

Surface Immobilized Cu-1,10-Phenanthroline Complexes with α -Aminophosphonate Groups in the 5-Position as Heterogenous Catalysts for Efficient Atom-Transfer Radical Cyclizations

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Supporting Information

Original raw datasets can be obtained free of charge through the Data Repository of the University of Stuttgart (DARUS) via the DOI: 10.18419/darus-3467.

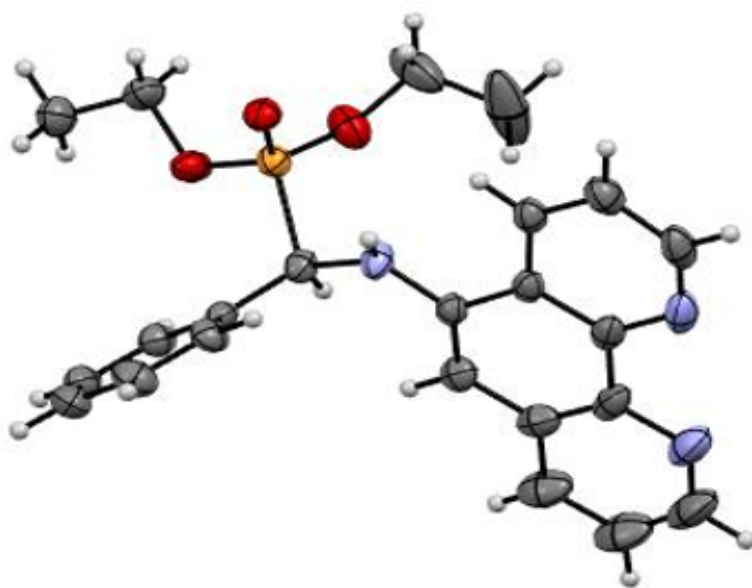


Figure S1. X-ray structure of L1, water of crystallization omitted for clarity (Cambridge Crystallographic Database deposition number 2253908)

NMR-Spectra of new ligands

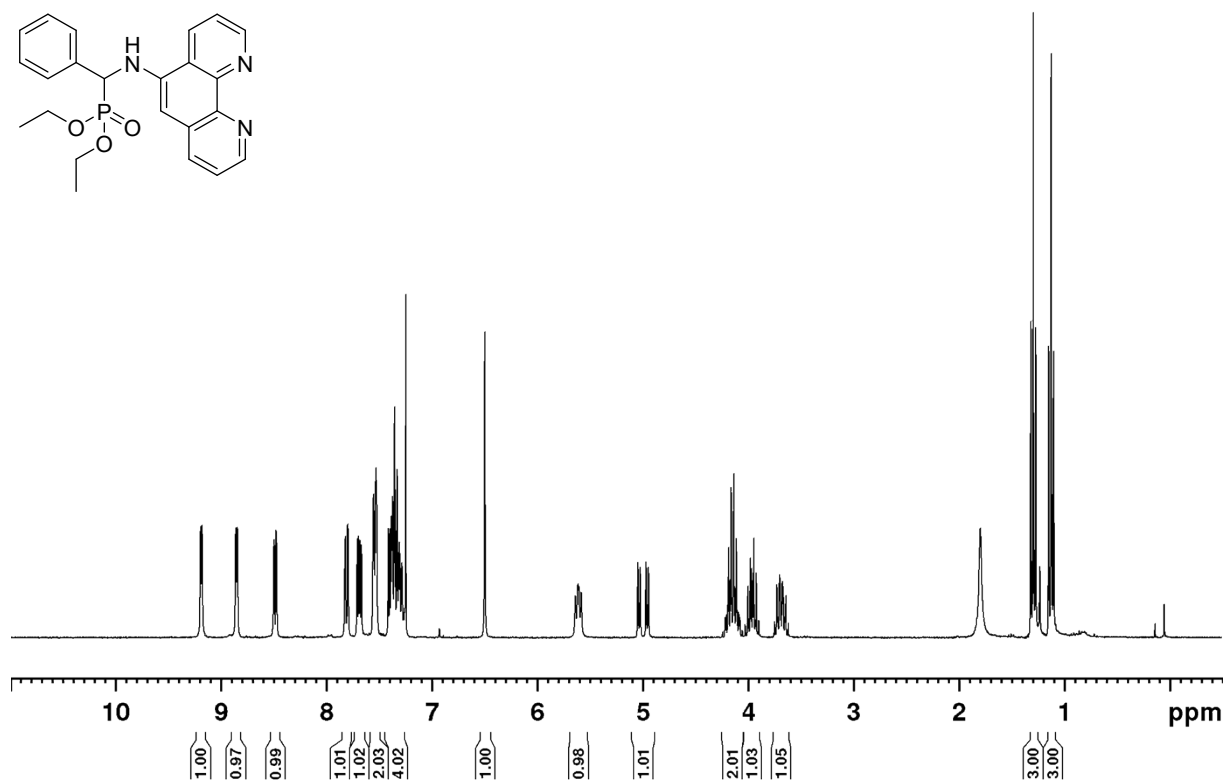


Figure S2. $^1\text{H-NMR}$ of L1 in CDCl_3 at 25°C .

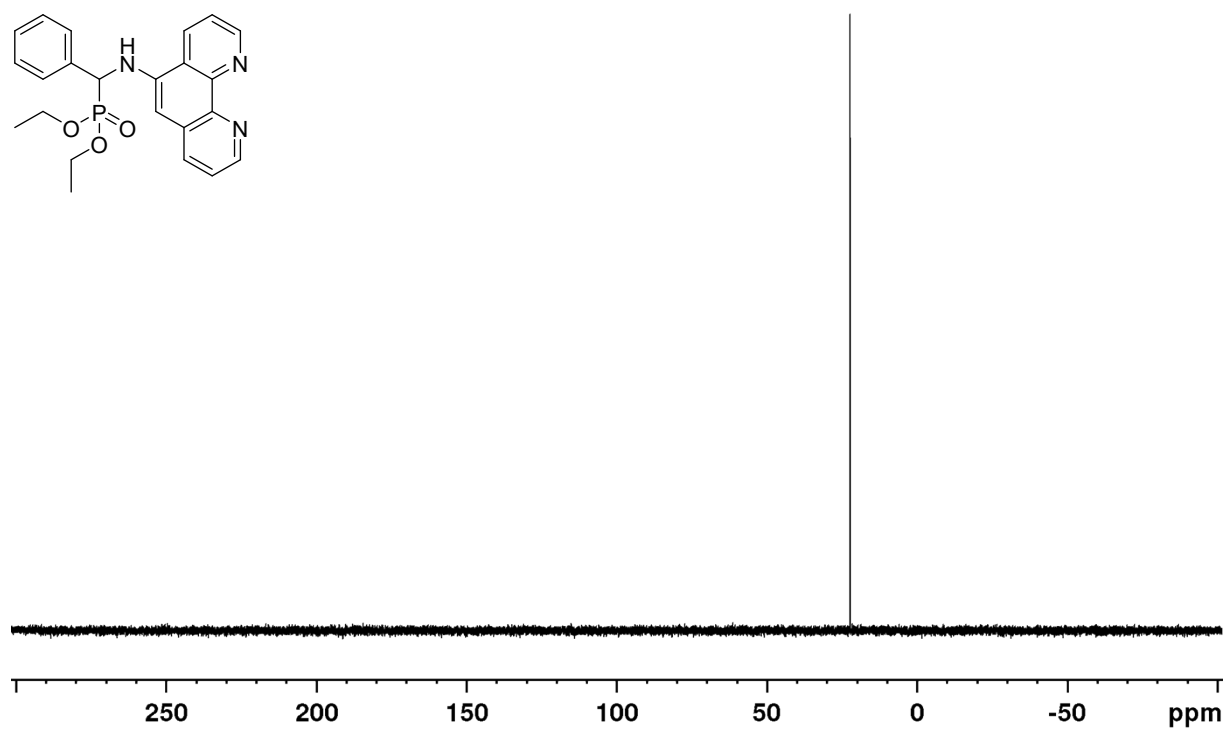


Figure S3. $^{31}\text{P}\{^1\text{H}\}$ -NMR of L1 in CDCl_3 at 25°C .

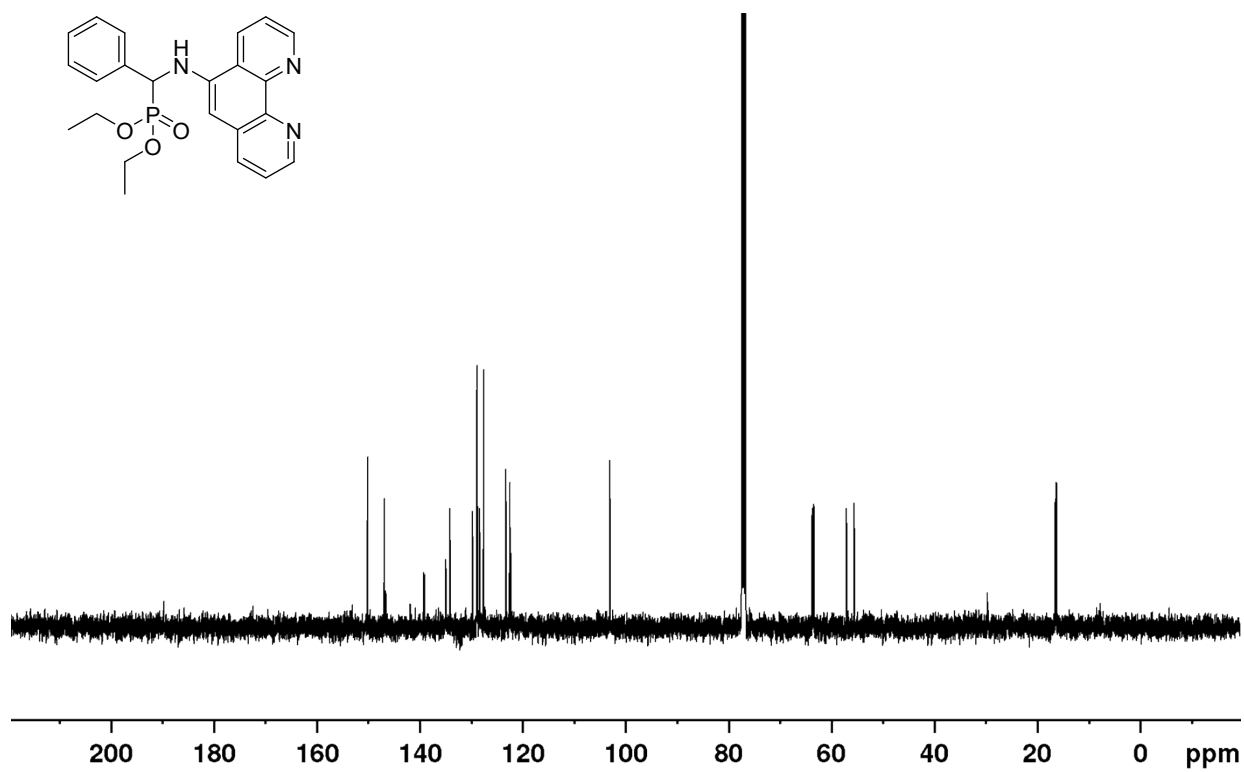


Figure S4. $^{13}\text{C}\{^1\text{H}\}$ -NMR of L1 in CDCl_3 at 25°C .

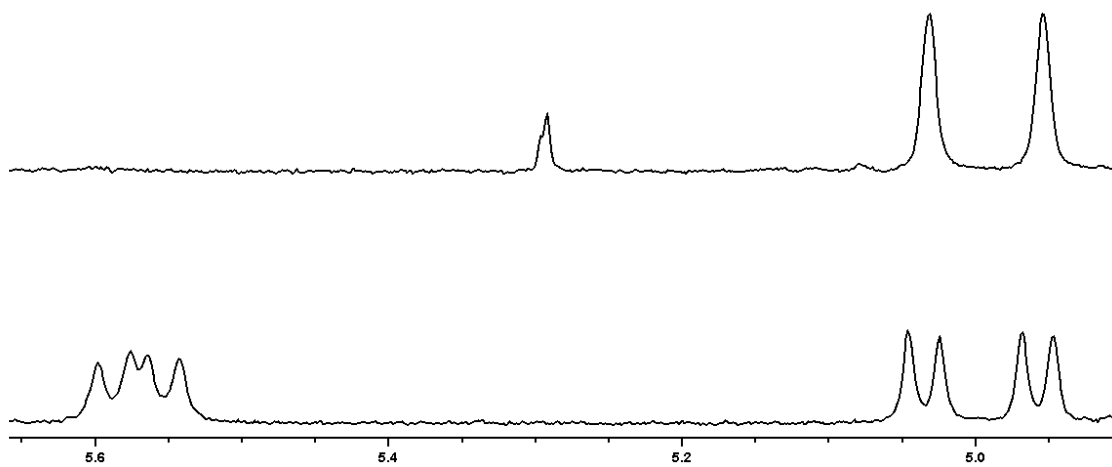
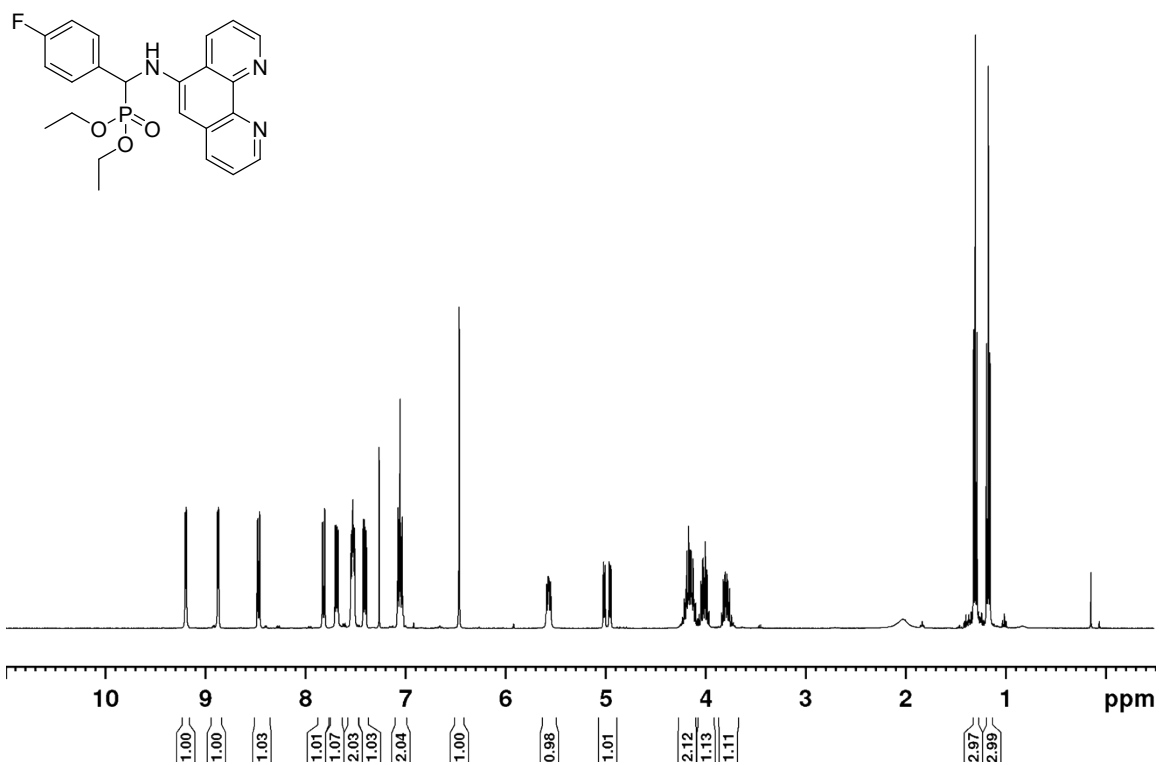


Figure S5. ¹H-NMR of **L2** in CDCl₃ at 25°C (top) Close up of CHP and amino-region of the ¹H NMR of **L2** with (middle) and without (bottom) addition of D₂O.

$^{19}\text{F}\{^1\text{H}\}$ -NMR

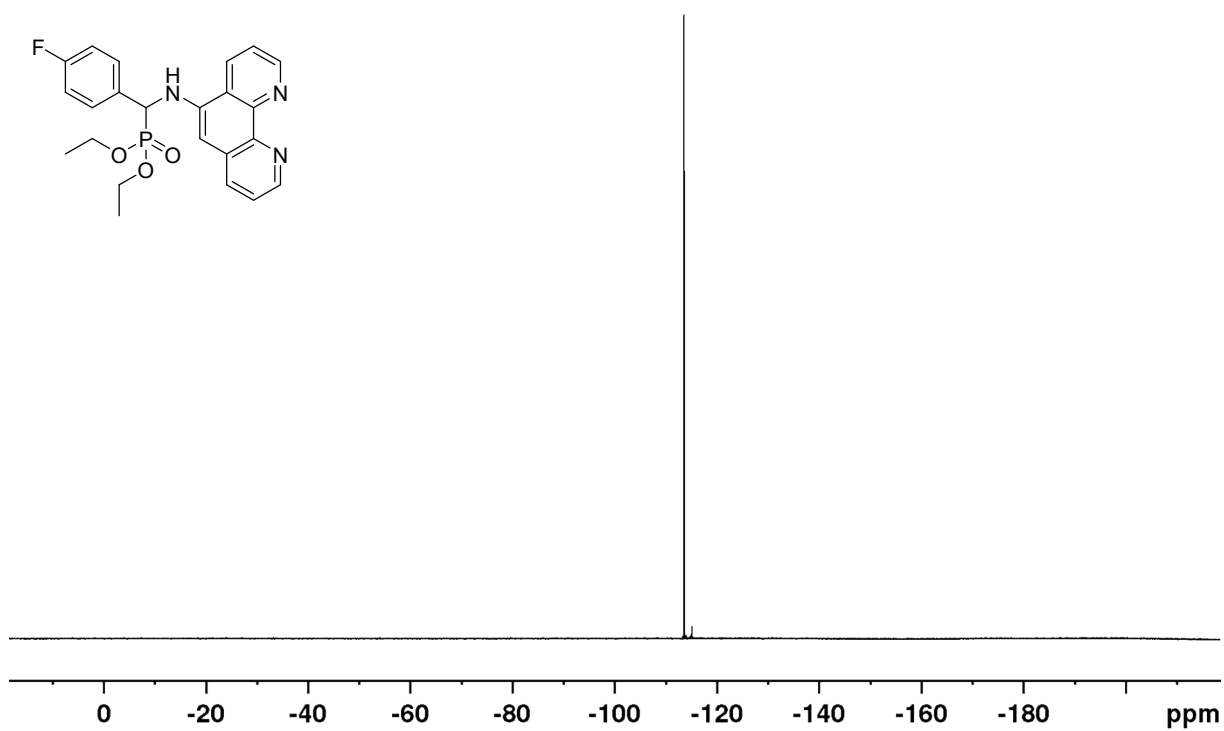


Figure S6. $^{19}\text{F}\{^1\text{H}\}$ -NMR of L2 in CDCl_3 at 25°C.

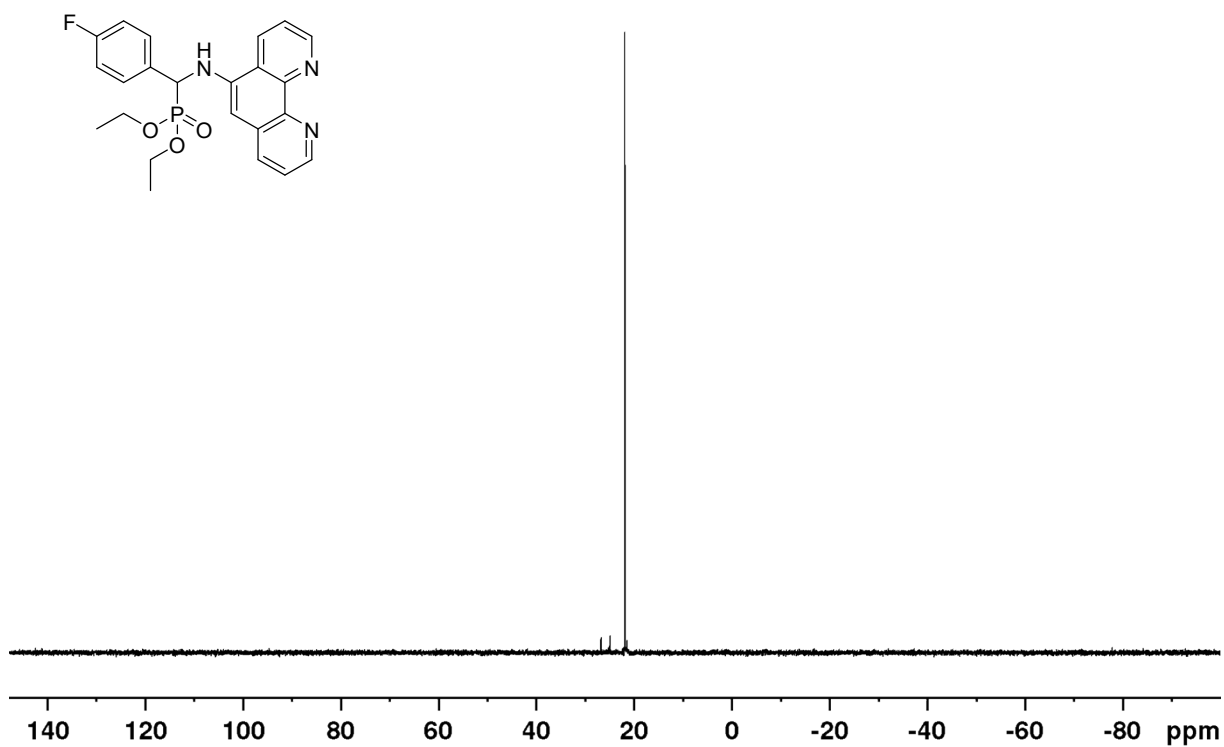
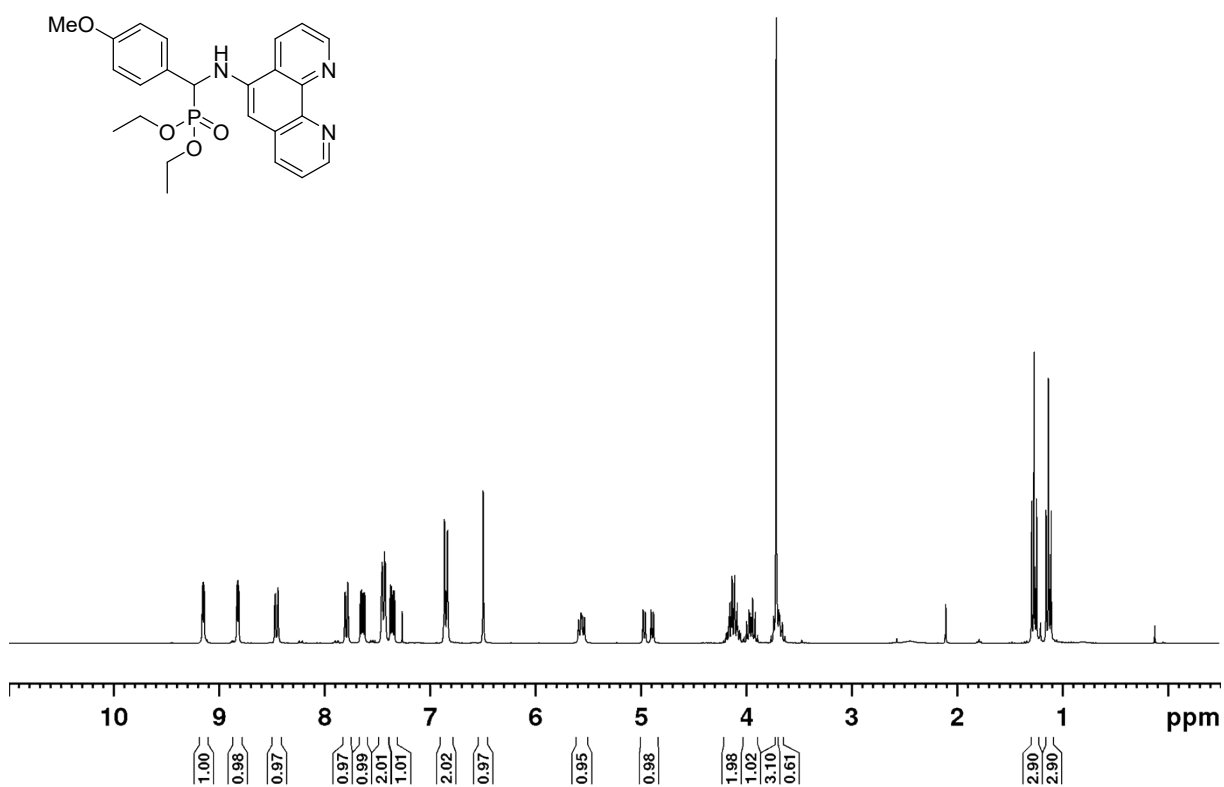
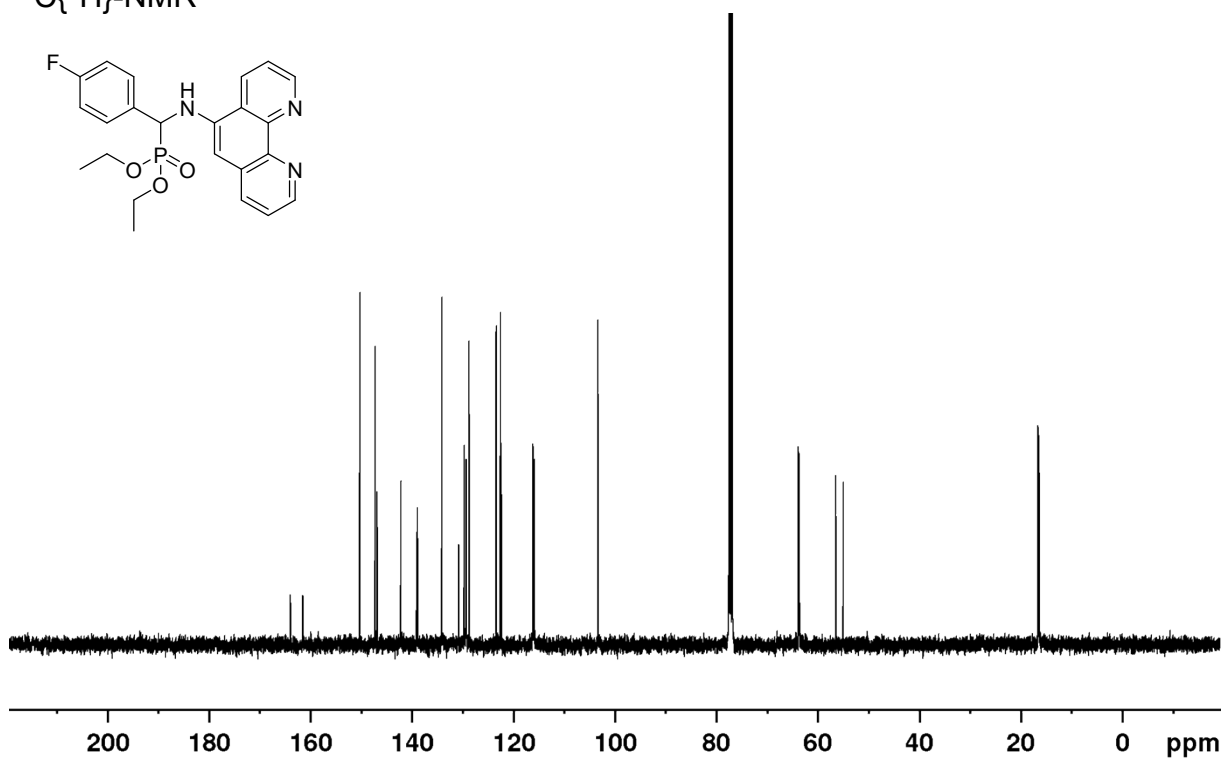
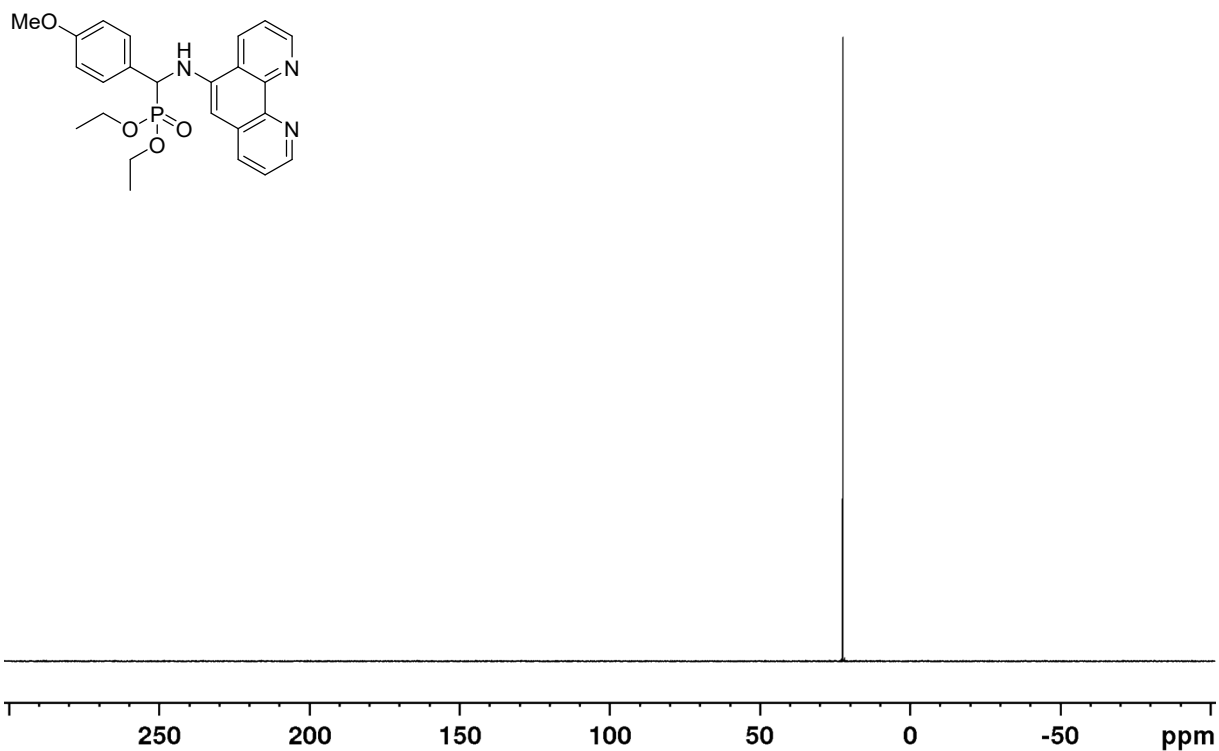


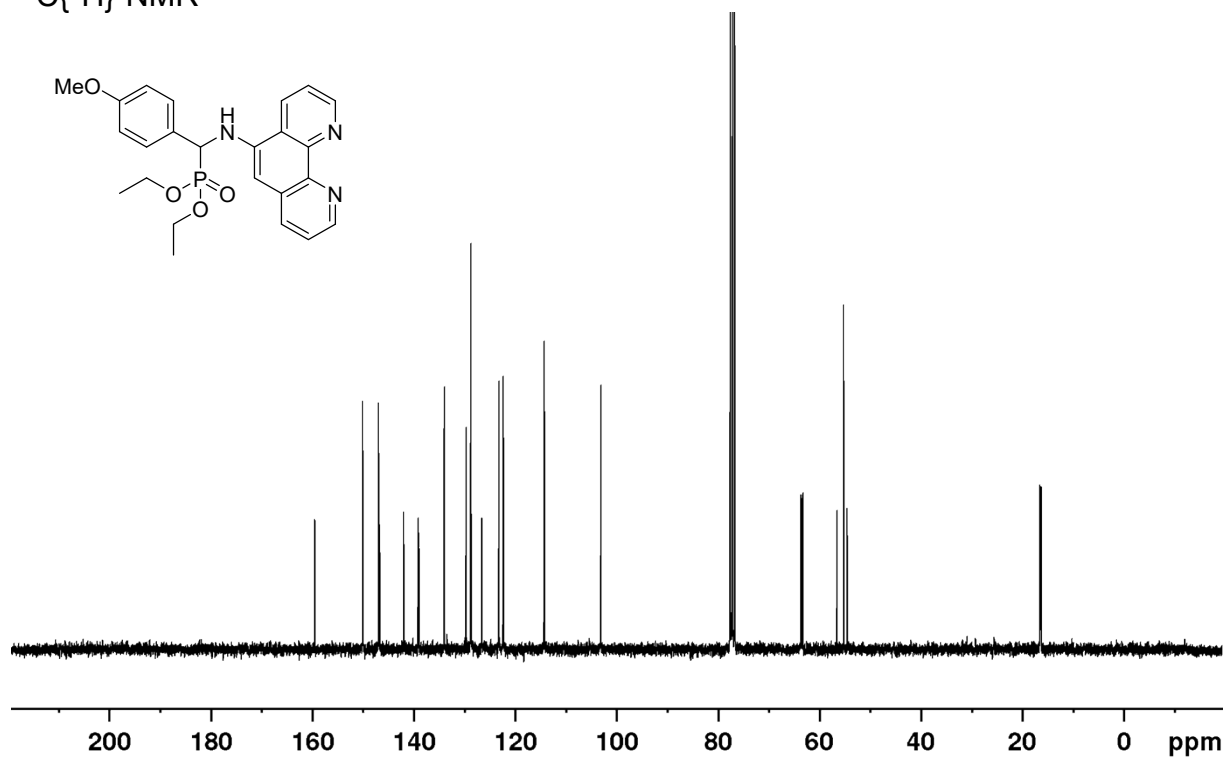
Figure S7. $^{31}\text{P}\{^1\text{H}\}$ -NMR of L2 in CDCl_3 at 25°C.

$^{13}\text{C}\{^1\text{H}\}$ -NMR





$^{13}\text{C}\{^1\text{H}\}$ -NMR



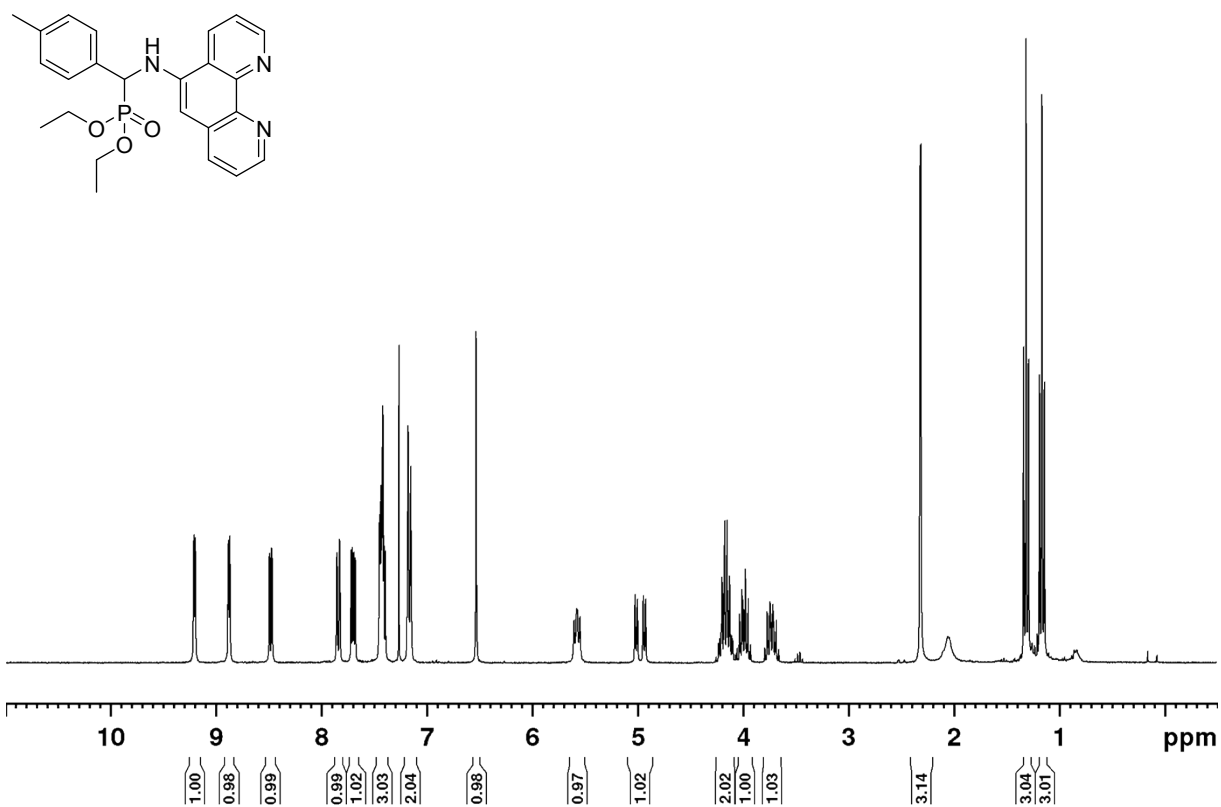


Figure S12. ¹H-NMR of L4 in CDCl₃ at 25°C.

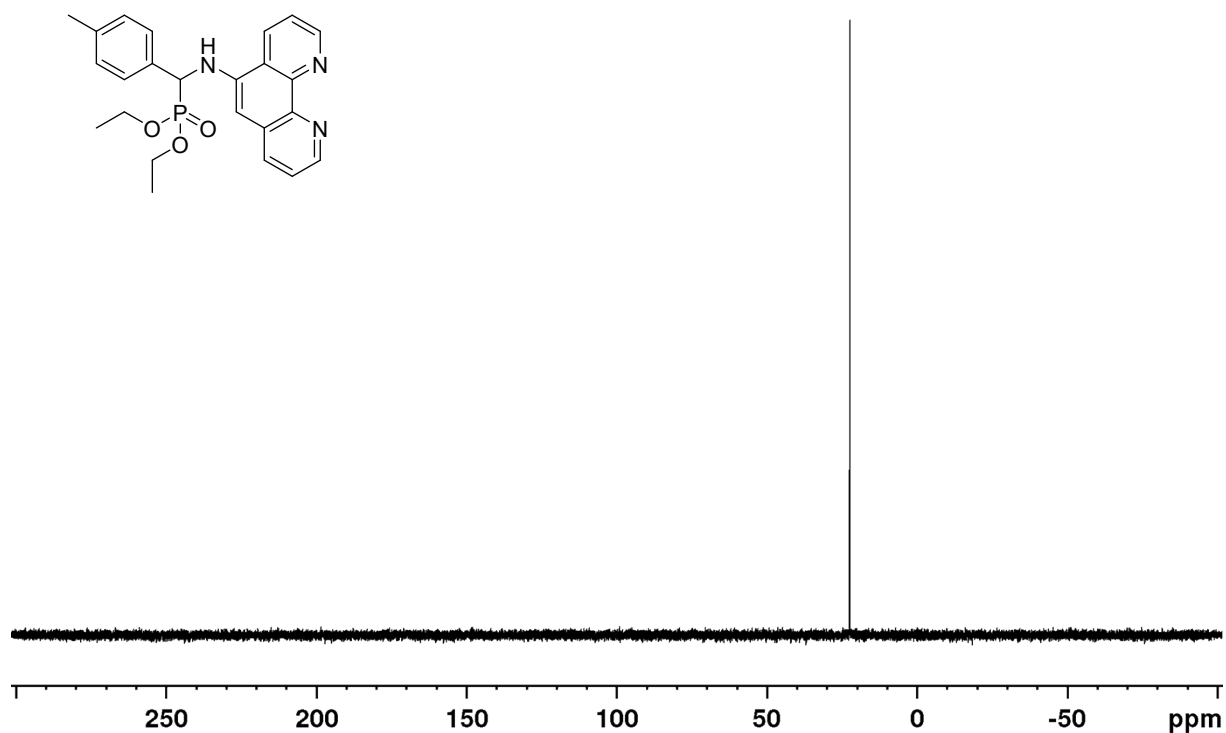


Figure S13. ³¹P{¹H}-NMR of L4 in CDCl₃ at 25°C.

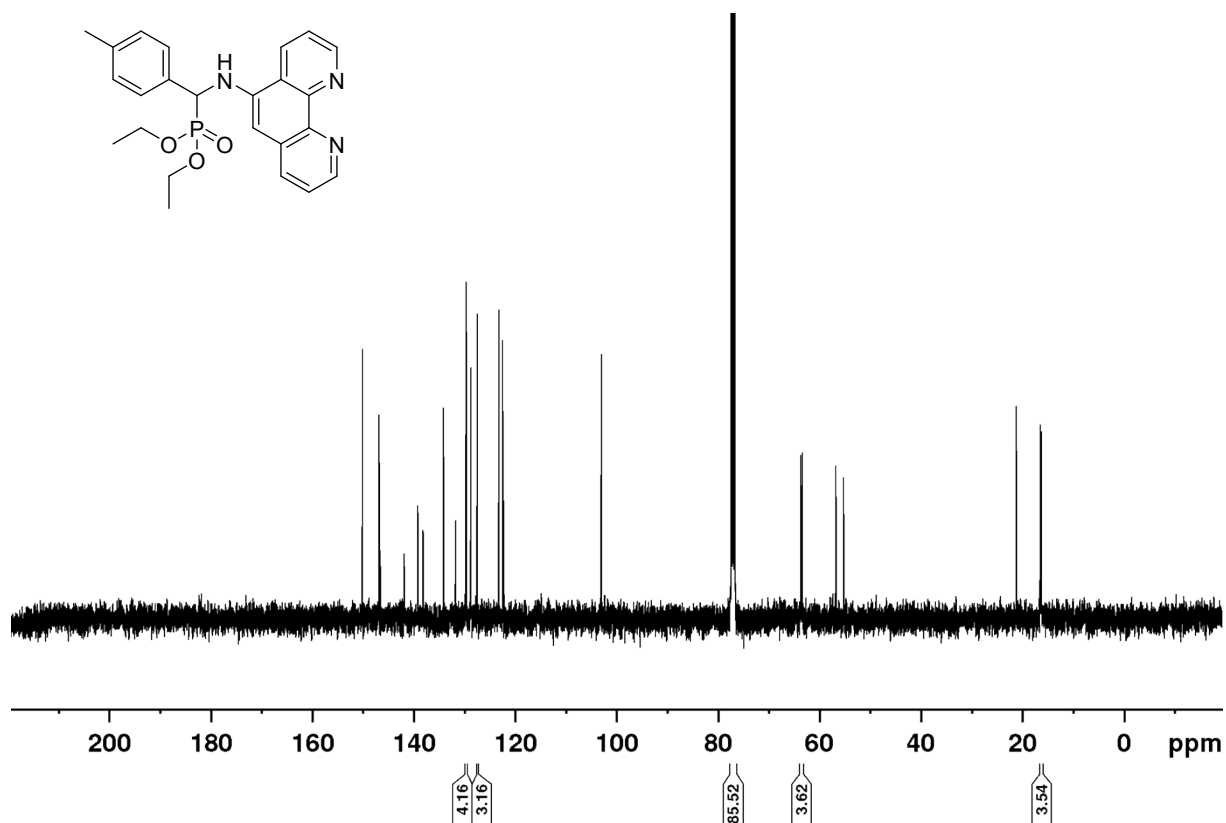


Figure S14. $^{13}\text{C}\{^1\text{H}\}$ -NMR of L4 in CDCl_3 at 25°C .

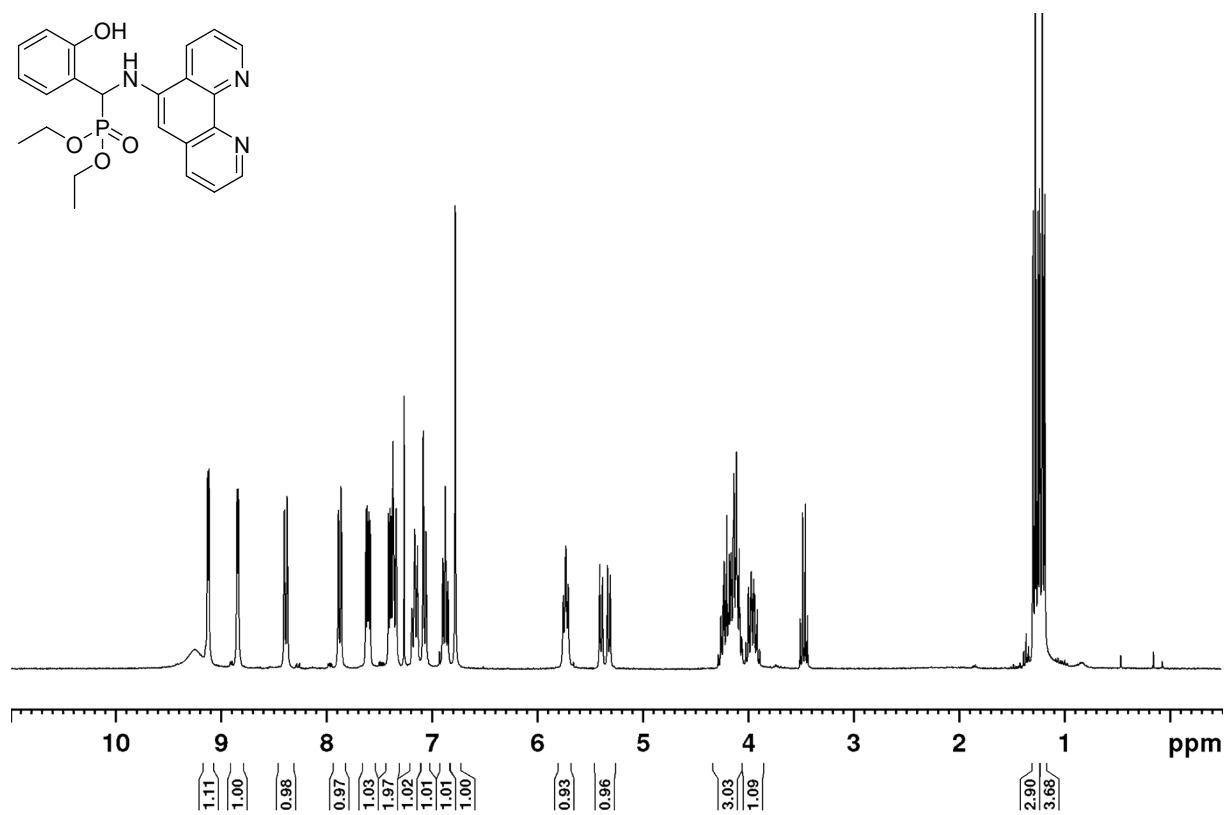


Figure S15. ^1H -NMR of L5 in CDCl_3 at 25°C .

$^{31}\text{P}\{^1\text{H}\}$ -NMR

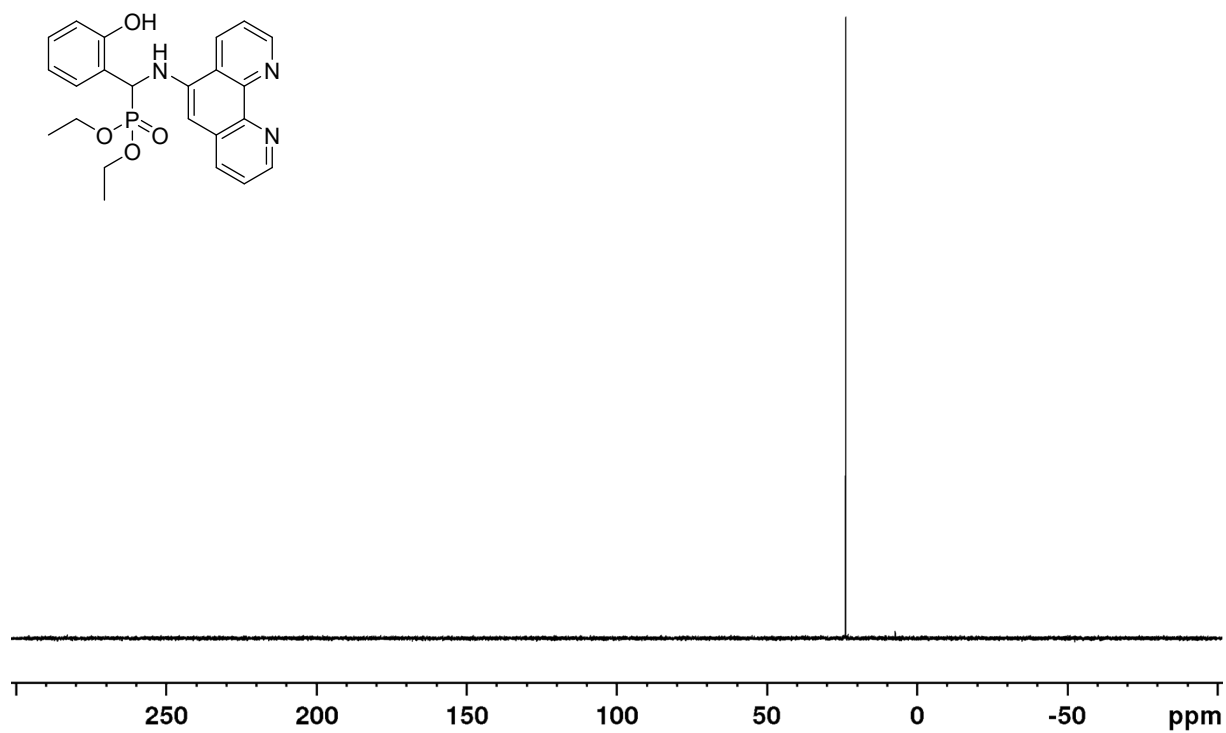


Figure S16. $^{31}\text{P}\{^1\text{H}\}$ -NMR of L5 in CDCl_3 at 25°C.

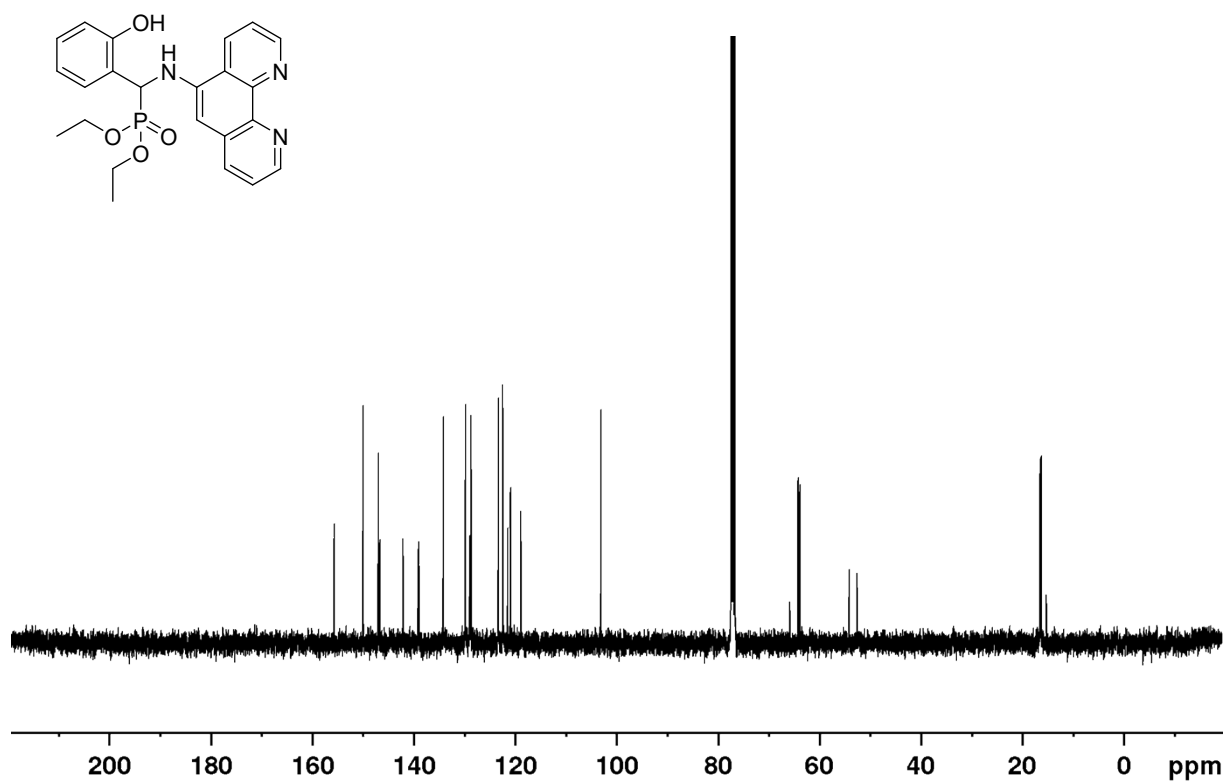


Figure S17. $^{13}\text{C}\{^1\text{H}\}$ -NMR of L1 in CDCl_3 at 25°C.

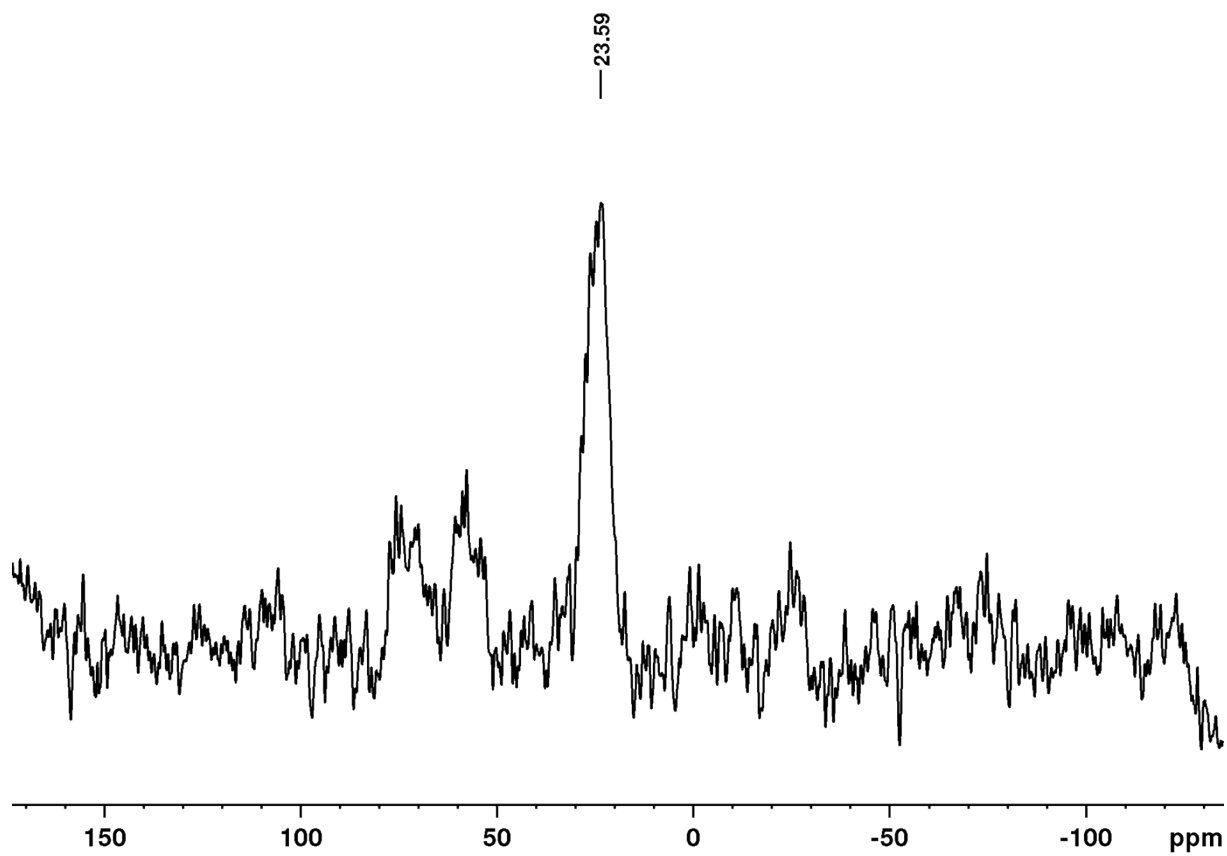


Figure S18. ^{31}P -CPMAS NMR of $\text{Cu}(\text{L3})_2\text{BF}_4@\text{SiO}_2$.

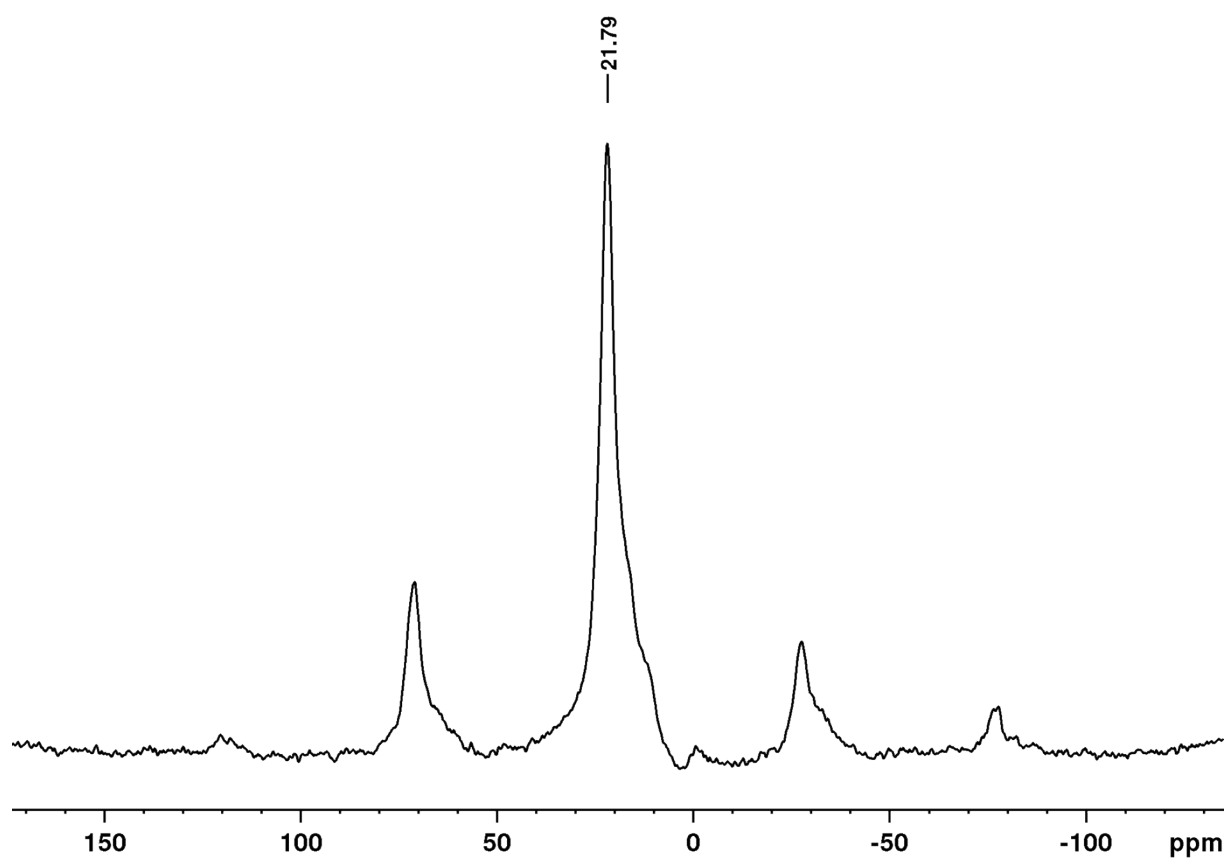


Figure S19. ^{31}P CPMAS NMR of $\text{L1}@\text{Al}_2\text{O}_3$.

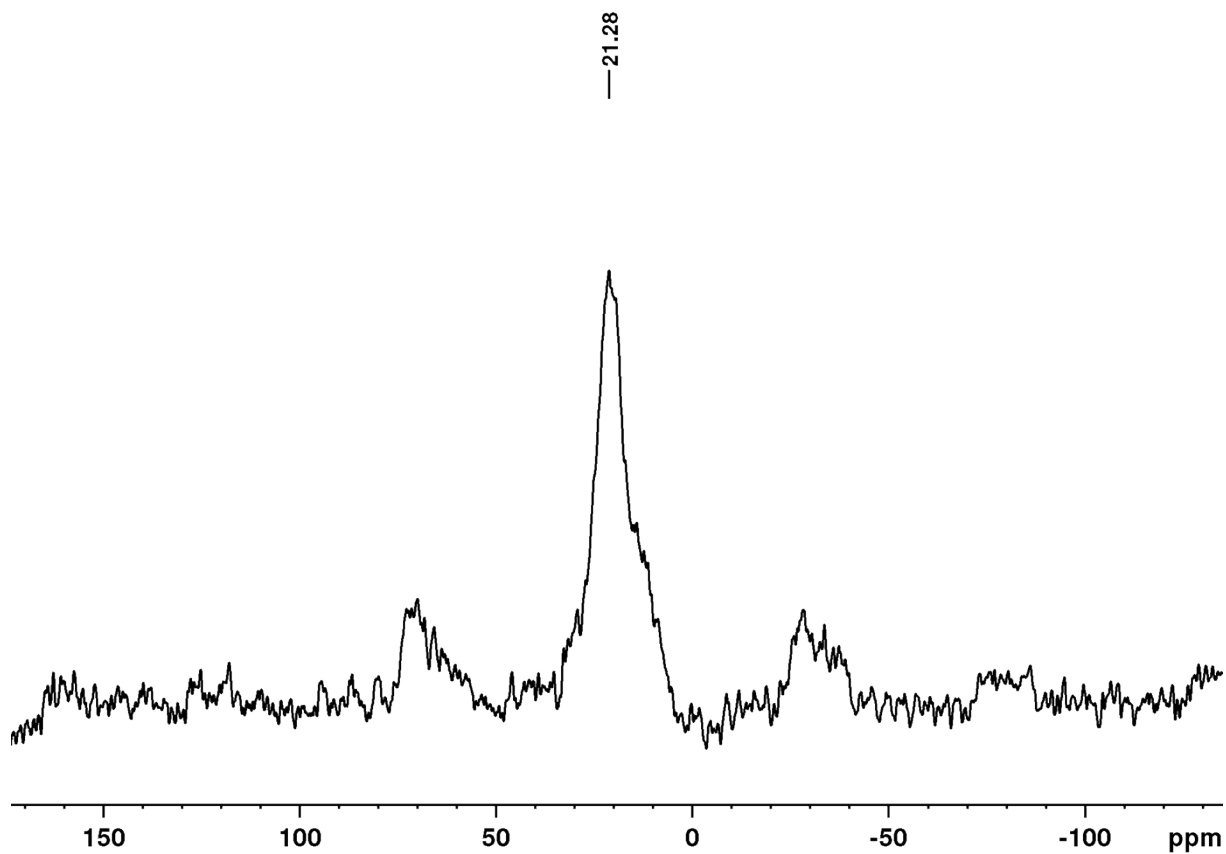


Figure S20. ^{31}P CPMAS NMR of $\text{Cu}(\text{L1})\text{BF}_4@ \text{Al}_2\text{O}_3$.

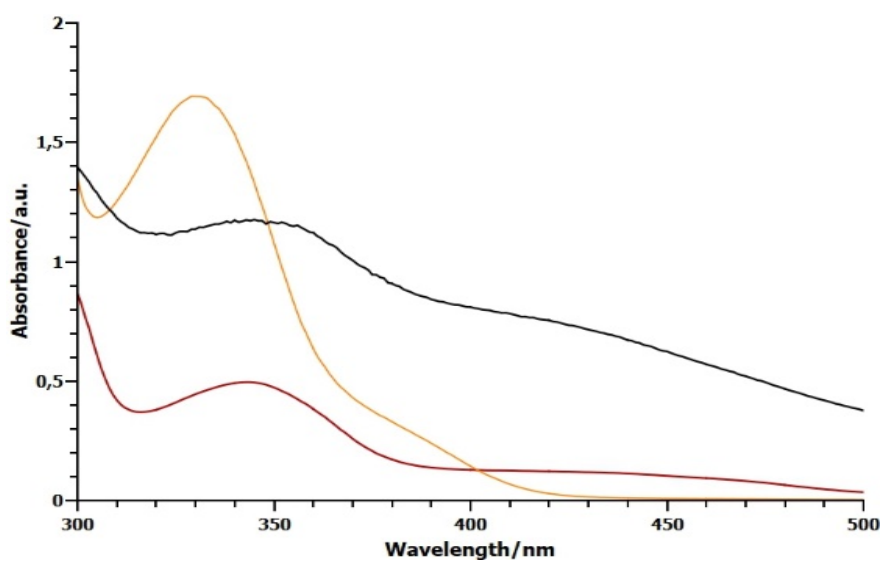


Figure S21. UV/Vis measurements of L3 (orange), $\text{Cu}(\text{L3})_2\text{BF}_4$ (blue) and $\text{Cu}(\text{L3})_2@ \text{SiO}_2$ (grey)

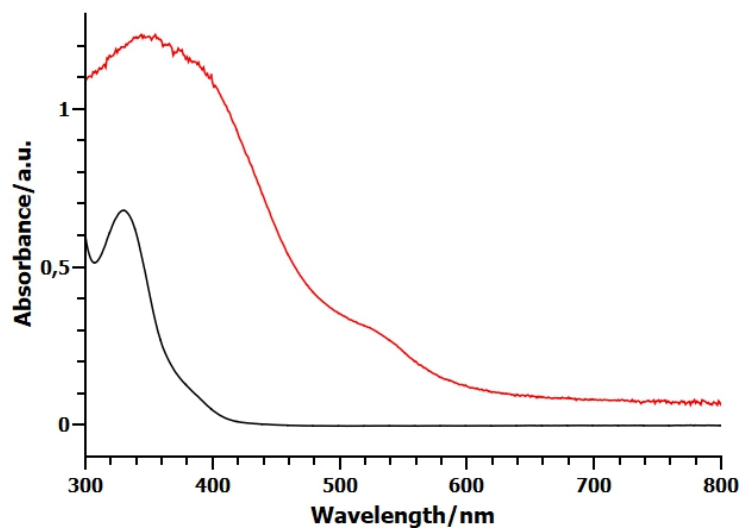


Figure S22. UV/Vis measurements of L1 (black) and L1@alumina (red)

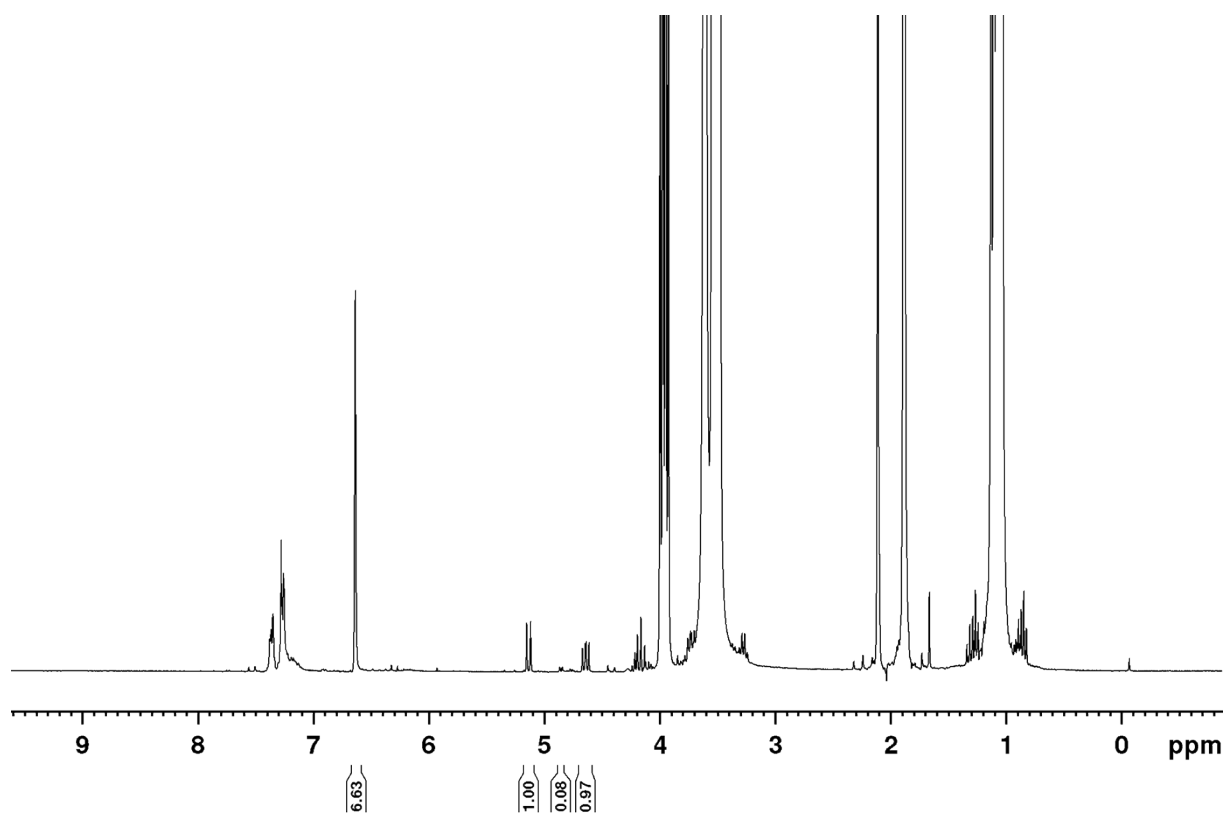


Figure S23. Exemplary NMR-spectrum after the cyclization reaction of **1**.

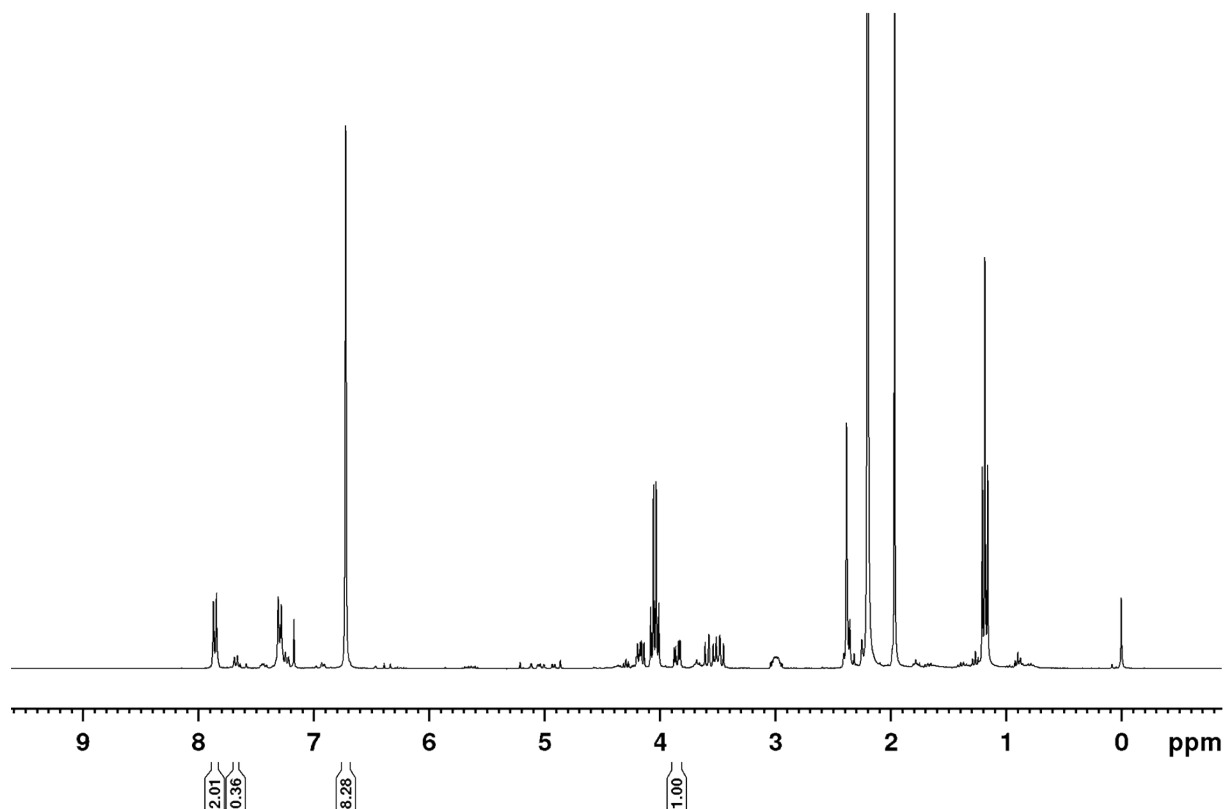


Figure S24. Exemplary NMR-spectrum after the cyclization reaction of **2**.

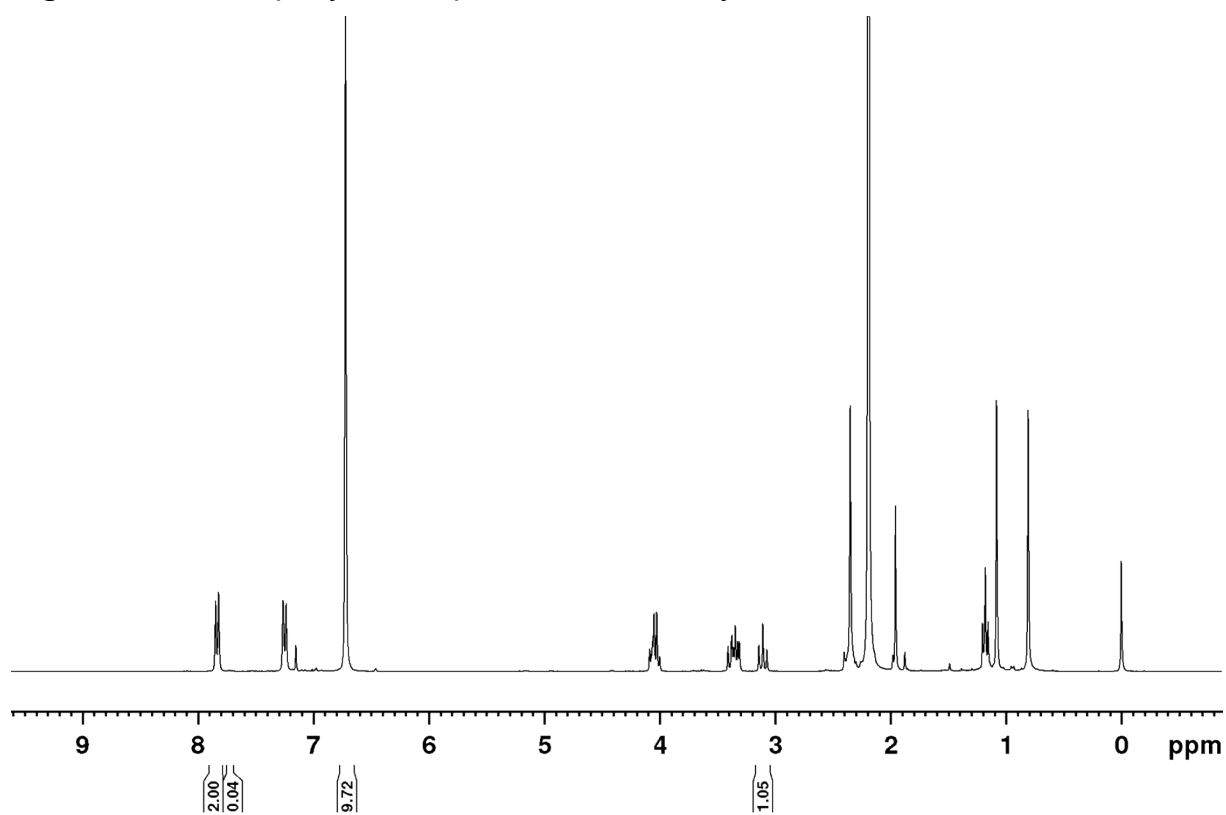


Figure S25. Exemplary NMR-spectrum after the cyclization reaction of **3**.