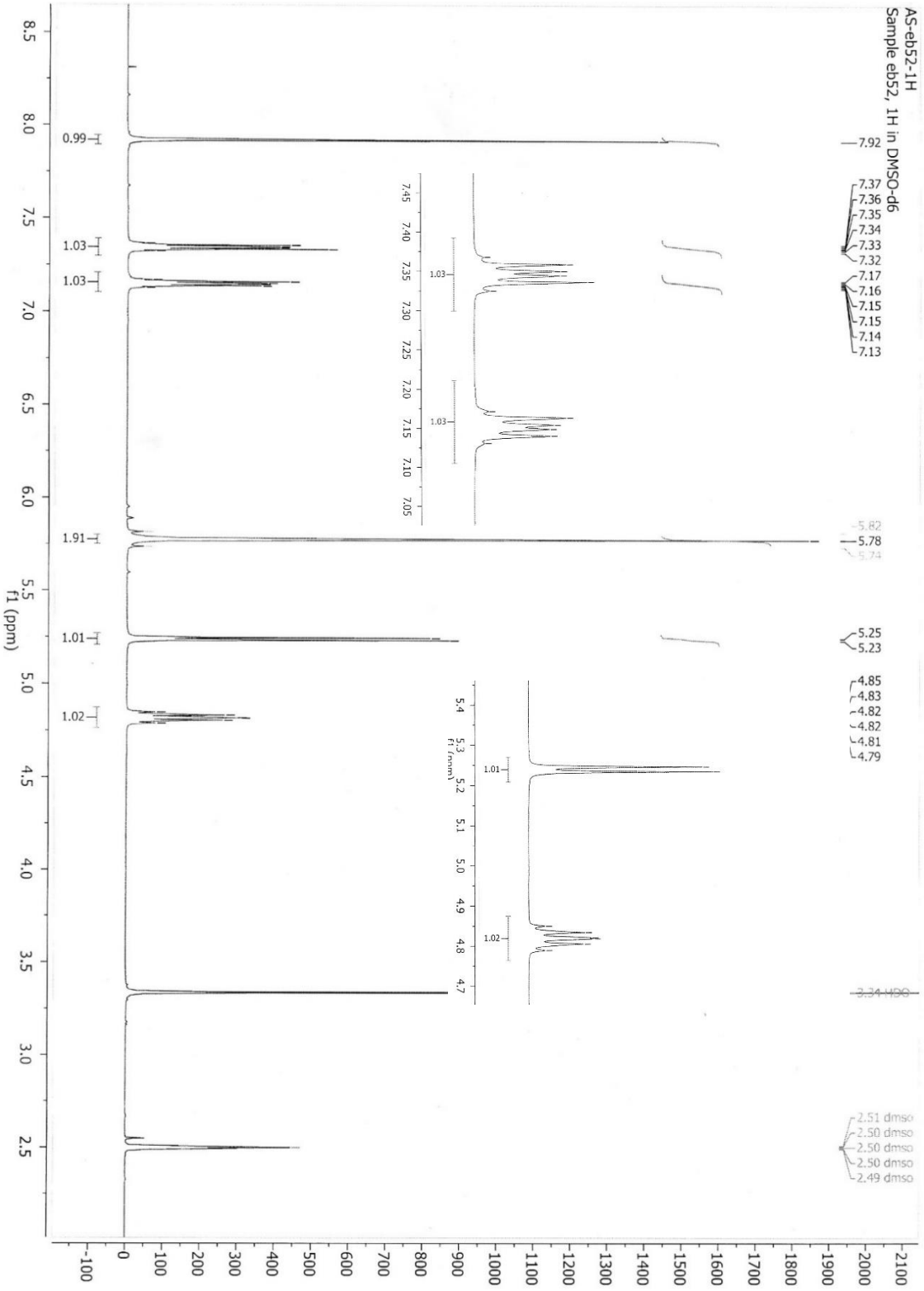


Figure S21. ^{13}C NMR (400 MHz) of 3g: 1-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)}ethanol

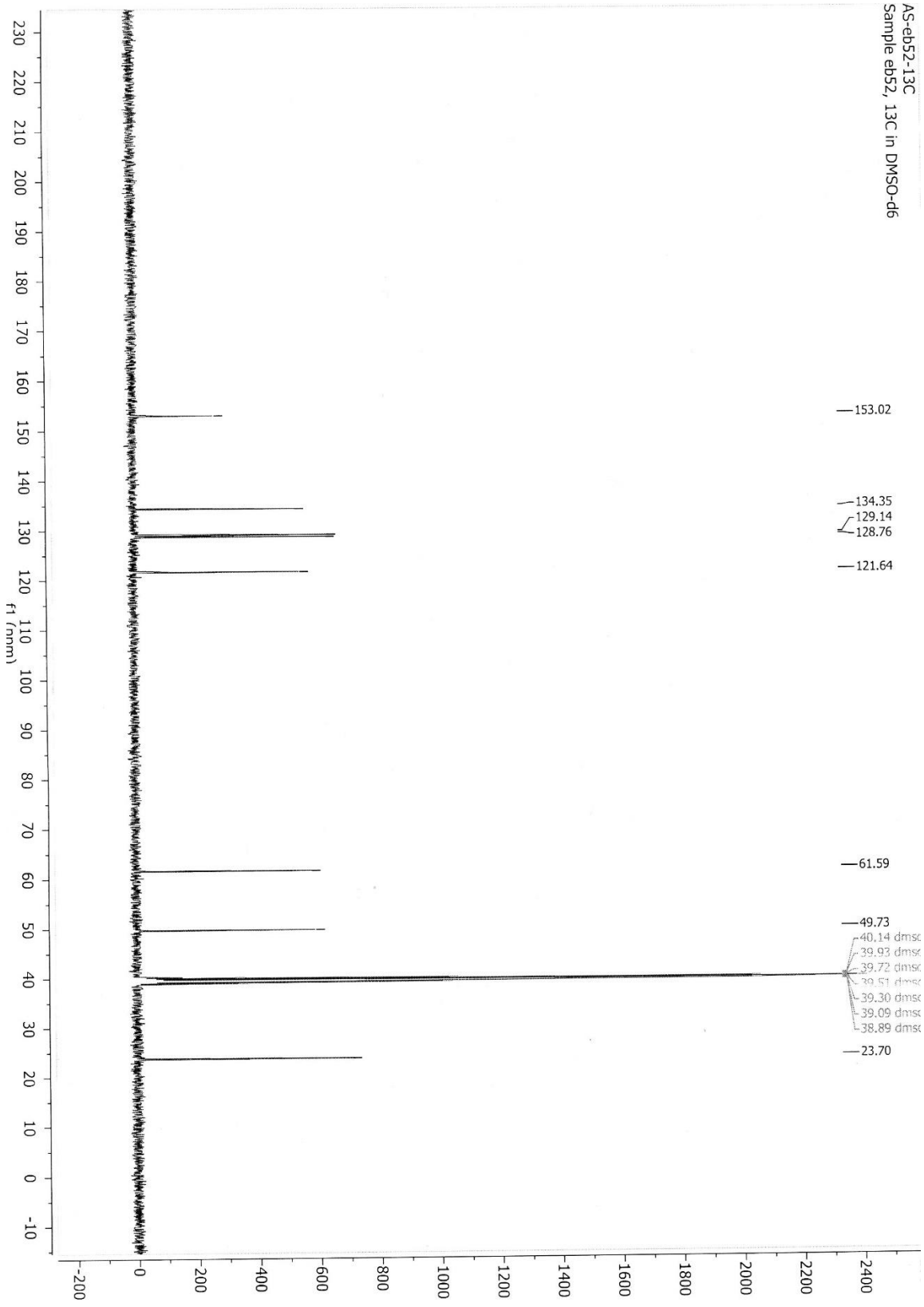
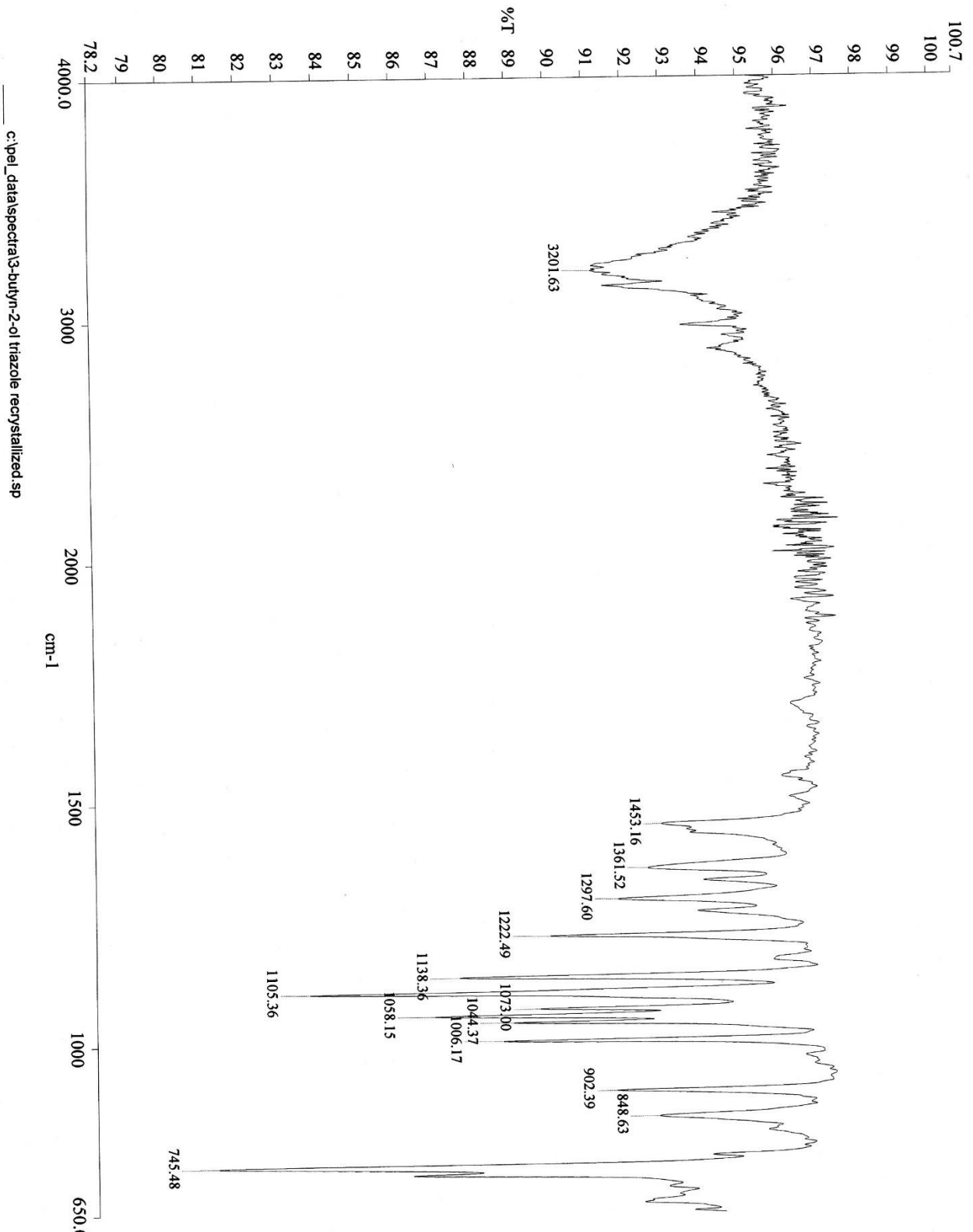


Figure S22. **FTIR of 3g: 1-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazolyl)}ethanol**



S1.9

Figure S23. ^{1}H NMR (400 MHz) of 3h: 1-{[1,1′-[(1,2-phenylene)bis(methylene)]bis [1*H*-1,2,3-triazolyl-4]}cyclohexanol

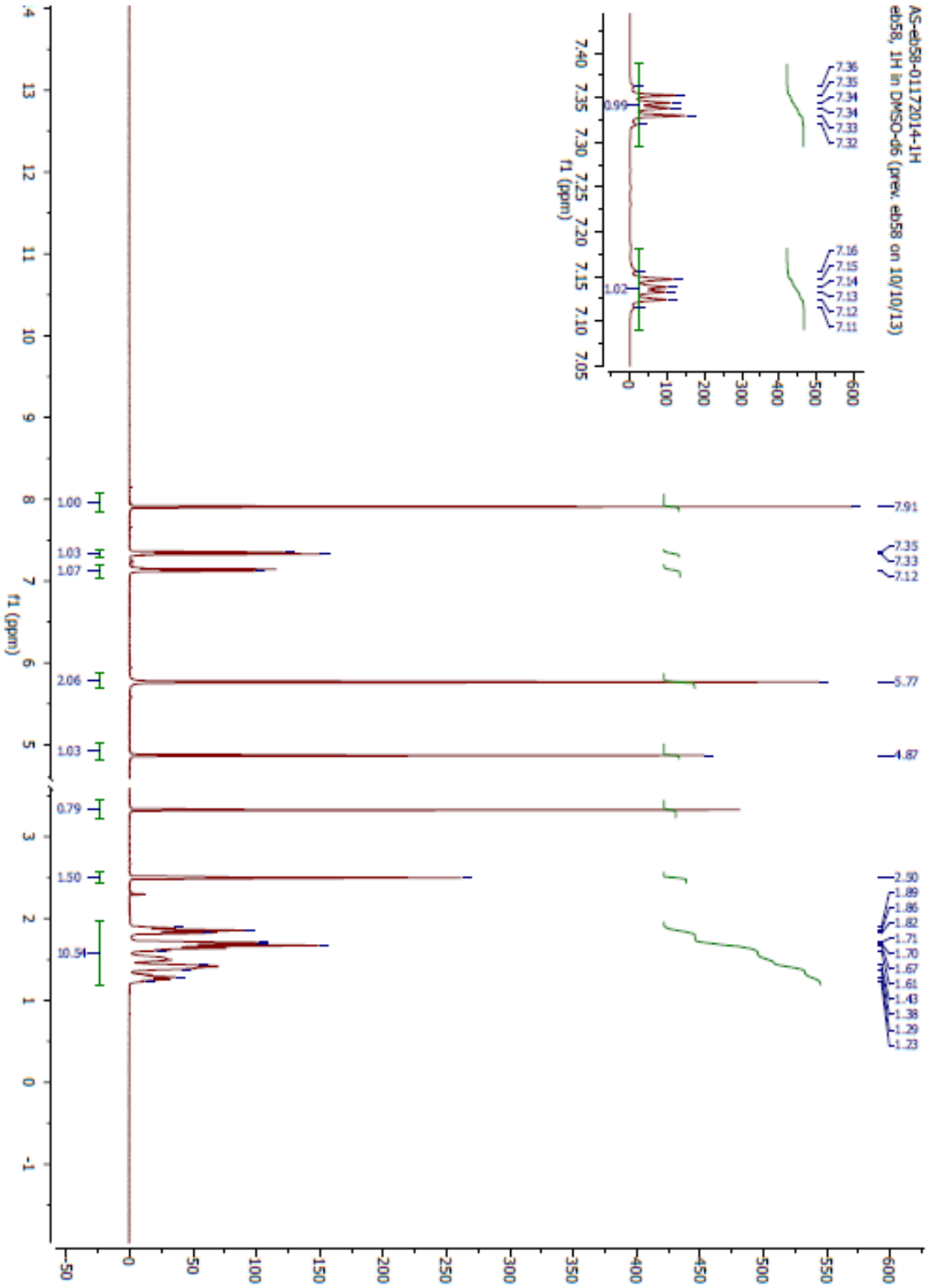


Figure S24. ^{13}C NMR (400 MHz) of 3h: 1-{[1,1′-[(1,2-phenylene)bis(methylene)]bis [1*H*-1,2,3-triazolyl-4]}cyclohexanol

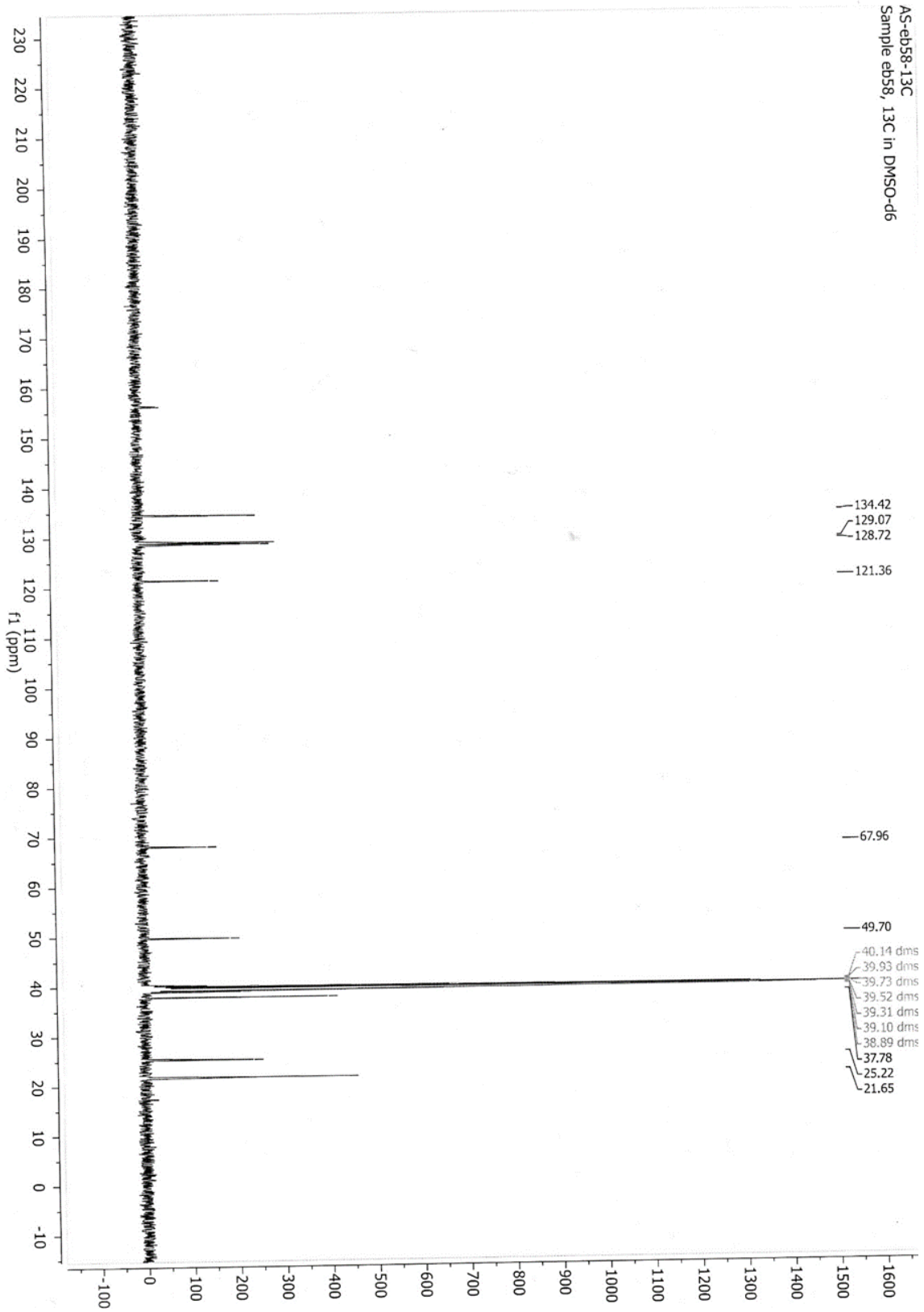


Figure S25. **FTIR of 3h: 1-{[1,1′-[(1,2-phenylene)bis(methylene)]bis [1*H*-1,2,3-triazolyl-4]}cyclohexanol**



S1.10

Figure S26. ^{1}H NMR (300 MHz) of 3i: 1,1′-[1,2-phenylenebis(methylene)]bis[4-(2,3,5,6-tetrafluoropyridyloxy-methyl)-1*H*-1,2,3-triazole

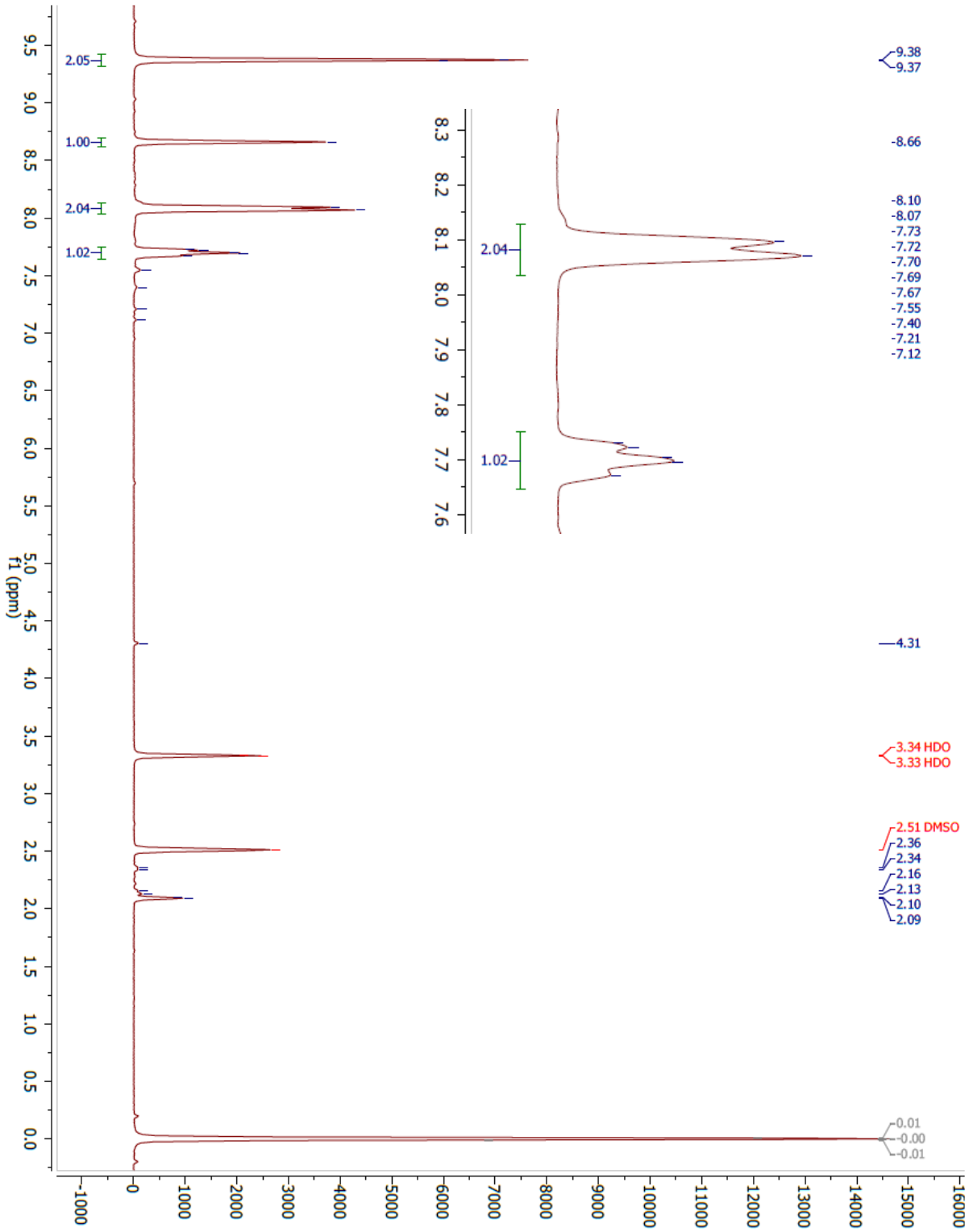


Figure S27. ^{13}C NMR (300 MHz) of 3i: 1,1′-[1,2-phenylenebis(methylene)]bis[4-(2,3,5,6-tetrafluoropyridyloxy-methyl)-1*H*-1,2,3-triazole

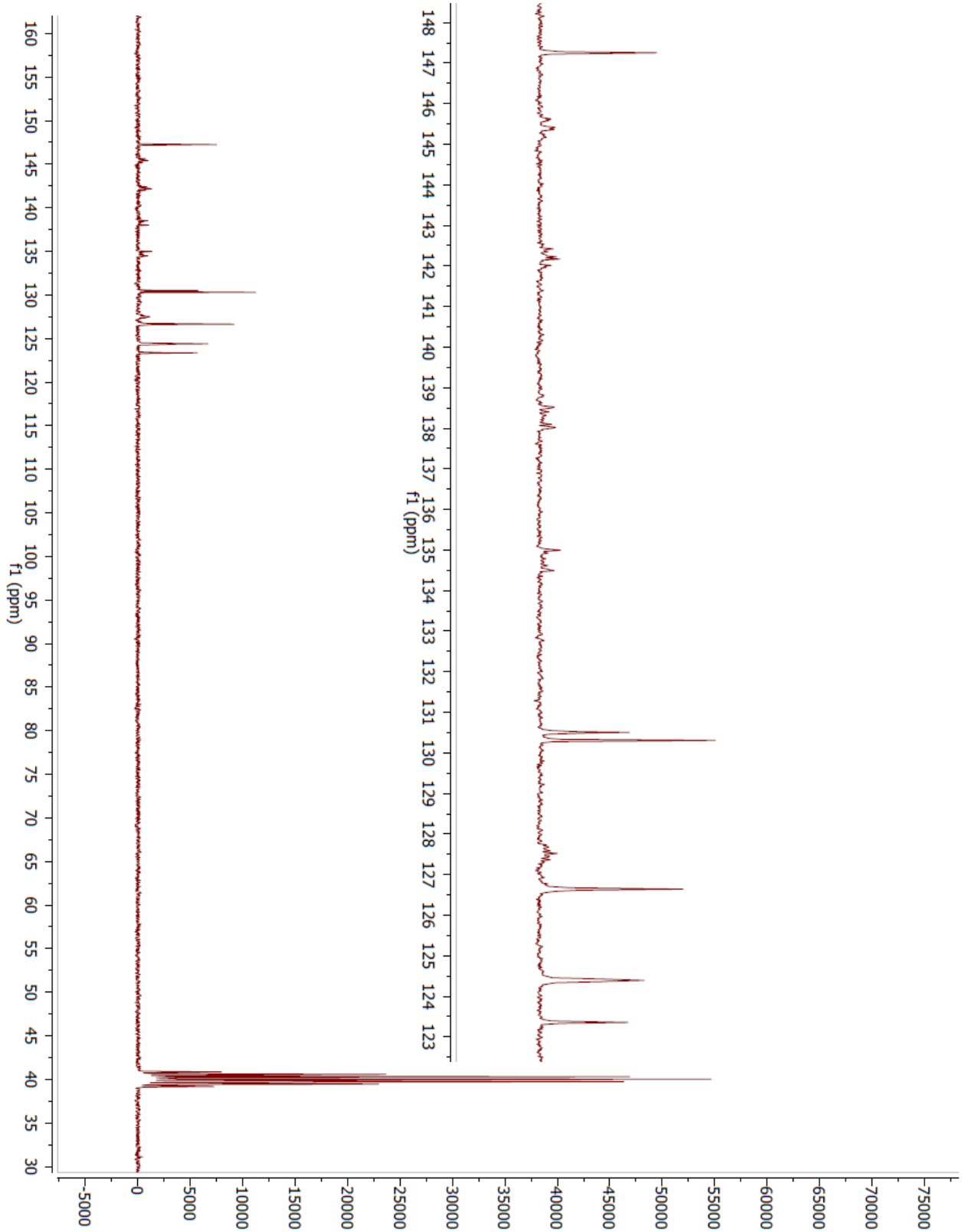


Figure S28. ^{19}F NMR (300 MHz) of 3i: 1,1′-[1,2-phenylenebis(methylene)]bis[4-(2,3,5,6-tetrafluoropyridyloxy-methyl)-1*H*-1,2,3-triazole

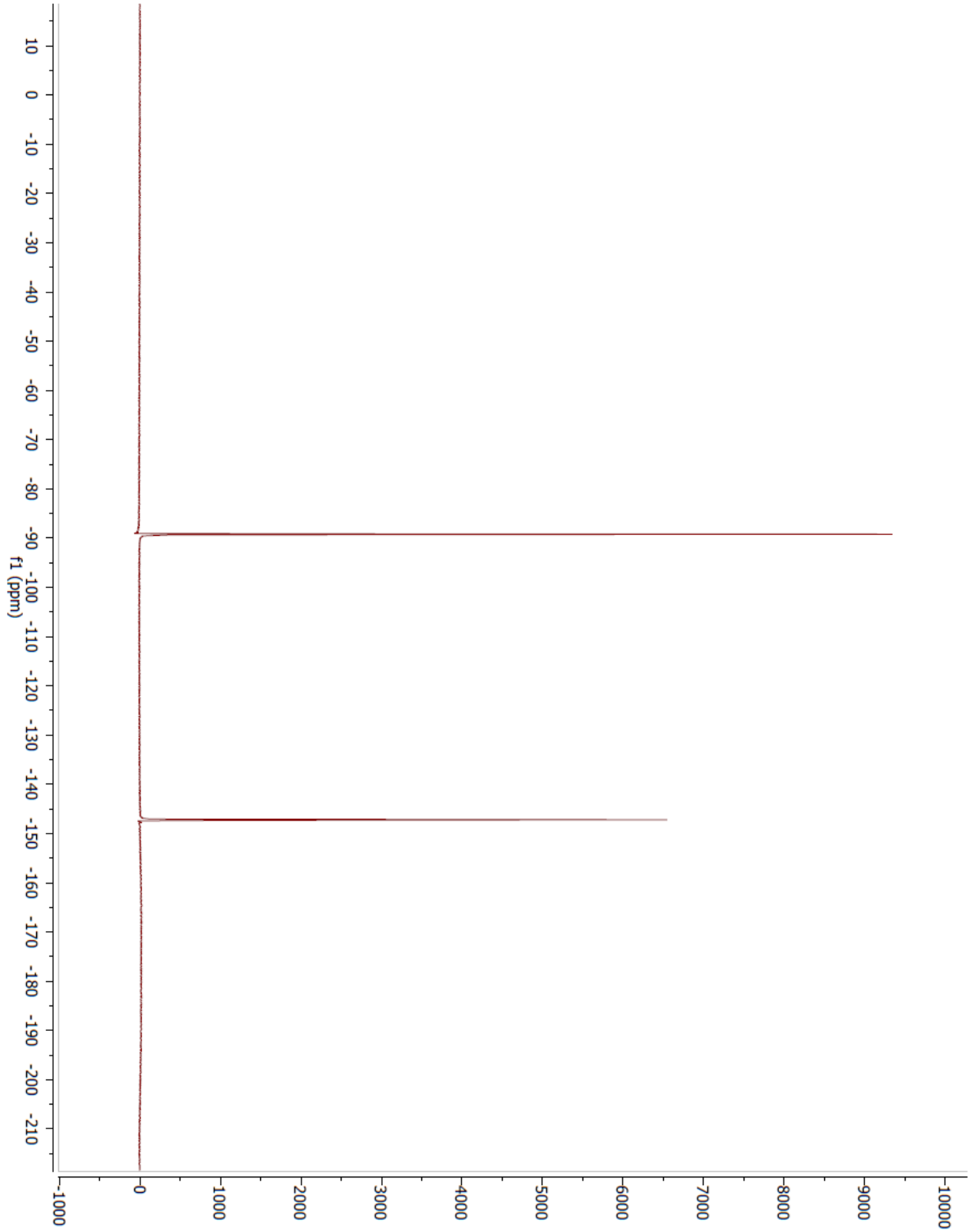
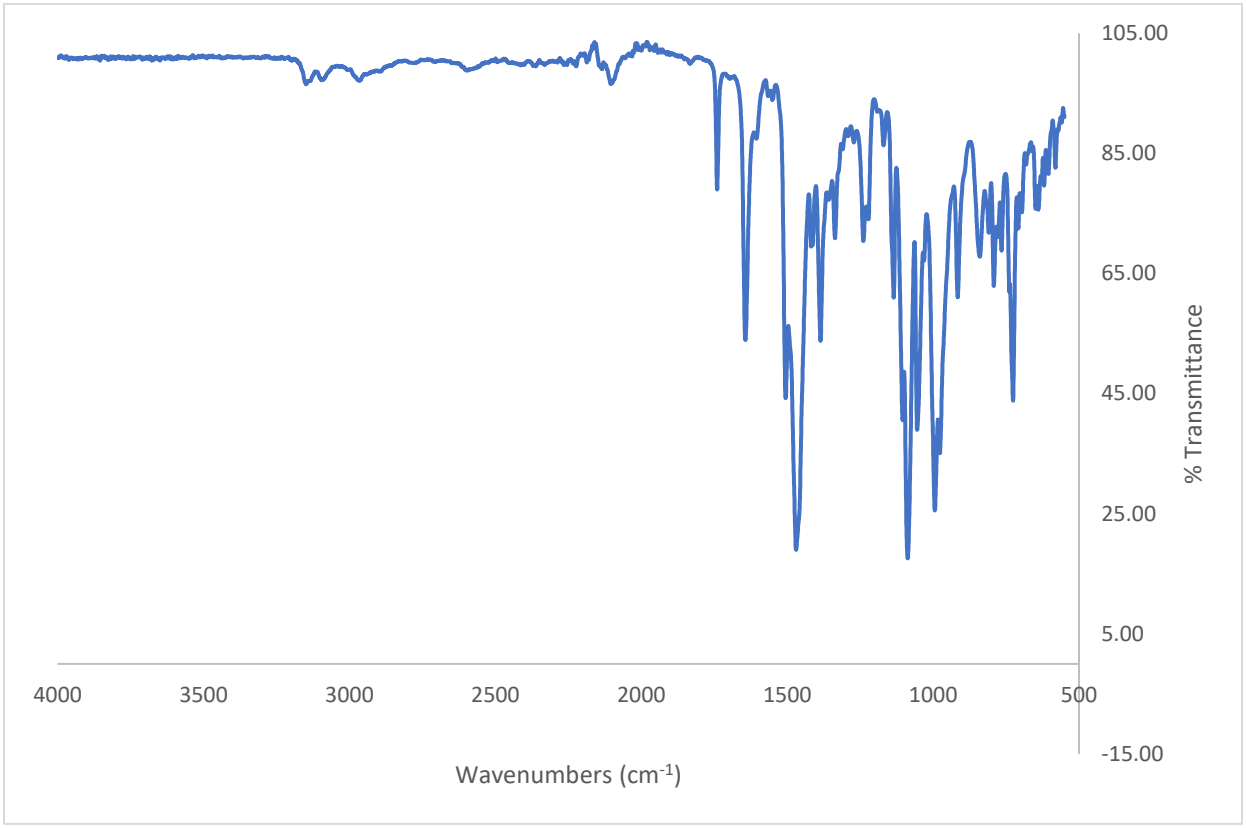
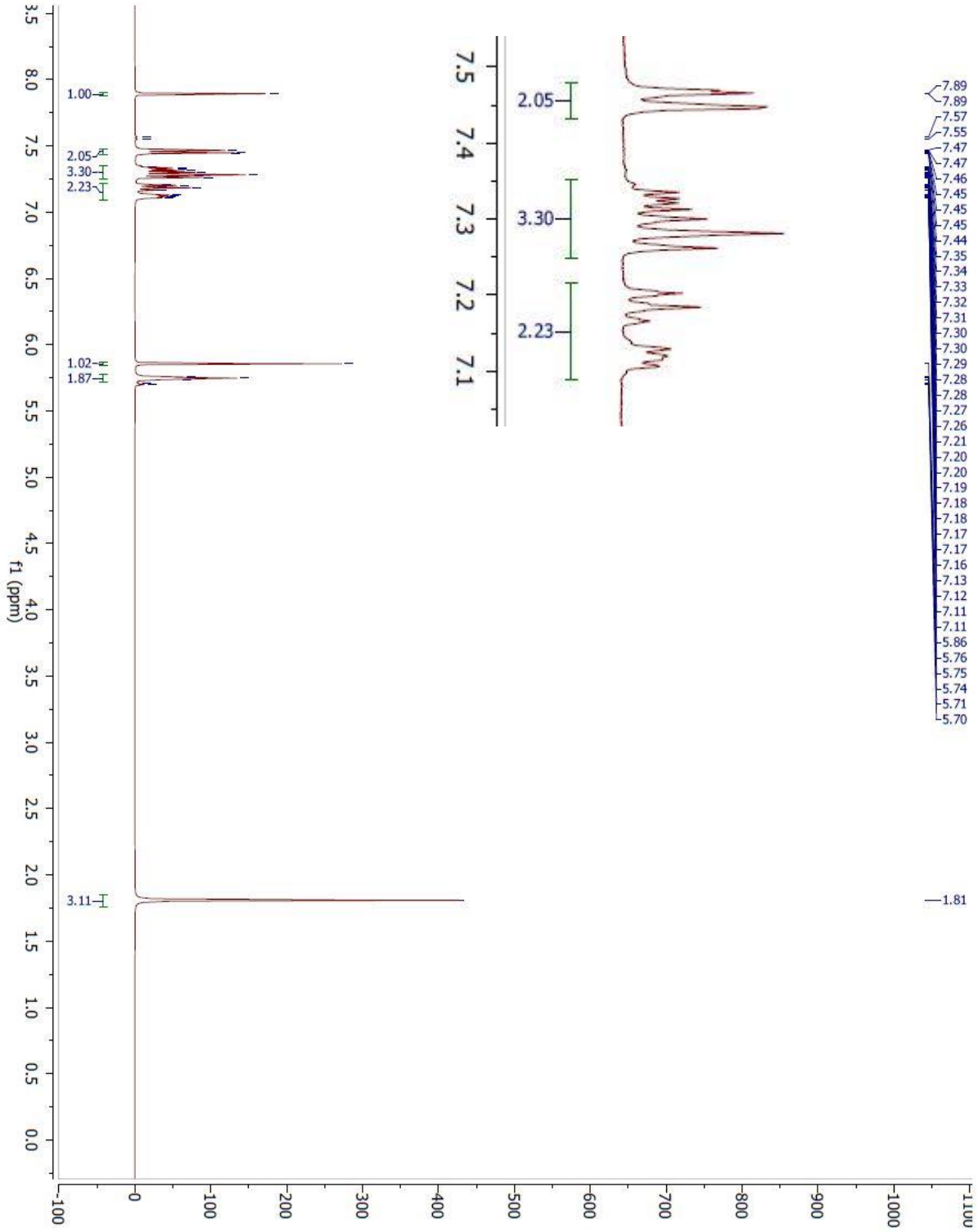


Figure S29. FTIR of 3i: 1,1′-[1,2-phenylenebis(methylene)]bis[4-(2,3,5,6-tetrafluoropyridyloxy-methyl)-1*H*-1,2,3-triazole



S1.11

Figure S30. ^{1}H NMR (400 MHz) of 3j: 1-phenyl-1-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazol-yl)}ethanol



The above spectrum has solvent peaks removed (DMSO, water, and ethanol).

Figure S31. ^{13}C NMR (400 MHz) of 3j: 1-phenyl-1-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazol-yl)}ethanol

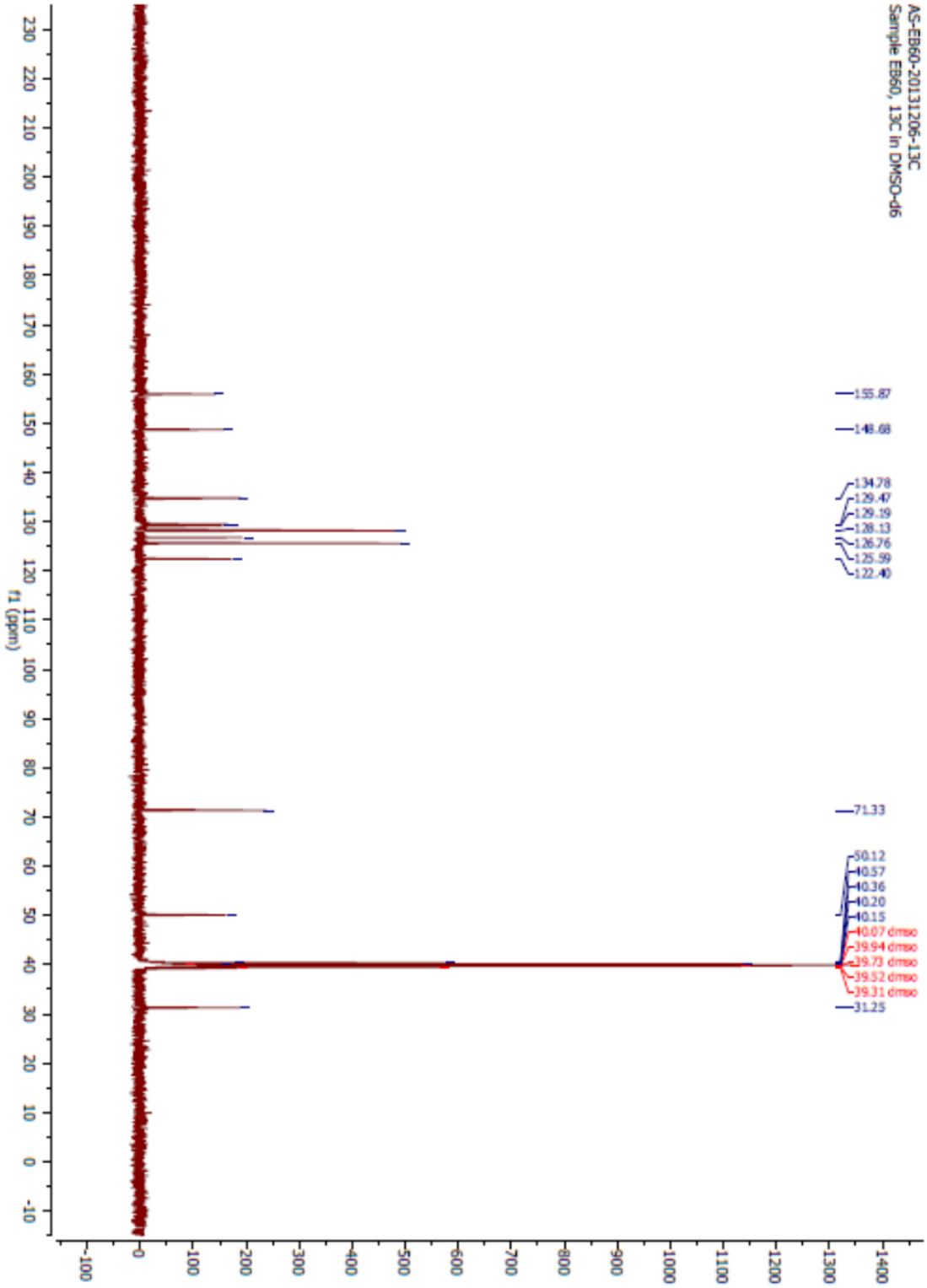
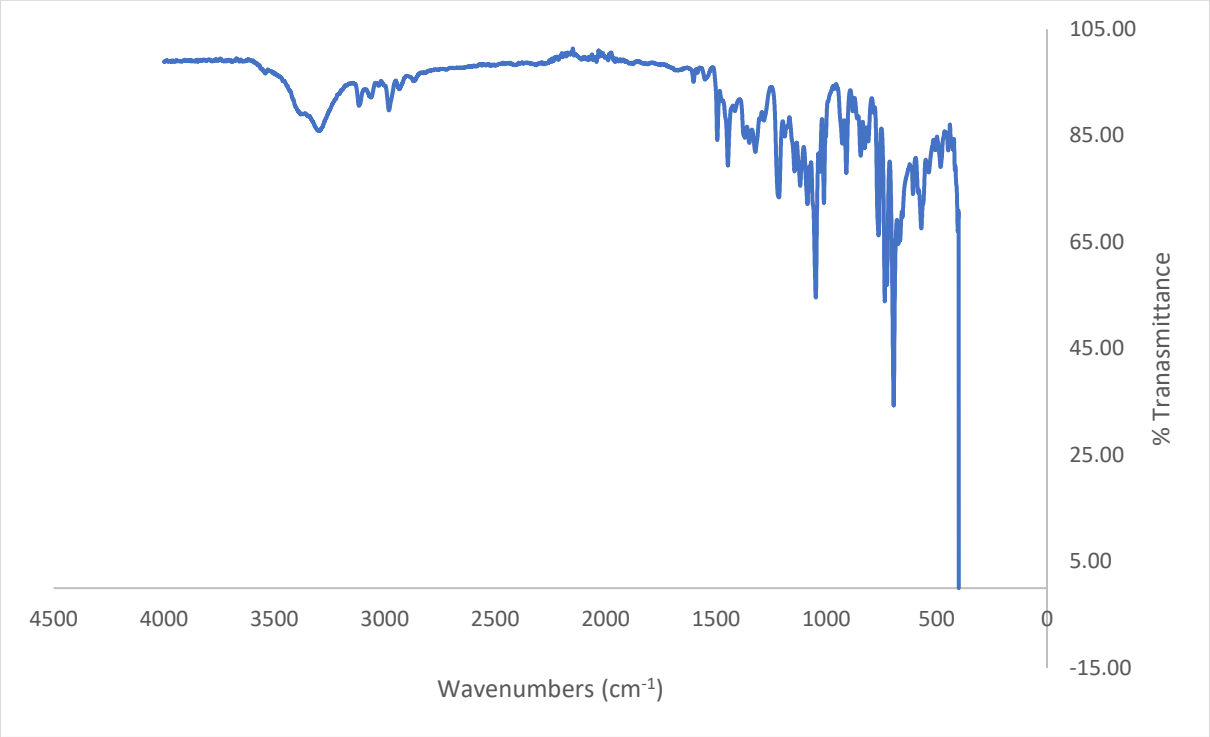
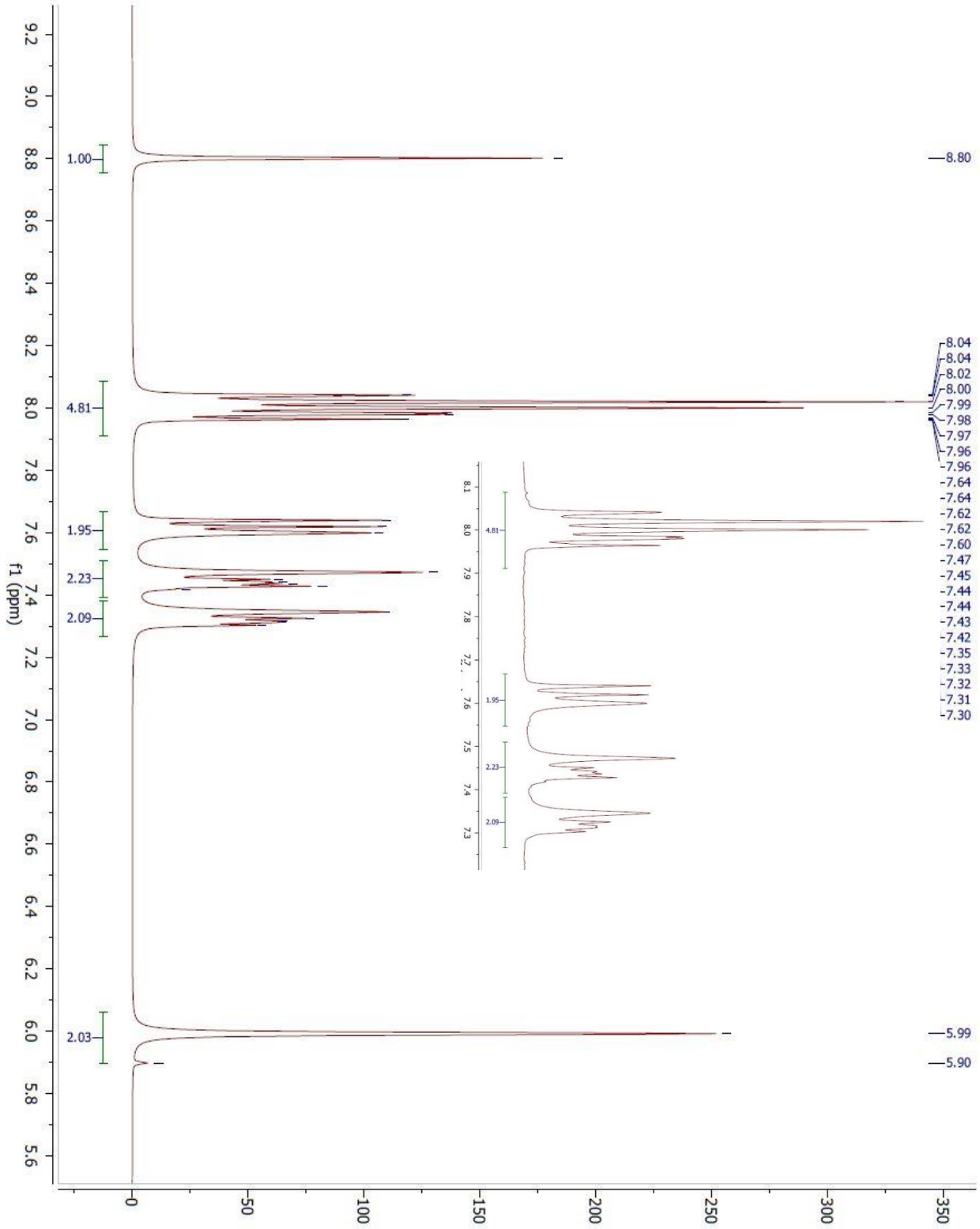


Figure S32. FTIR of 3j: 1-phenyl-1-{[1,1′-(1,2-phenylene)bis(methylene)]bis-4-(1*H*-1,2,3-triazol-yl)}ethanol



S1.12

Figure S33. ^{1}H NMR (400 MHz) of 3k: 4-{1,1′-[(1,2-(phenylene)bis(methylene)]bis-1H-1,2,3-triazole-4,4′-yl}-benzoic acid



The above spectrum has solvent peaks removed (DMSO, water, ethanol).

Figure S34. ^{13}C NMR (400 MHz) of 3k: 4-{1,1′-[(1,2-(phenylene)bis(methylene)]bis-1H-1,2,3-triazole-4,4′-yl}-benzoic acid

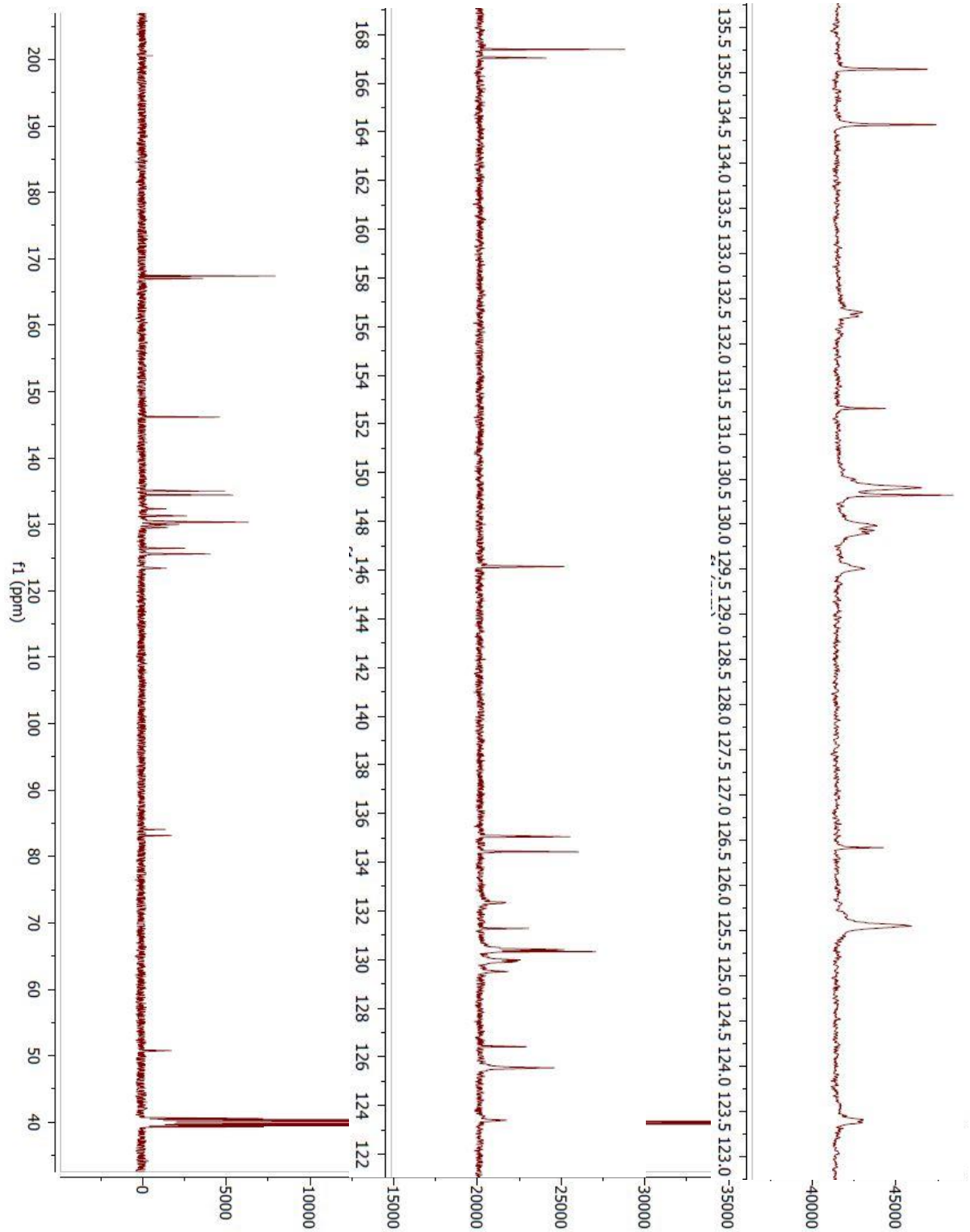
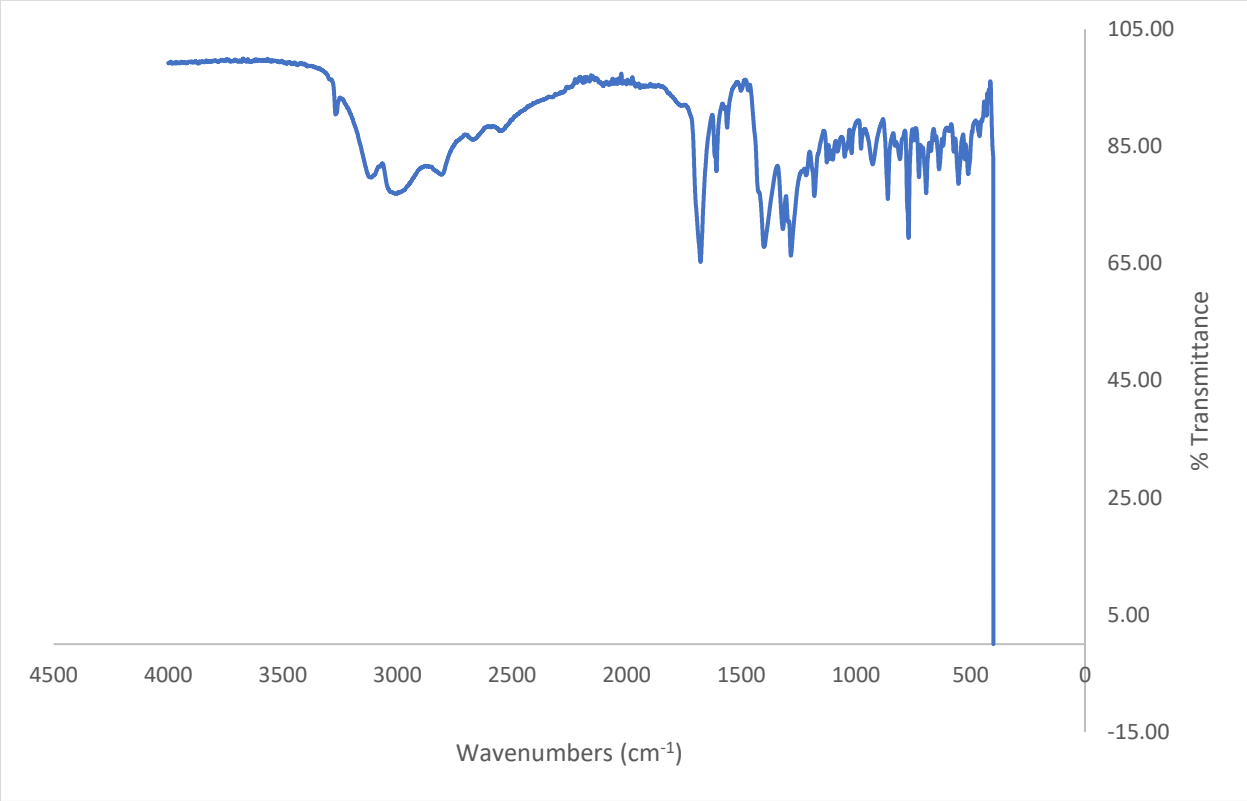


Figure S35. FTIR of 3k: 4-{1,1′-[(1,2-(phenylene)bis(methylene)]bis-1H-1,2,3-triazole-4,4′-yl}-benzoic acid



S1.13

Figure S36. ^{1}H NMR (300 MHz) of 4a: 4,4′-(1,3-phenylene)bis[1-benzyl-1*H*-1,2,3-triazole]

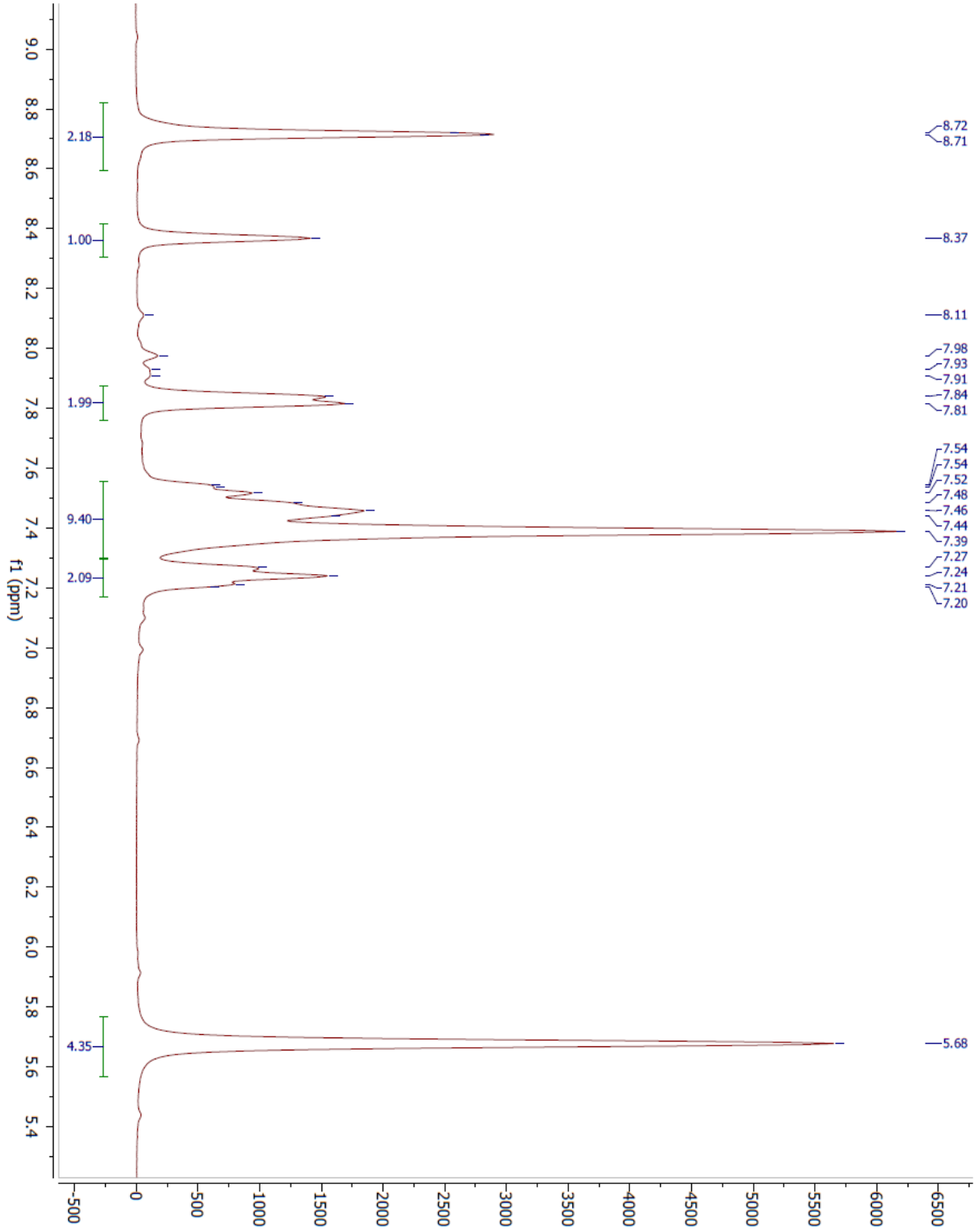
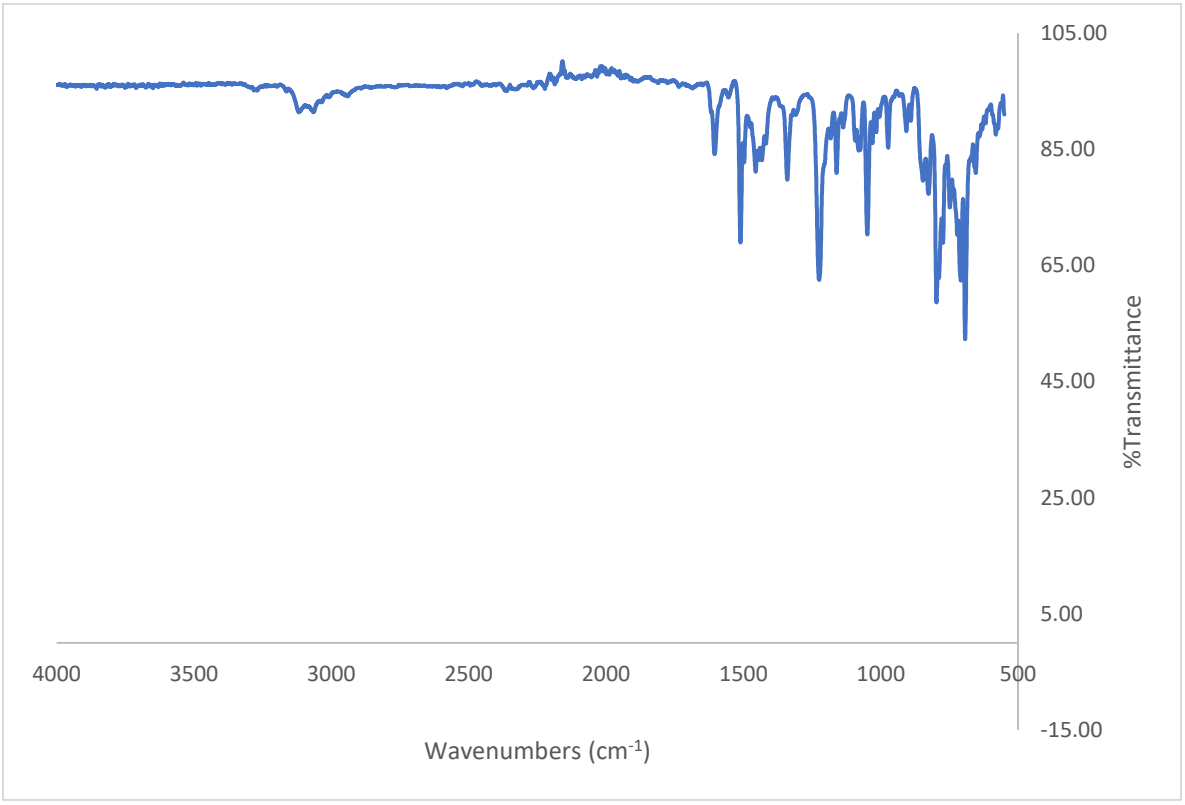


Figure S37. FTIR of 4a: 4,4′-(1,3-phenylene)bis[1-benzyl-1*H*-1,2,3-triazole]



S1.14

Figure S38. ^{1}H NMR (300 MHz) of 4b: 2,2′-[1,3-phenylenebis(1*H*-1,2,3-triazole-4,1-diyl)]bis[1-phenyl-ethanone]

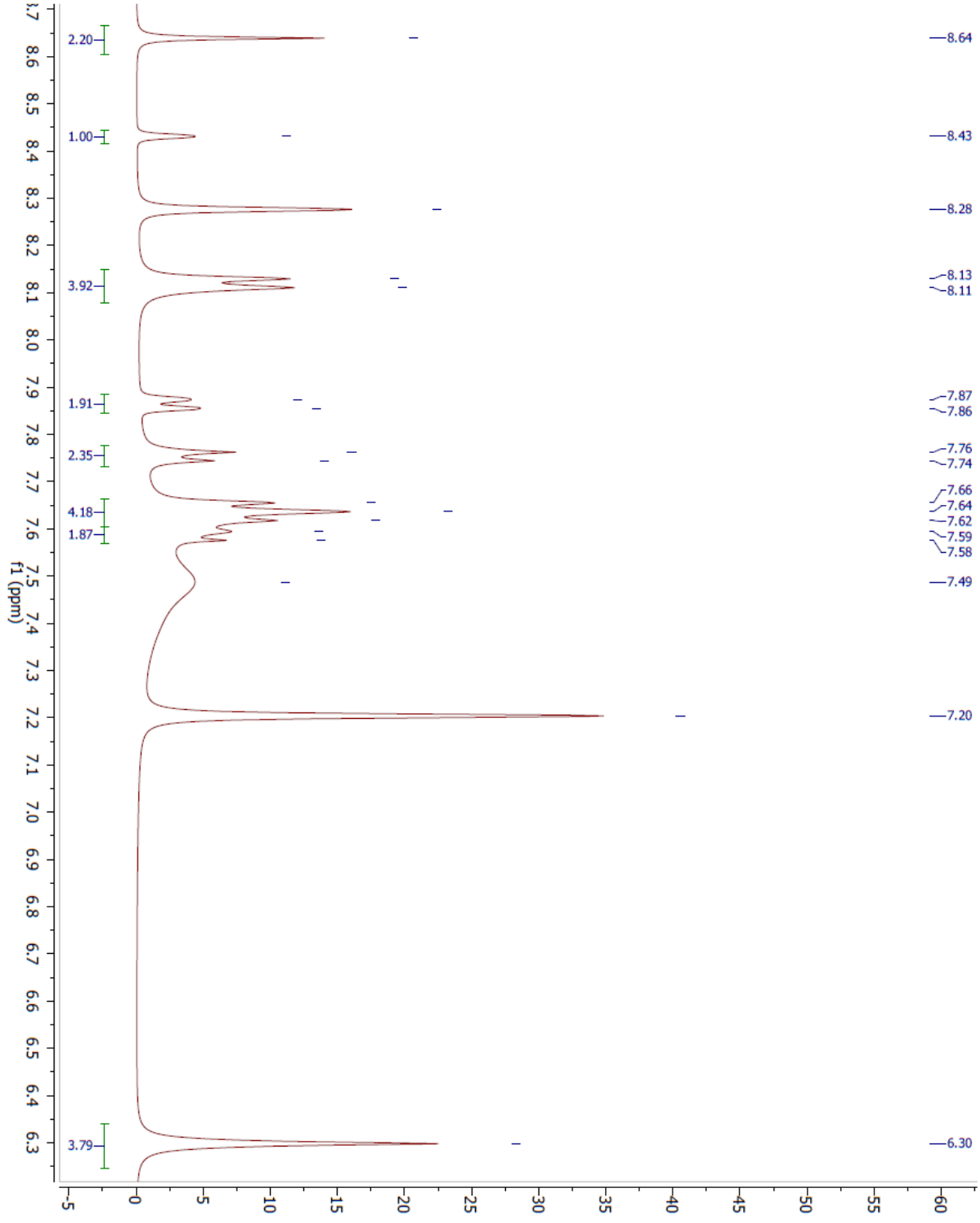
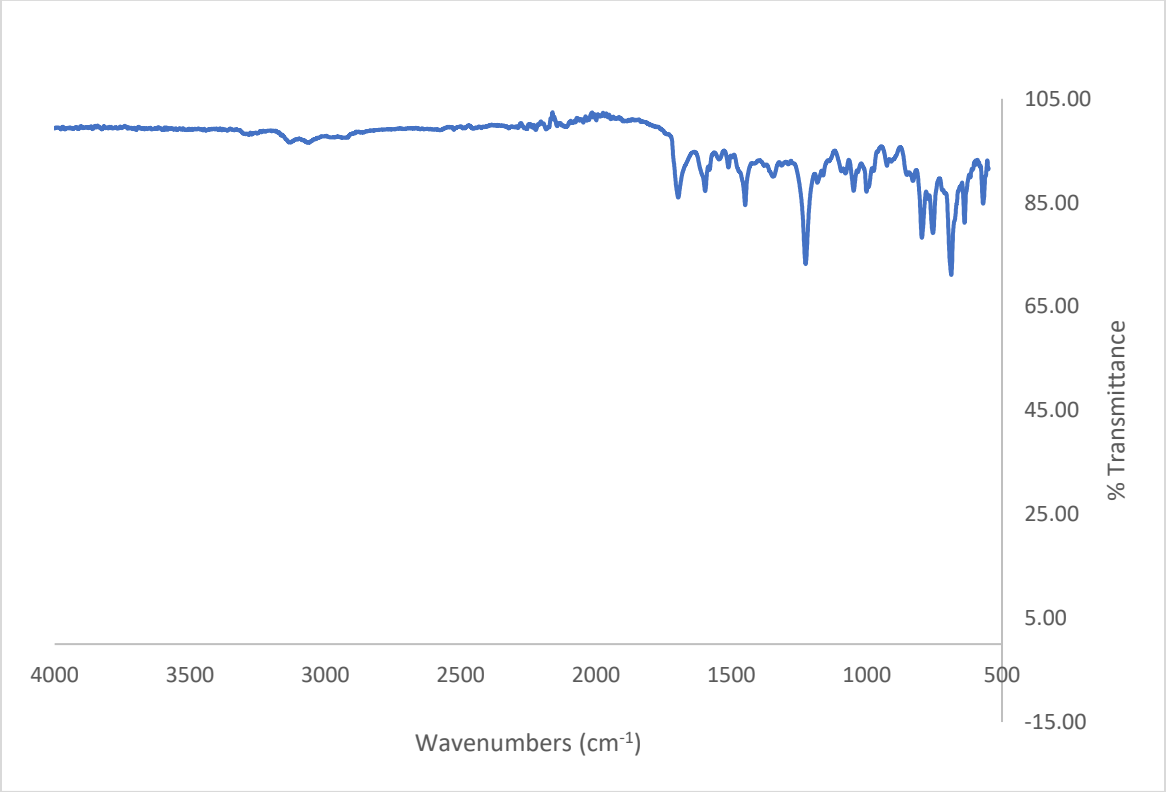


Figure S39. FTIR of 4b: 2,2′-[1,3-phenylenebis-(1*H*-1,2,3-triazole-4,1-diyl)]bis[1-phenylethanone]



S1.15

Figure S40. ^{1}H NMR (300 MHz) of 4c: 4,4′-(1,3-phenylene)bis[1-(2,3,5,6-tetrafluoropyridyl)-1*H*-1,2,3-triazole]

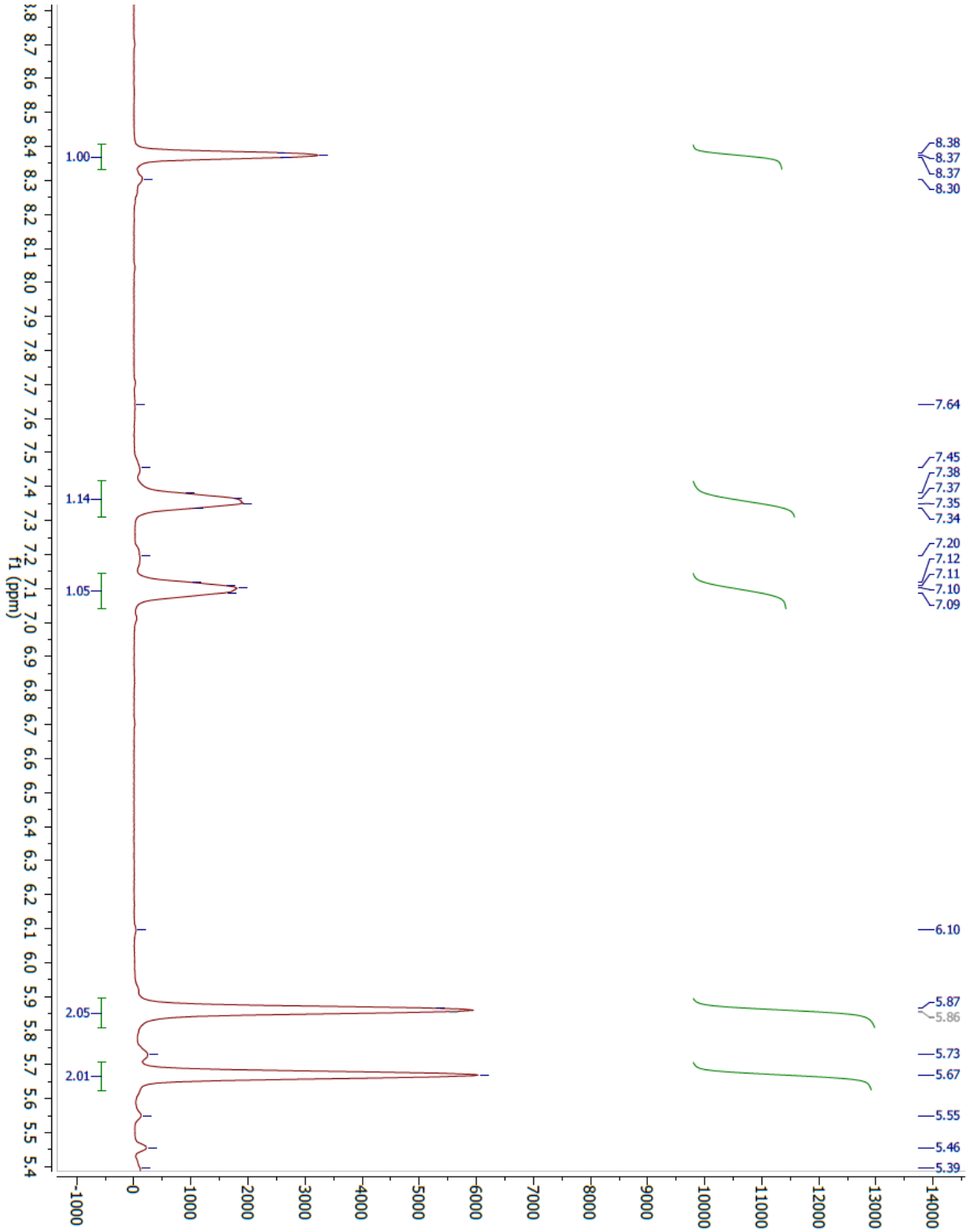


Figure S41. ^{19}**F NMR (300 MHz) of 4c: 4,4′-(1,3-phenylene)bis[1-(2,3,5,6-tetrafluoropyridyl)-1*H*-1,2,3-triazole]**

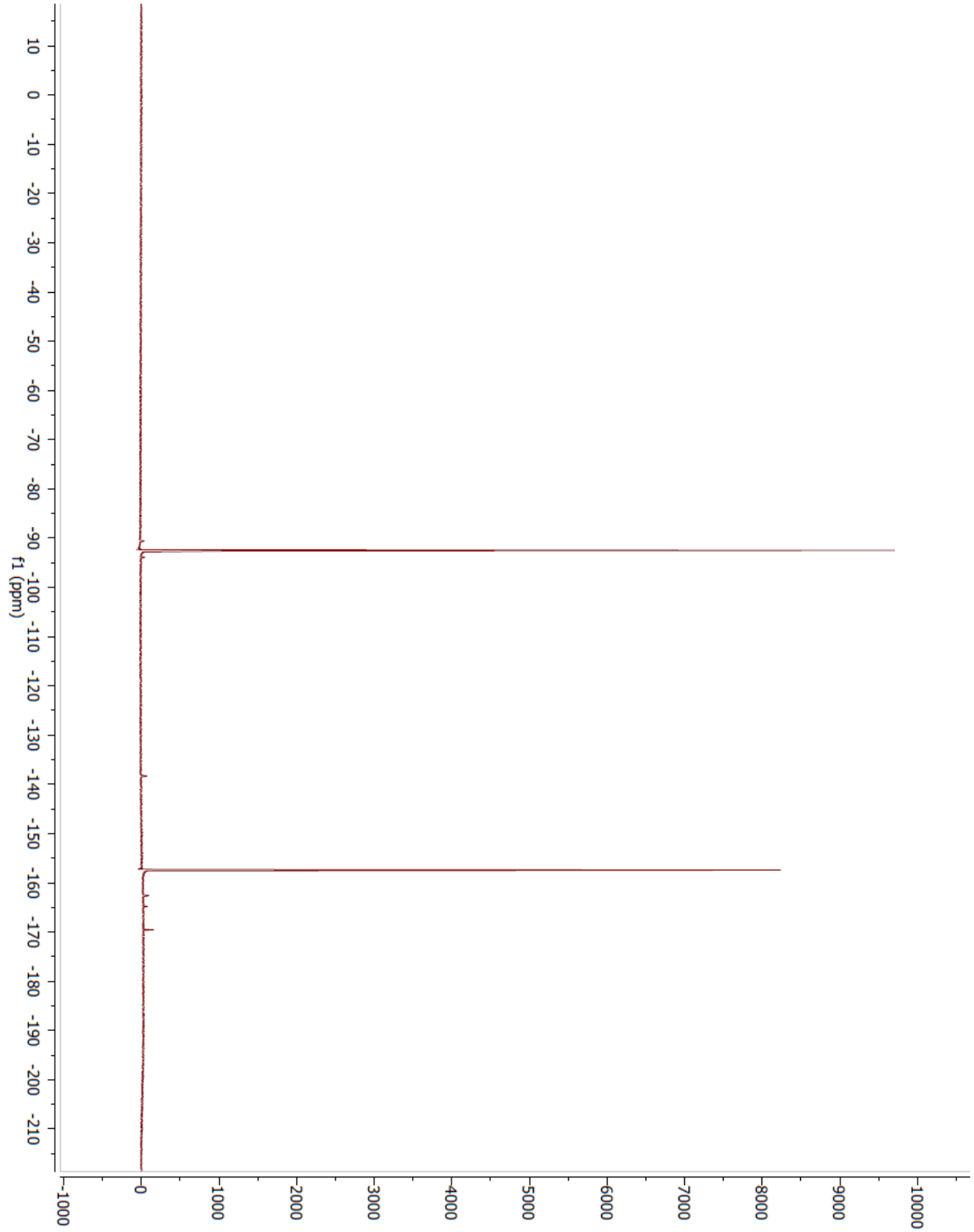
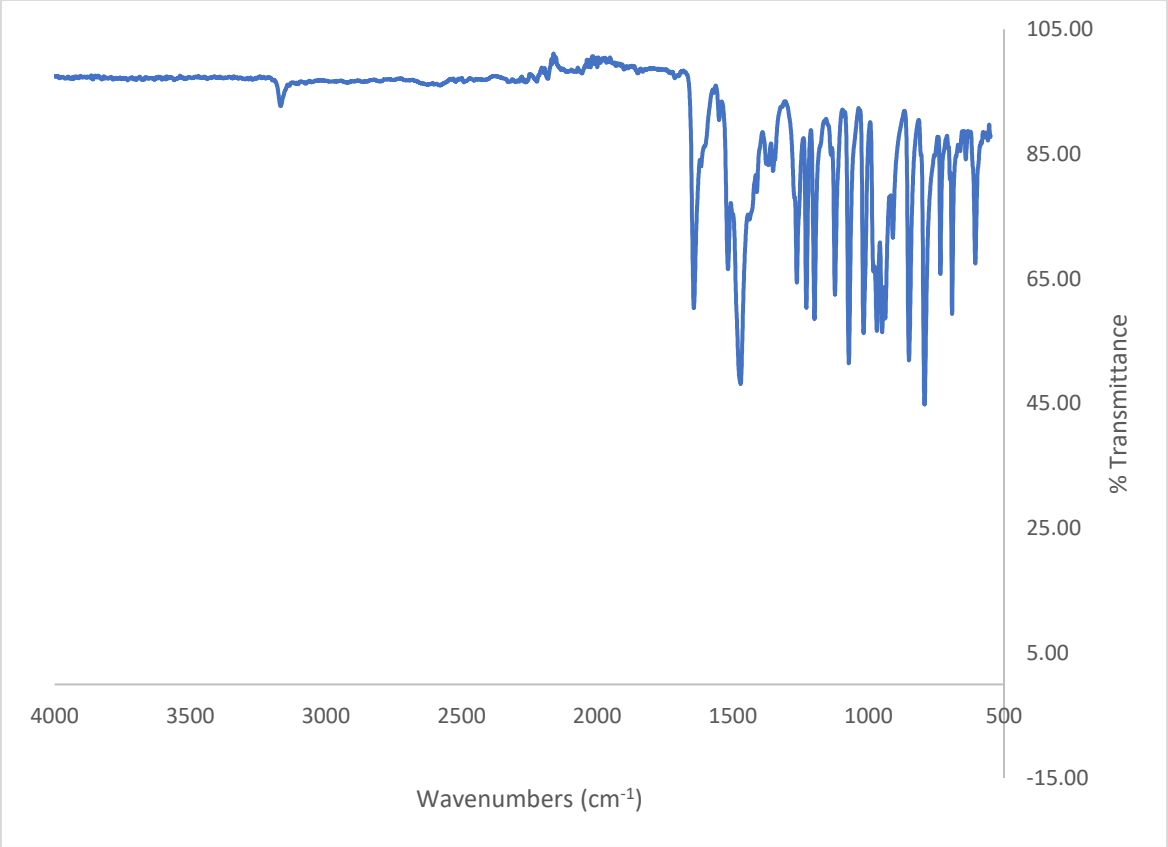
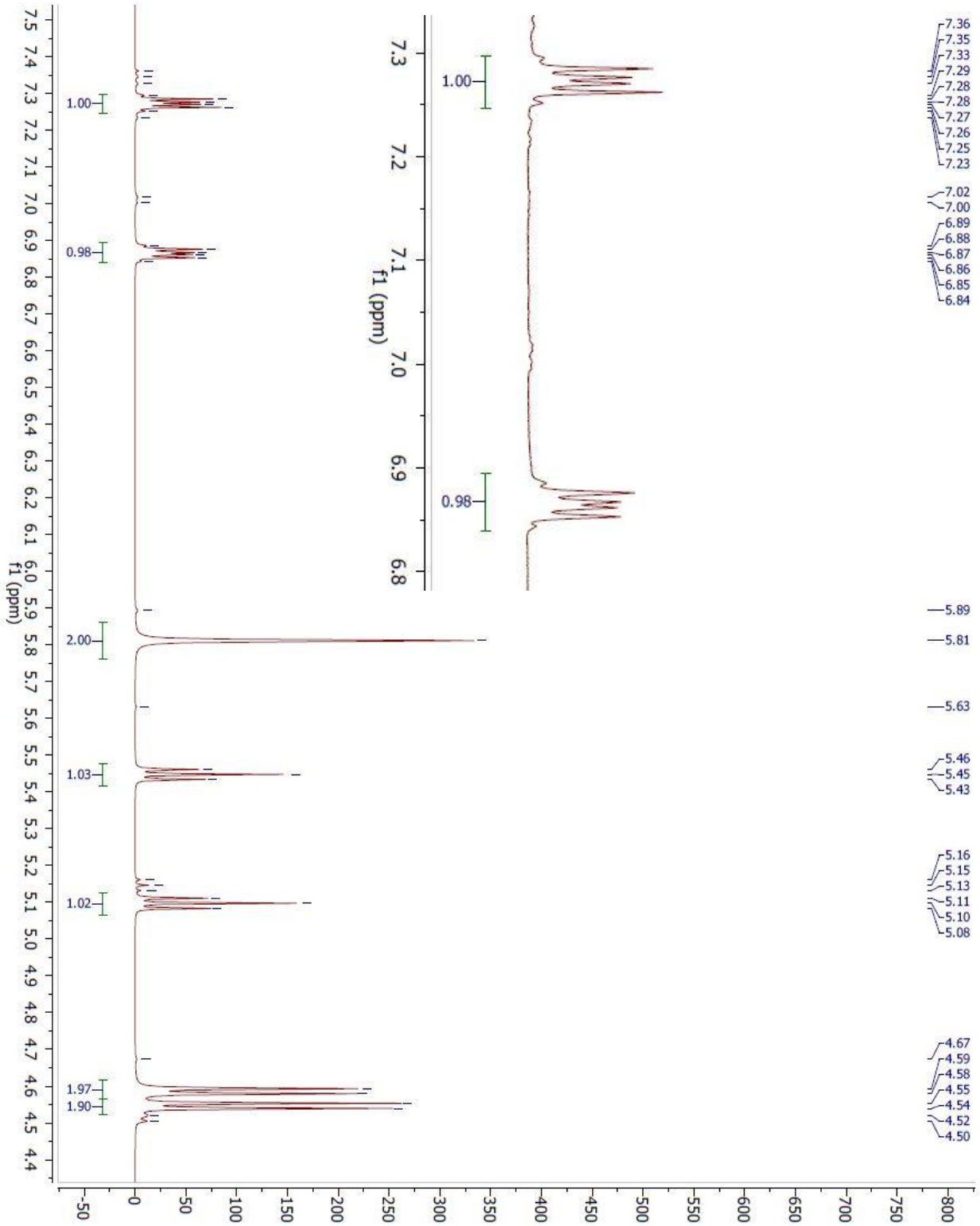


Figure S42. FTIR of 4c: 4,4′-(1,3-phenylene)bis[1-(2,3,5,6-tetrafluoropyridyl)-1*H*-1,2,3-triazole]



S1.16

Figure S43. ^{1}H NMR (400 MHz) of 5: 1,1′-[(1,2-phenylene)bis(methylene)]bis-4,5-(1*H*-1,2,3-triazolyl)dimethanol



The above spectrum has solvent peaks removed (DMSO, water, ethanol).

Figure S44. ^{13}C NMR (400 MHz) of 5: 1,1′-[(1,2-phenylene)bis(methylene)]bis-4,5-(1*H*-1,2,3-triazolyl)dimethanol

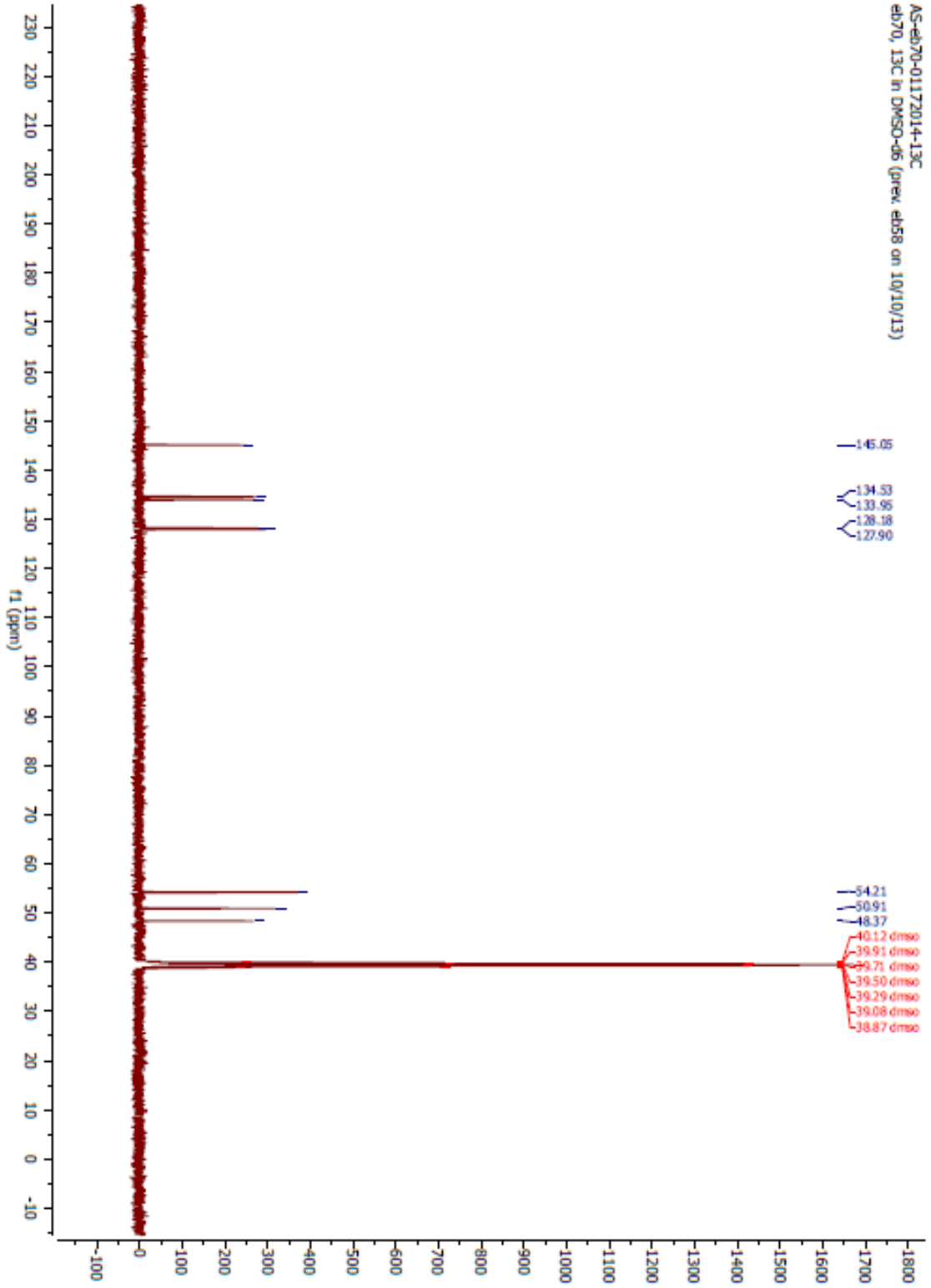
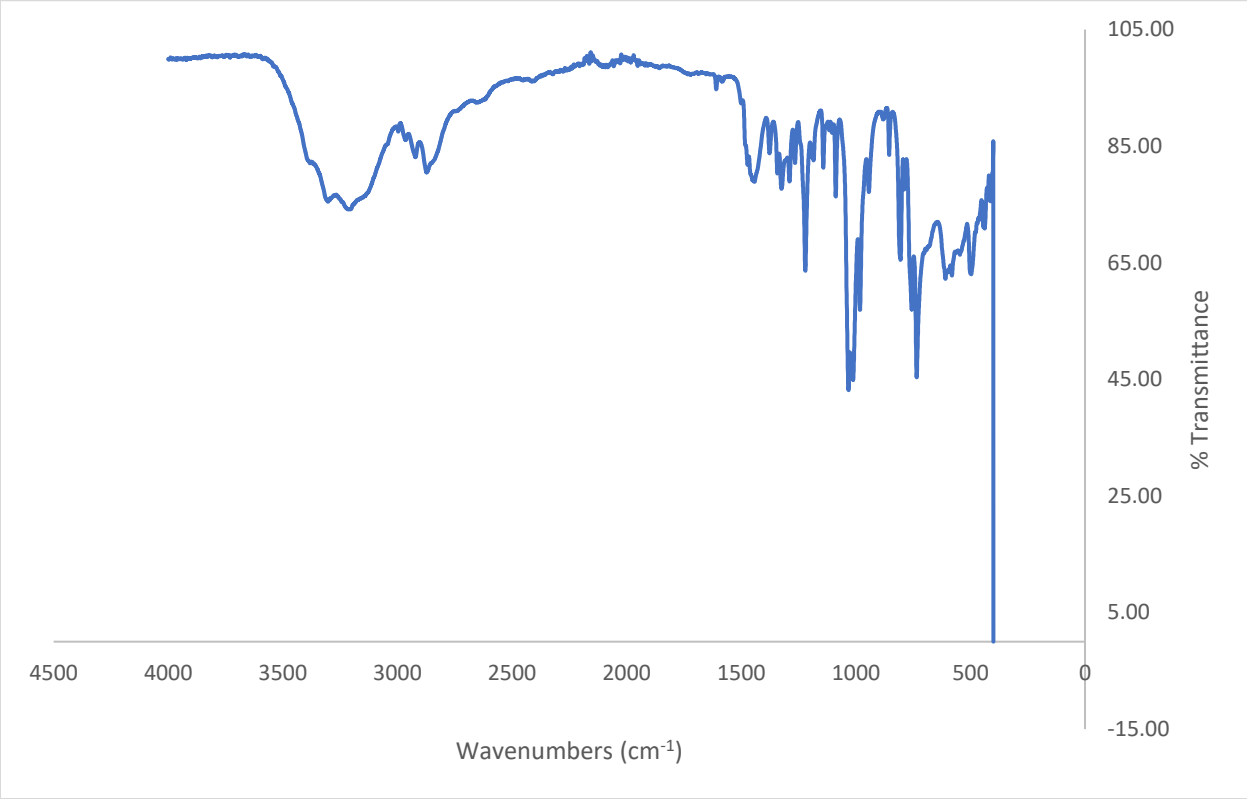


Figure S45. FTIR of 5: 1,1′-[(1,2-phenylene)bis(methylene)]bis-4,5-(1*H*-1,2,3-triazolyl)dimethanol



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