Supplementary Information

Cellulose-reinforced poly(ethylene-co-vinyl acetate)-supported Ag nanoparticles with excellent catalytic properties: Synthesis of thioamides using the Willgerodt–Kindler reaction

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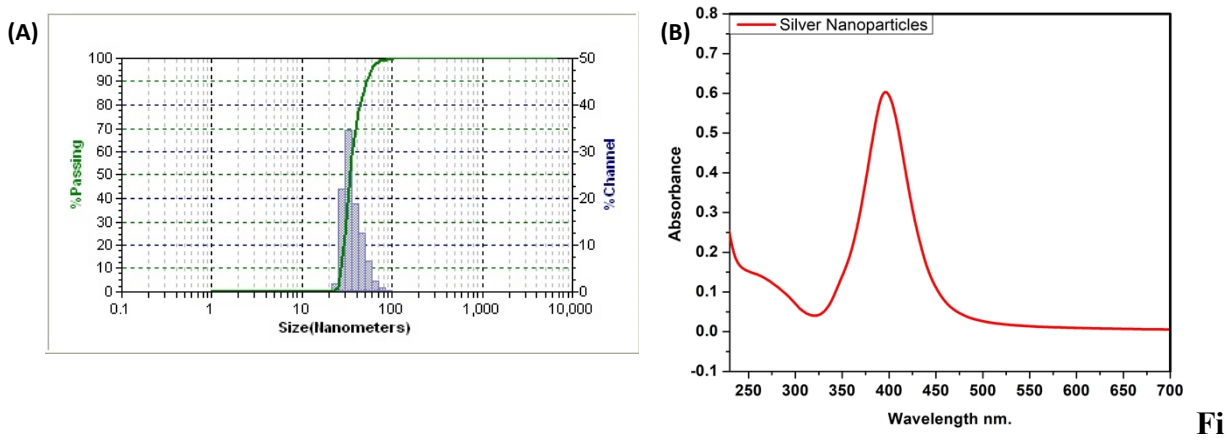


Figure S1. (A) Dynamic light scattering and (B) ultraviolet–visible spectra of Ag nanoparticles.

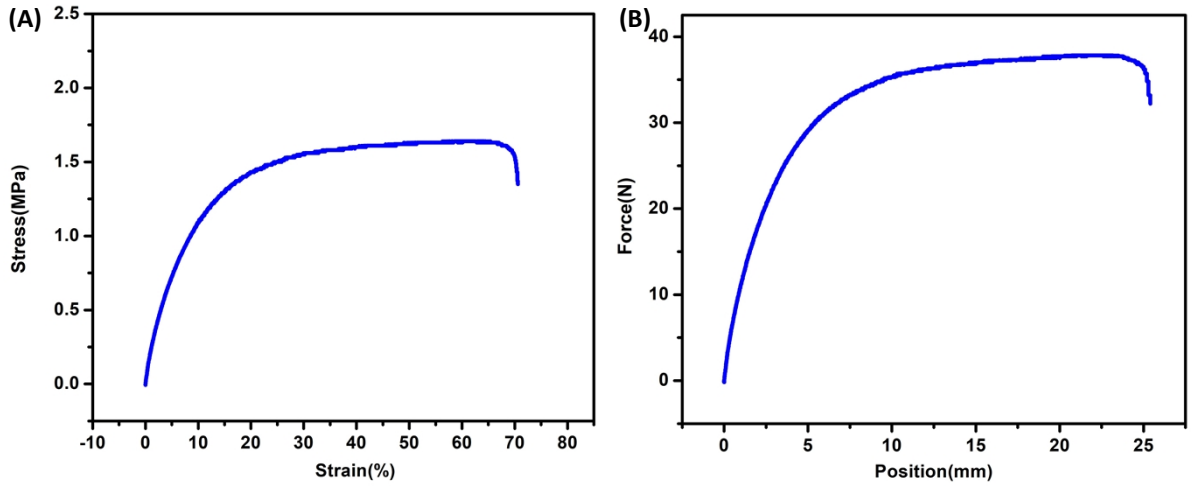


Figure S2. (A) Stress–strain and (B) force–position curves of poly(ethylene-co-vinyl acetate).

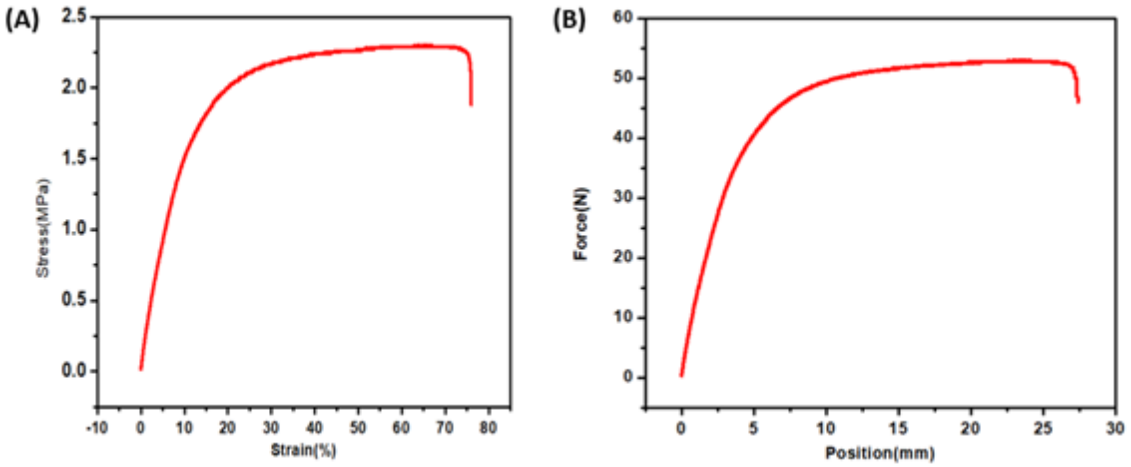


Figure S3. (A) Stress–strain and (B) force–position curves of the cellulose–poly(ethylene-co-vinyl acetate composite.

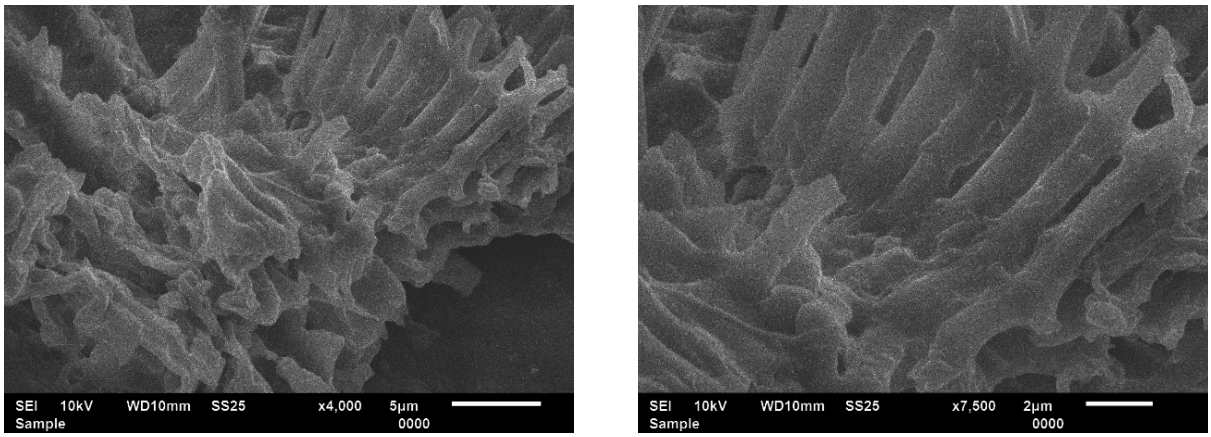


Figure S4. Scanning electron micrographs of the AgNPs@cellulose–PEVA after five catalytic cycles at different magnifications. Here, AgNPs and PEVA denote Ag nanoparticles and poly(ethylene-co-vinyl acetate), respectively.

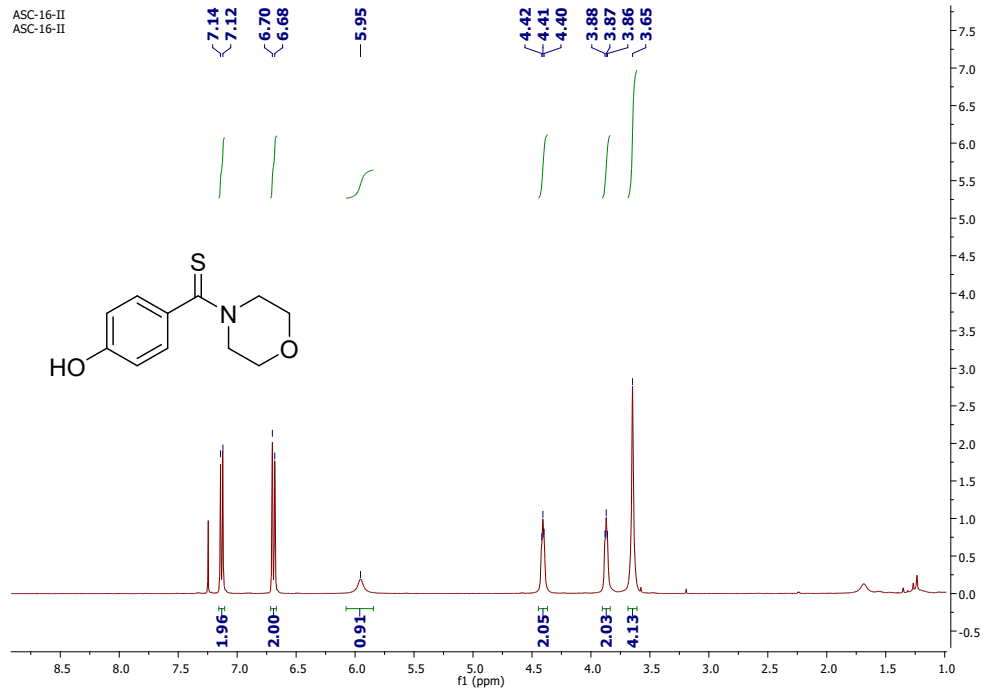


Figure S5. ^{1}H NMR ($CDCl_3$) of **1**.

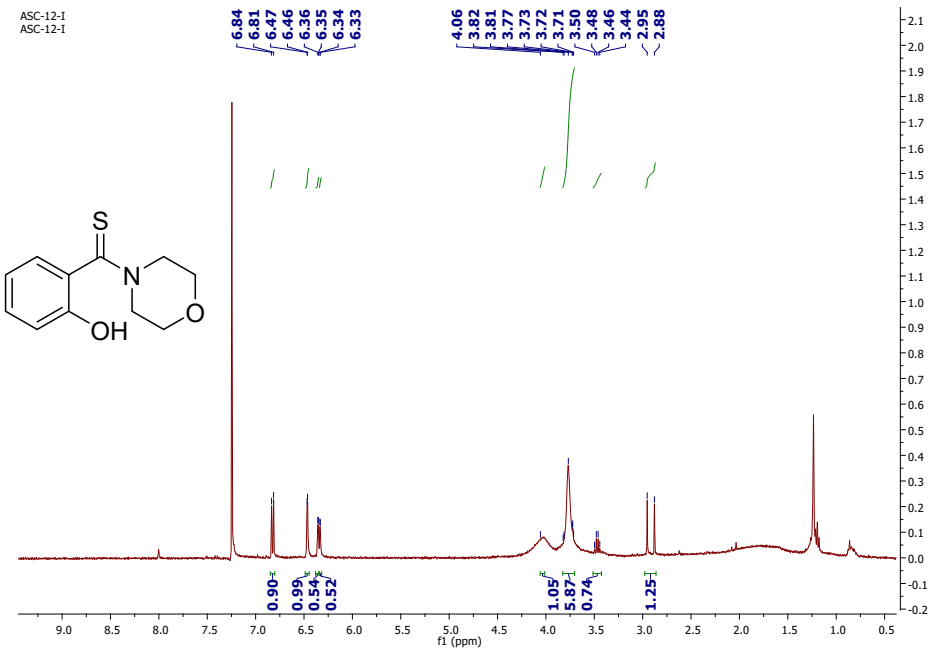


Figure S6. ^{1}H NMR ($CDCl_3$) of **2**.

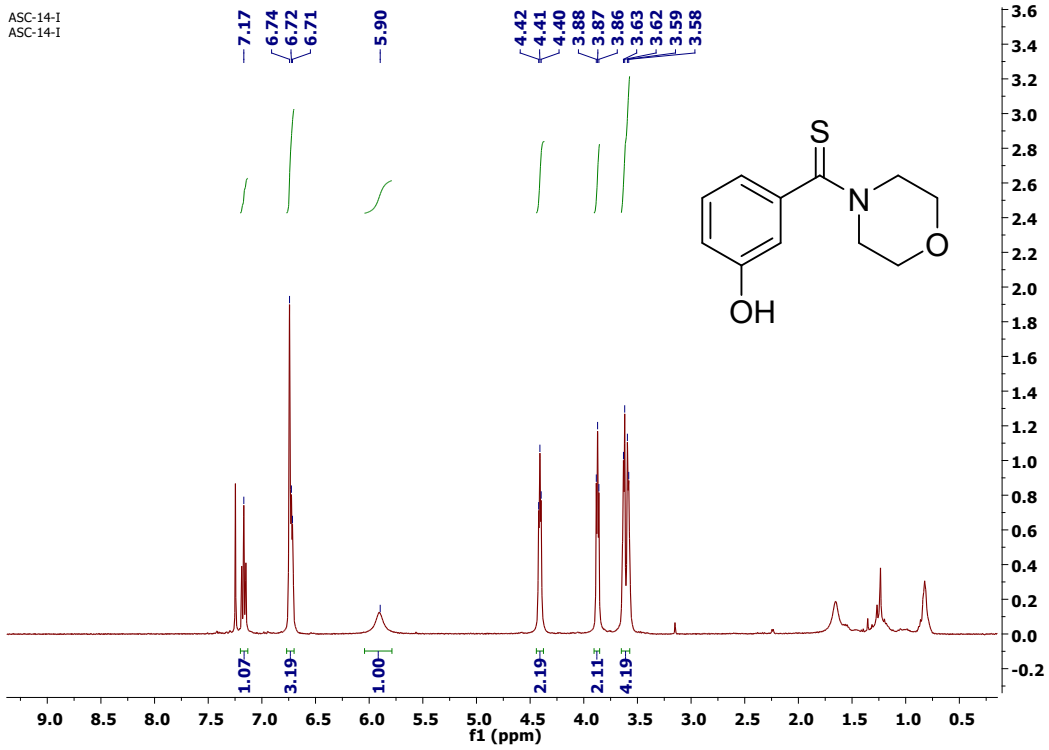


Figure S7. ^{1}H NMR ($CDCl_3$) of **3**.

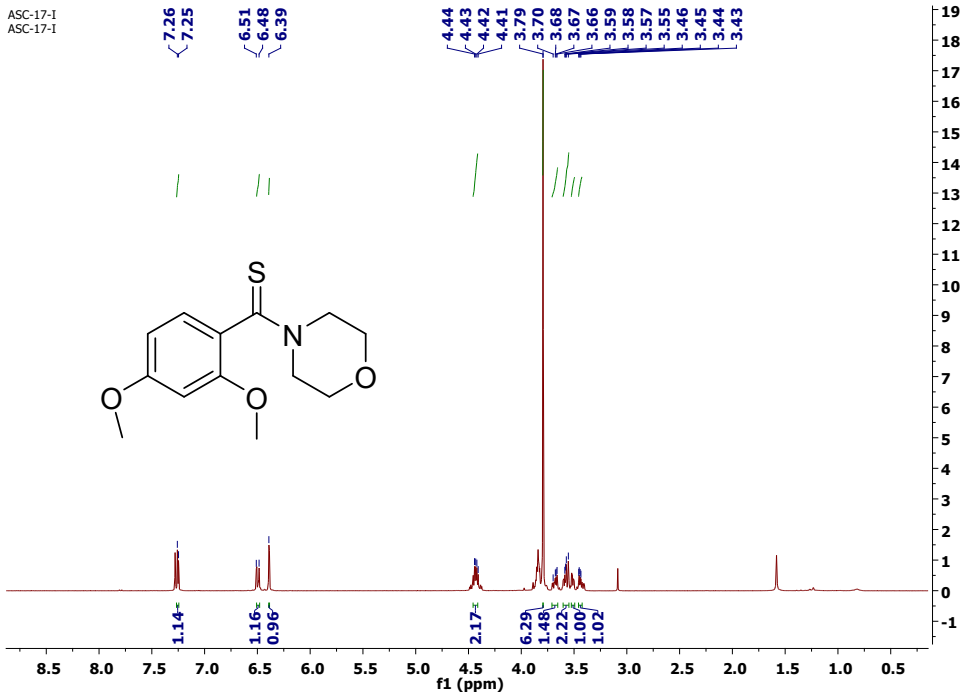


Figure S8. ^{1}H NMR ($CDCl_3$) of **4**.

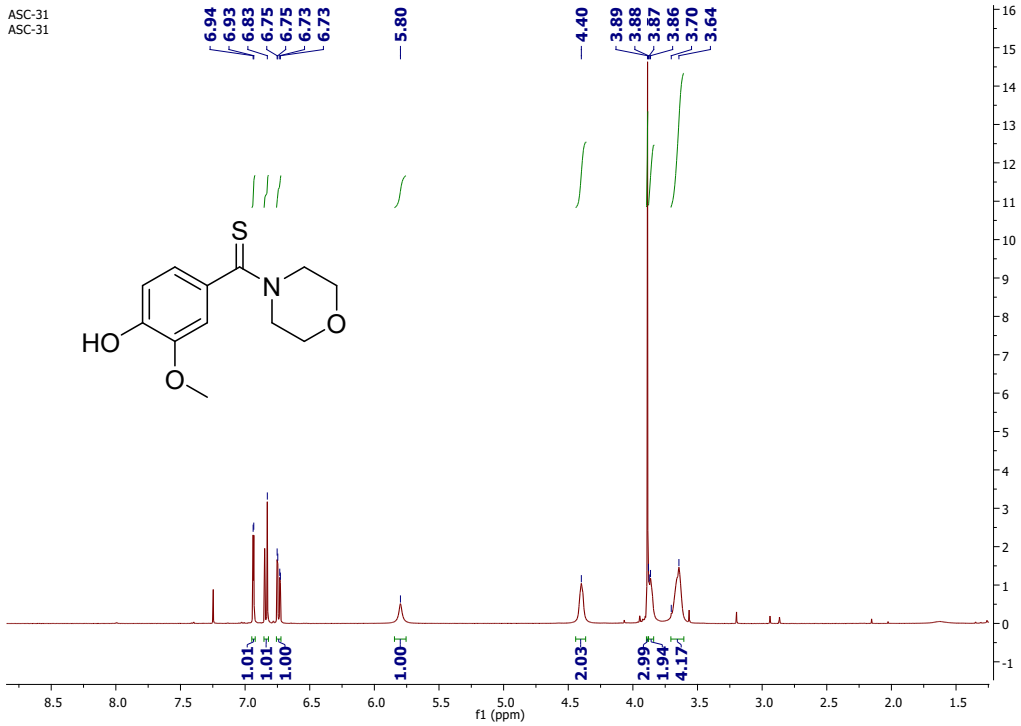


Figure S9. ^{1}H NMR ($CDCl_3$) of **5**.

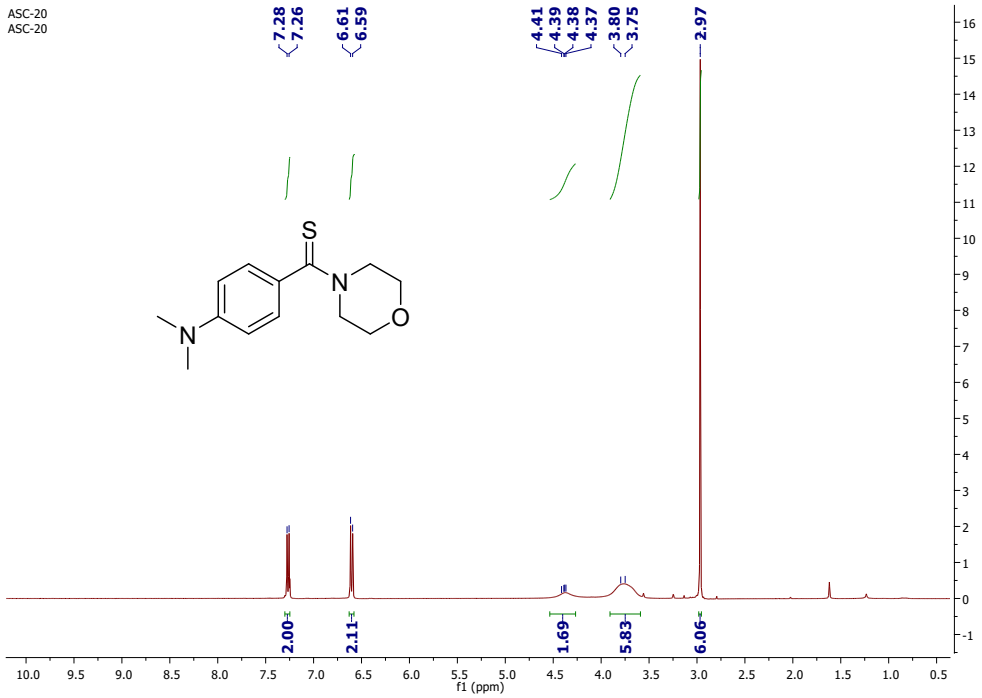


Figure S10. ^{1}H NMR ($CDCl_3$) of **6**.

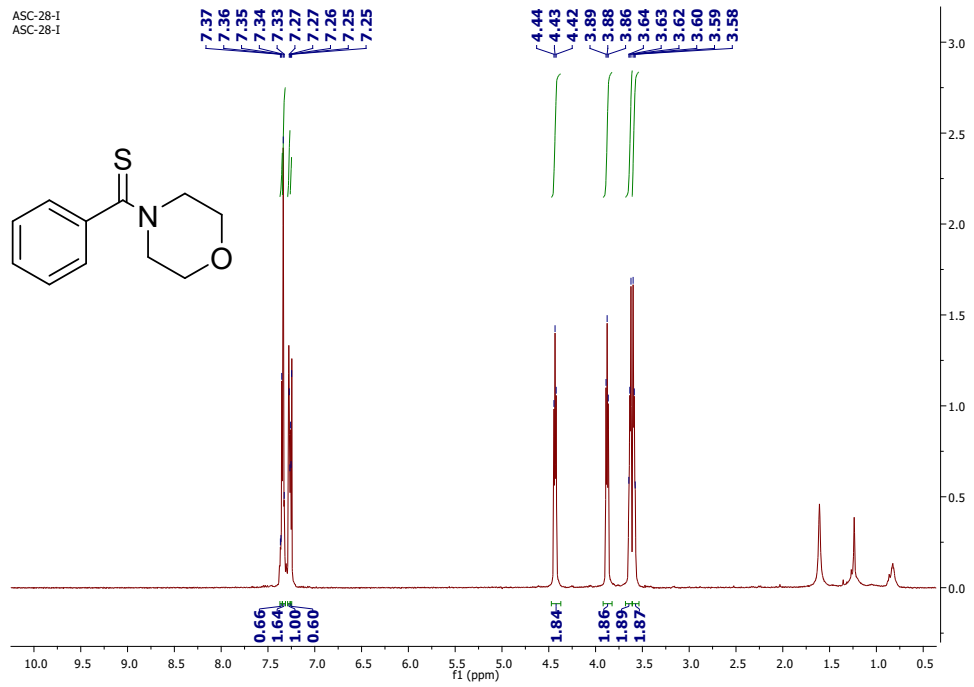


Figure S11. ^{1}H NMR ($CDCl_3$) of **7**.

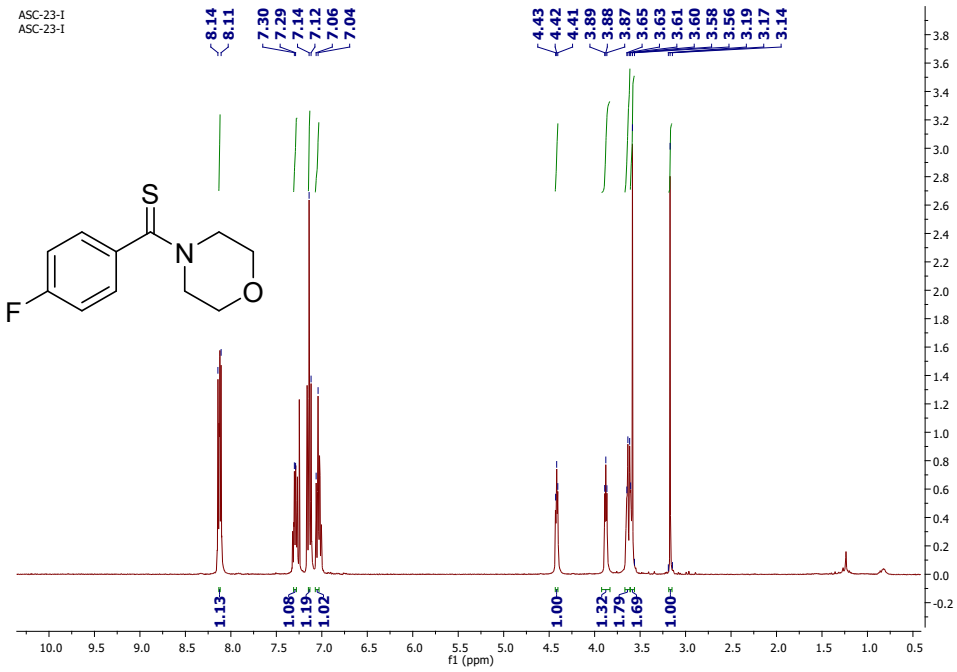


Figure S12. ^{1}H NMR ($CDCl_3$) of **8**.

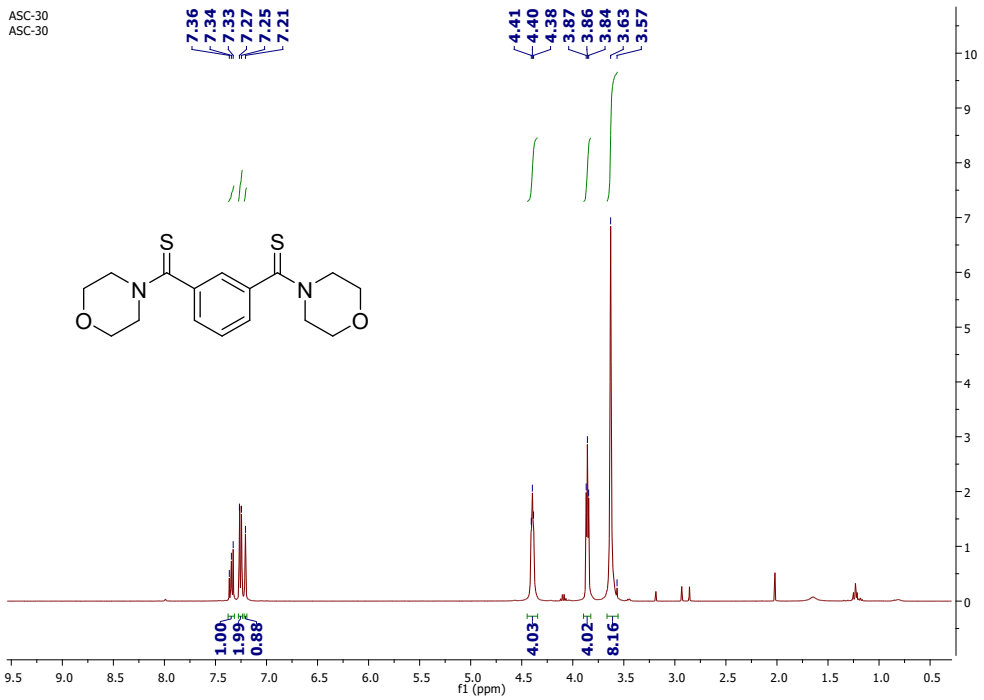


Figure S13. ^{1}H NMR ($CDCl_3$) of **9**.

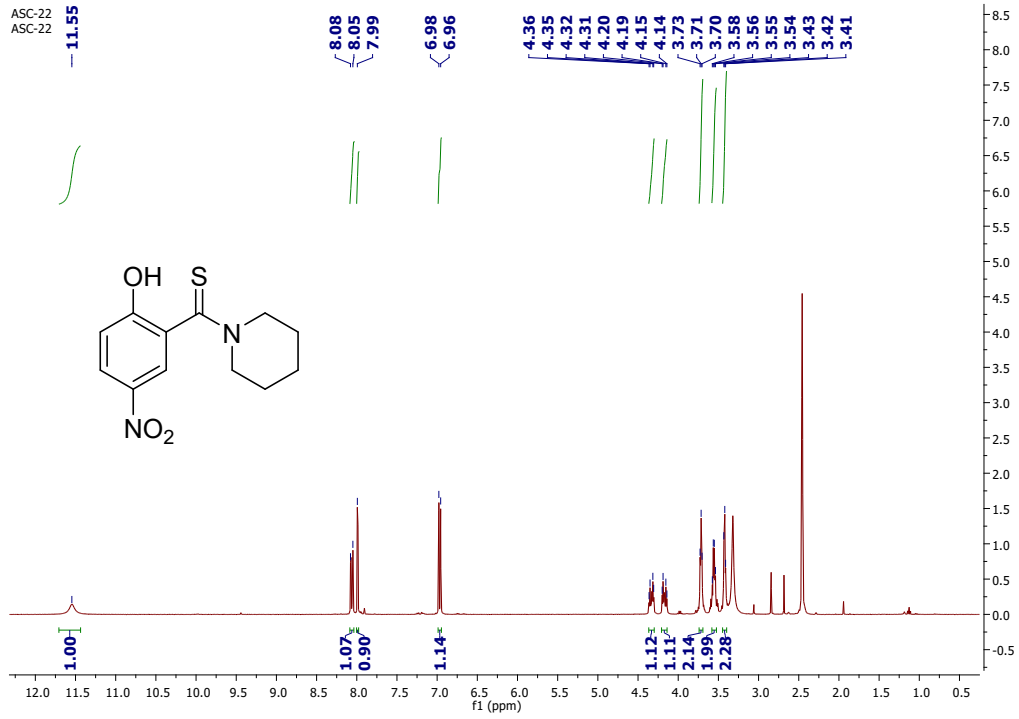


Figure S14. ^{1}H NMR ($CDCl_3$) of **10**.

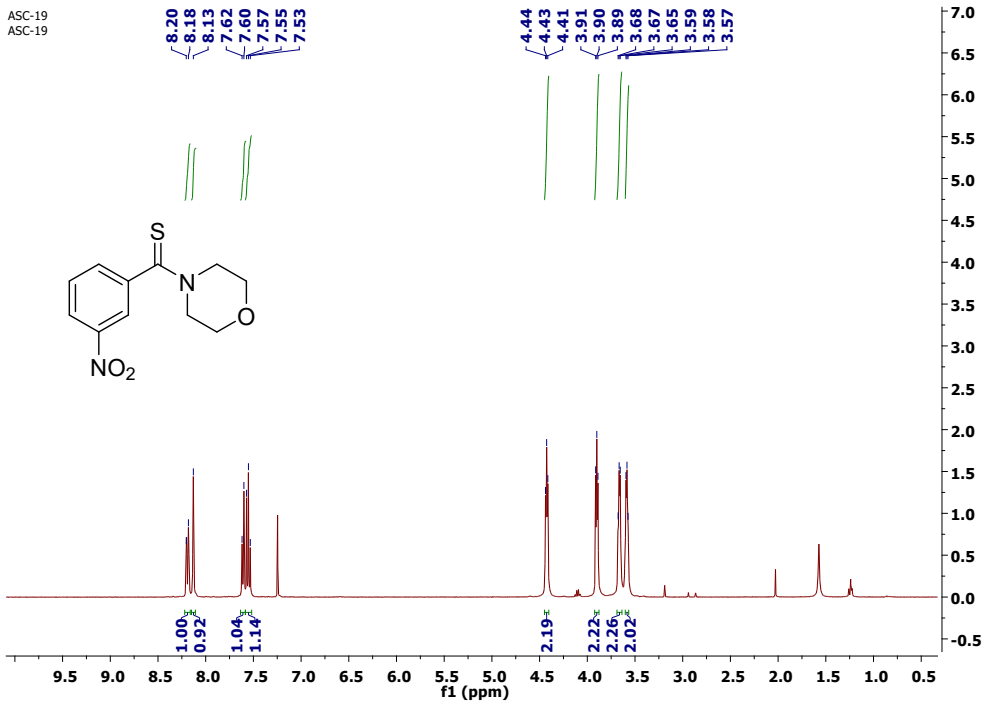


Figure S15. ^{1}H NMR ($CDCl_3$) of **11**.

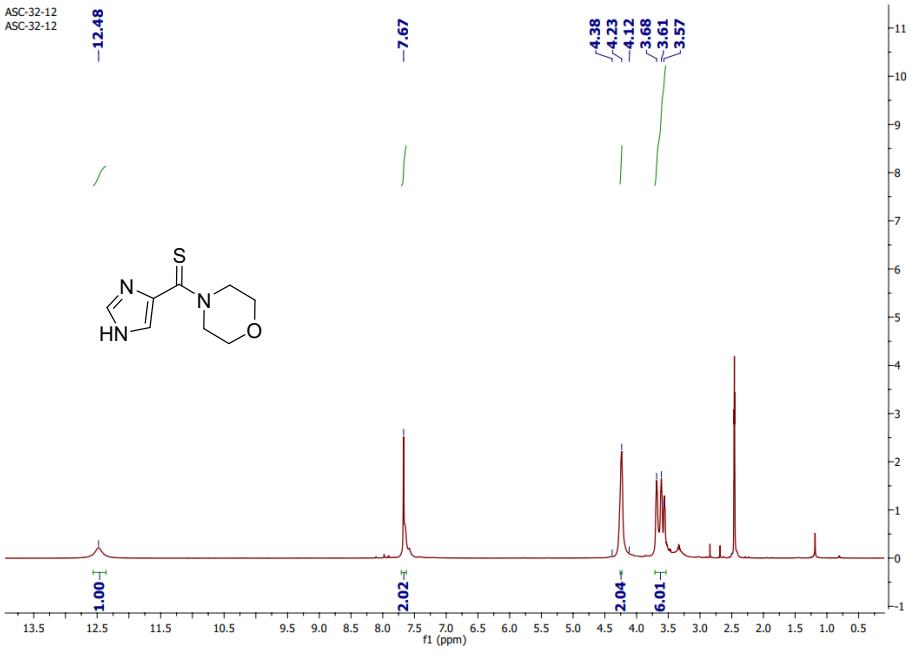


Figure S16. ^{1}H NMR ($CDCl_3$) of **12**.

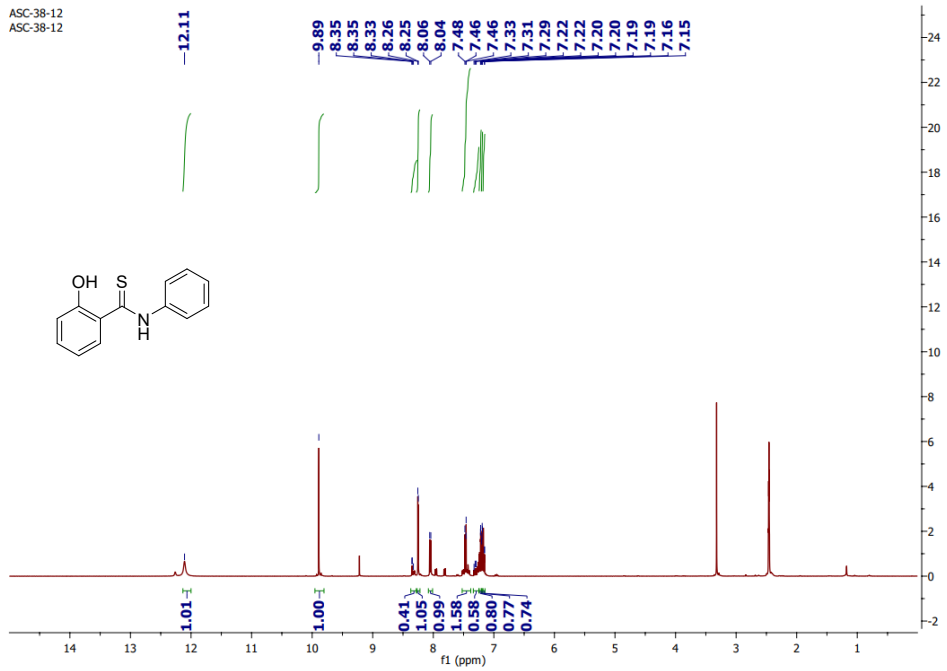


Figure S17. ^{1}H NMR ($CDCl_3$) of **13**.

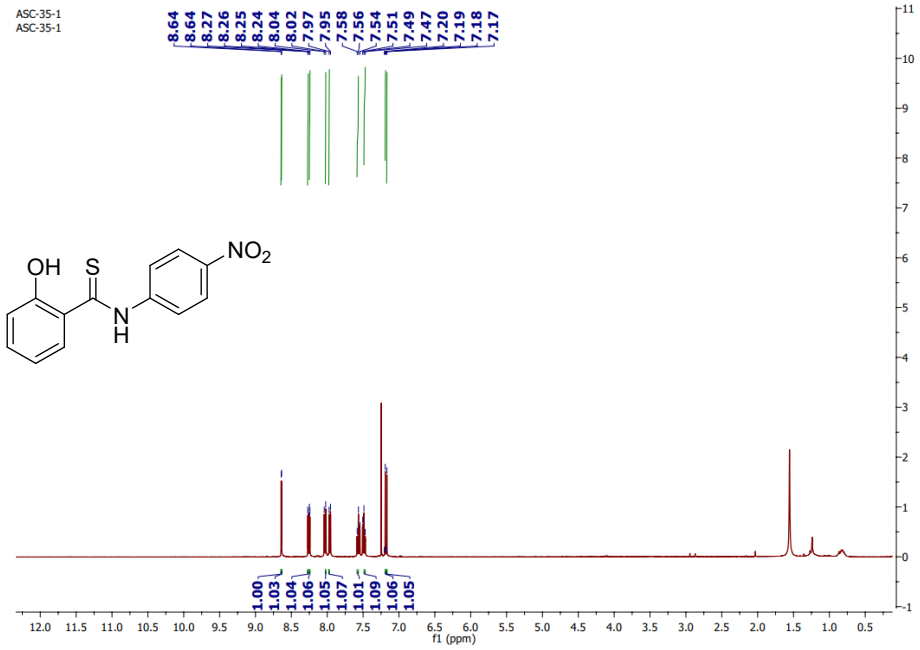


Figure S18. ^{1}H NMR ($CDCl_3$) of **14**.

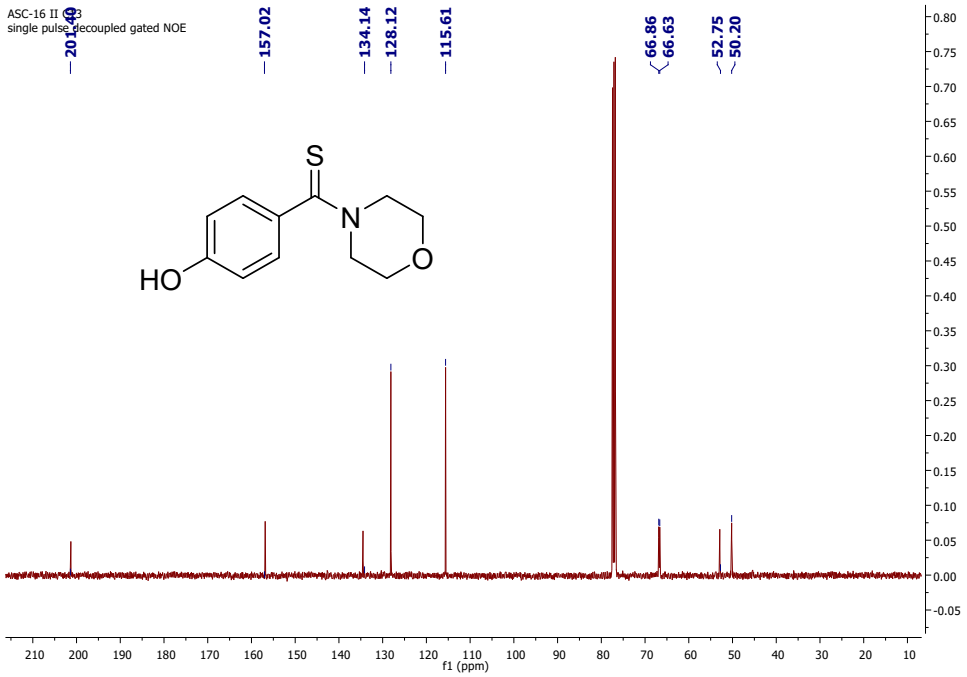


Figure S19. ^{13}C NMR ($CDCl_3$) of **1**.

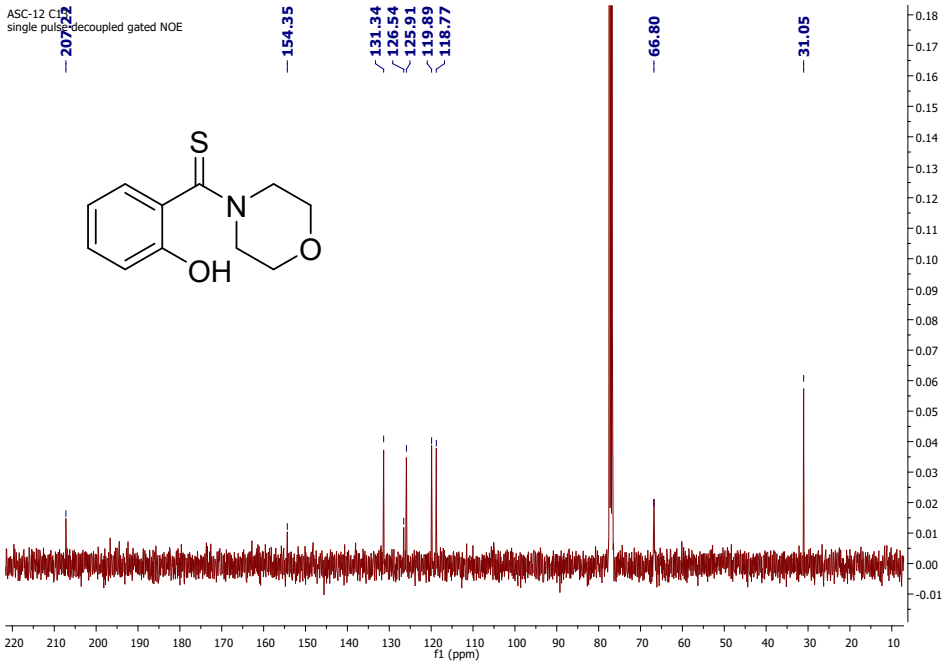


Figure S20. ^{13}C NMR ($CDCl_3$) of **2**.

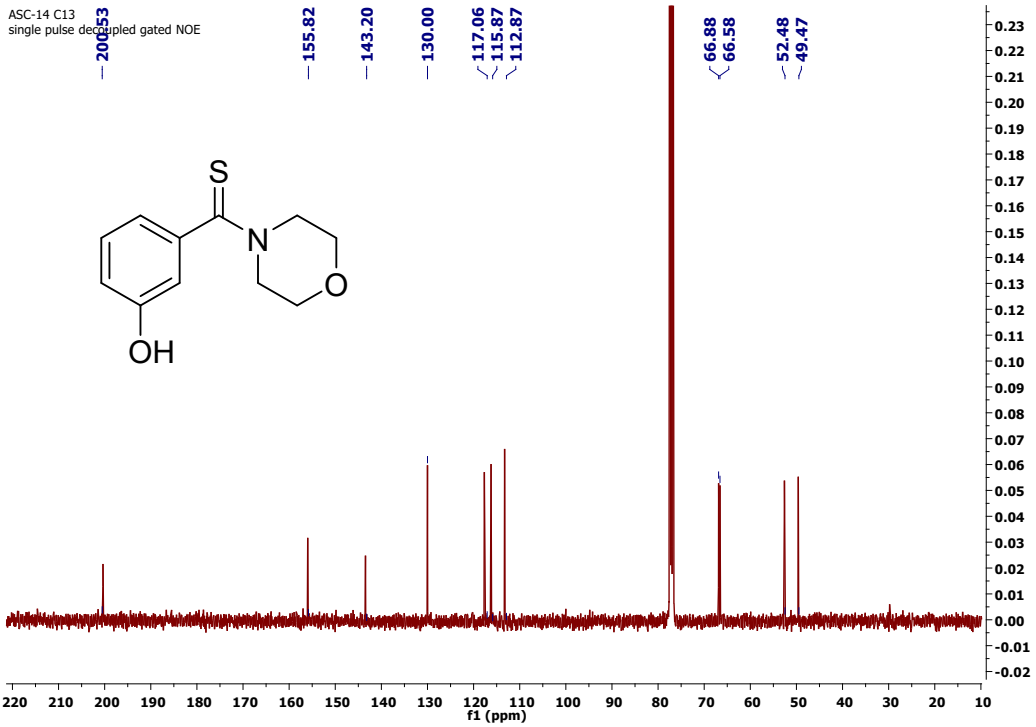


Figure S21. ^{13}C NMR ($CDCl_3$) of **3**.

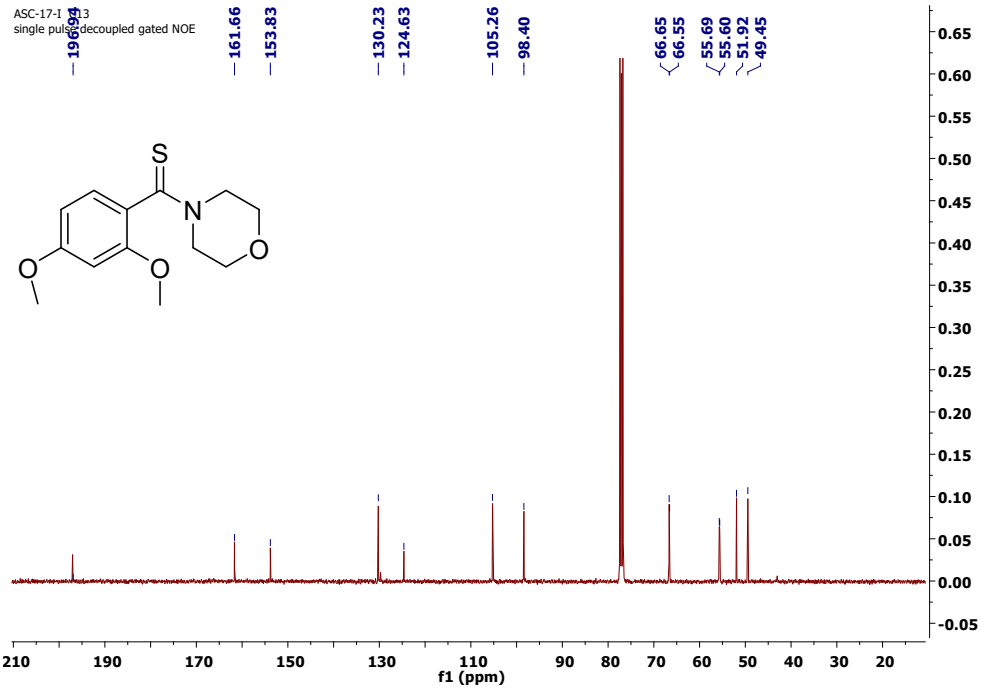


Figure S22. ^{13}C NMR ($CDCl_3$) of **4**.

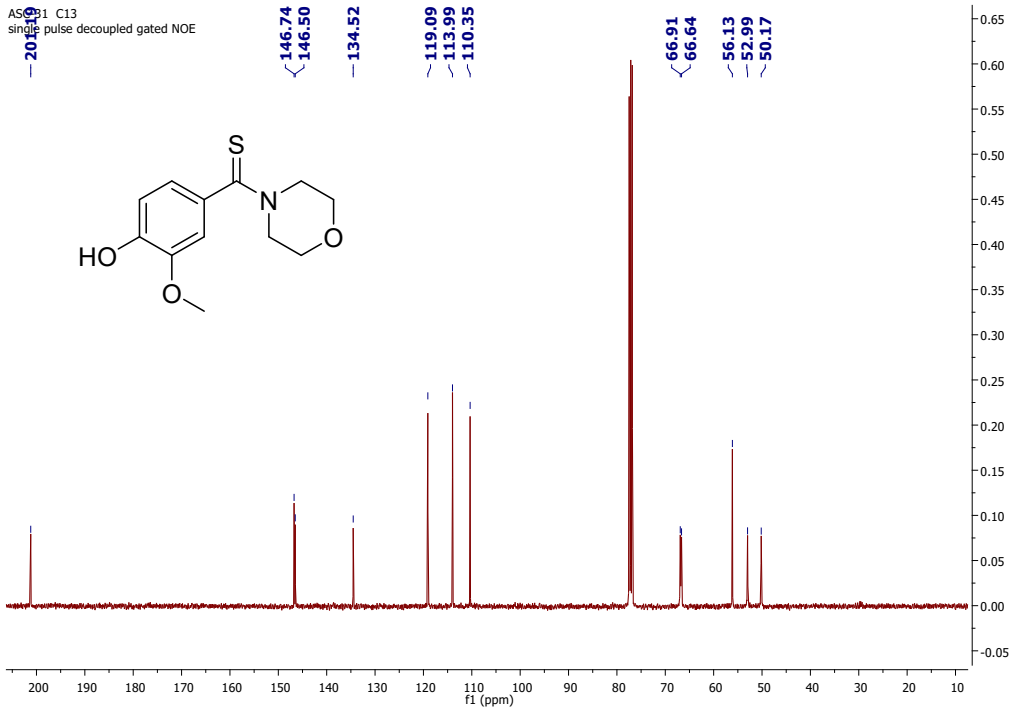


Figure S23. ^{13}C NMR ($CDCl_3$) of **5**.

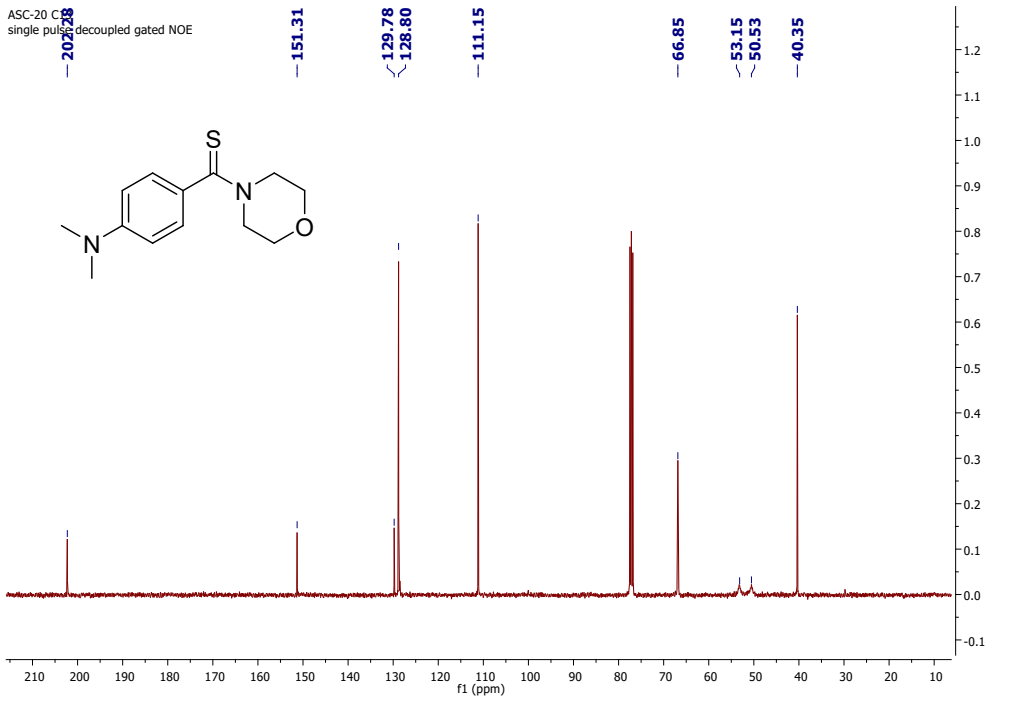


Figure S24. ^{13}C NMR ($CDCl_3$) of **6**.

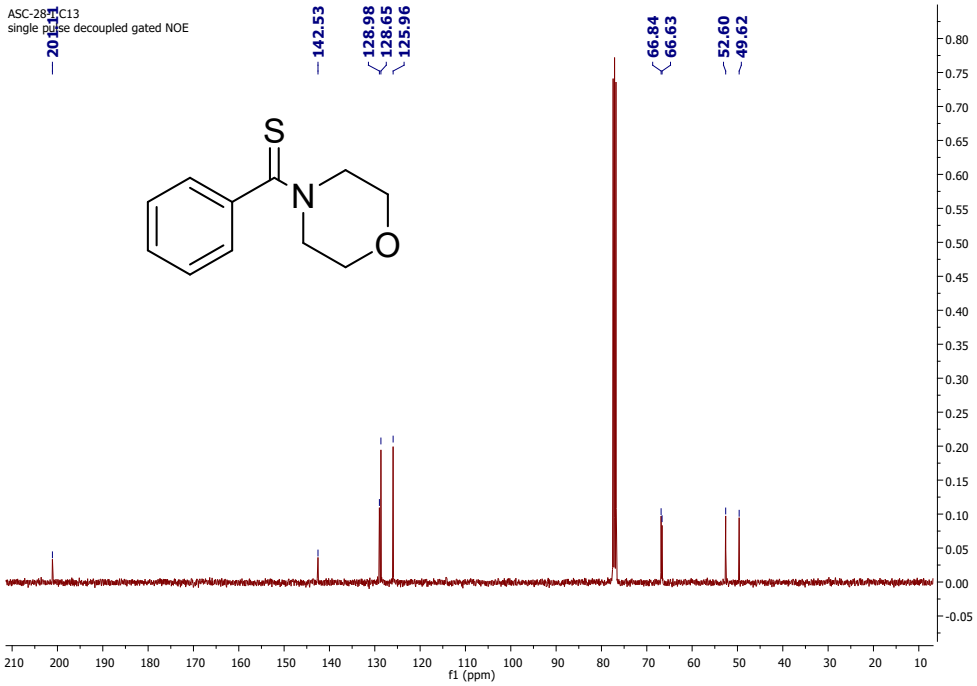


Figure S25. ^{13}C NMR ($CDCl_3$) of **7**.

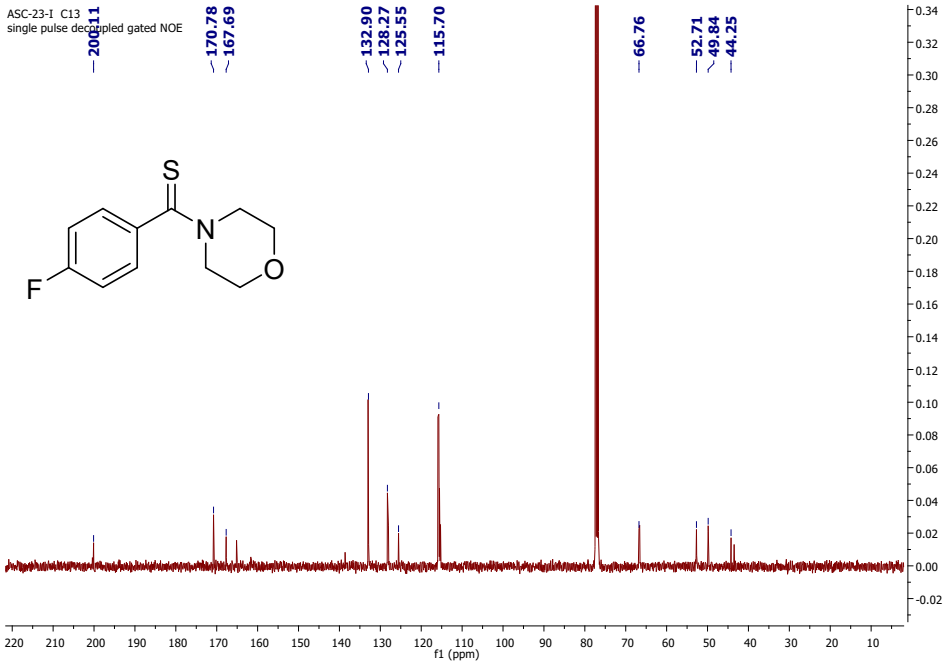


Figure S26. ^{13}C NMR ($CDCl_3$) of **8**.

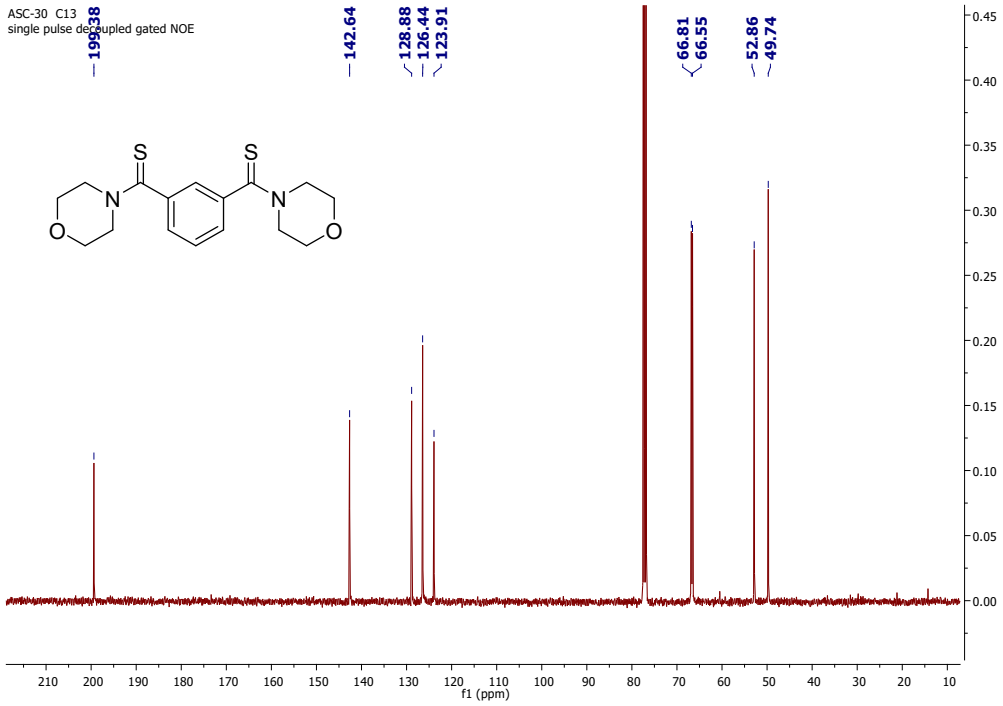


Figure S27. ^{13}C NMR ($CDCl_3$) of **9**.

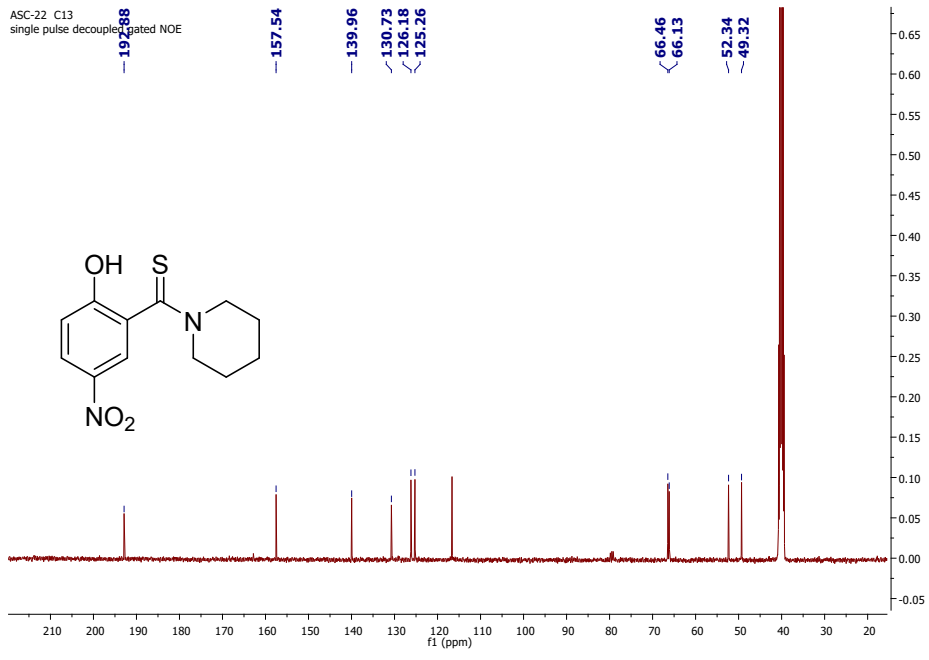


Figure S28. ^{13}C NMR ($CDCl_3$) of **10**.

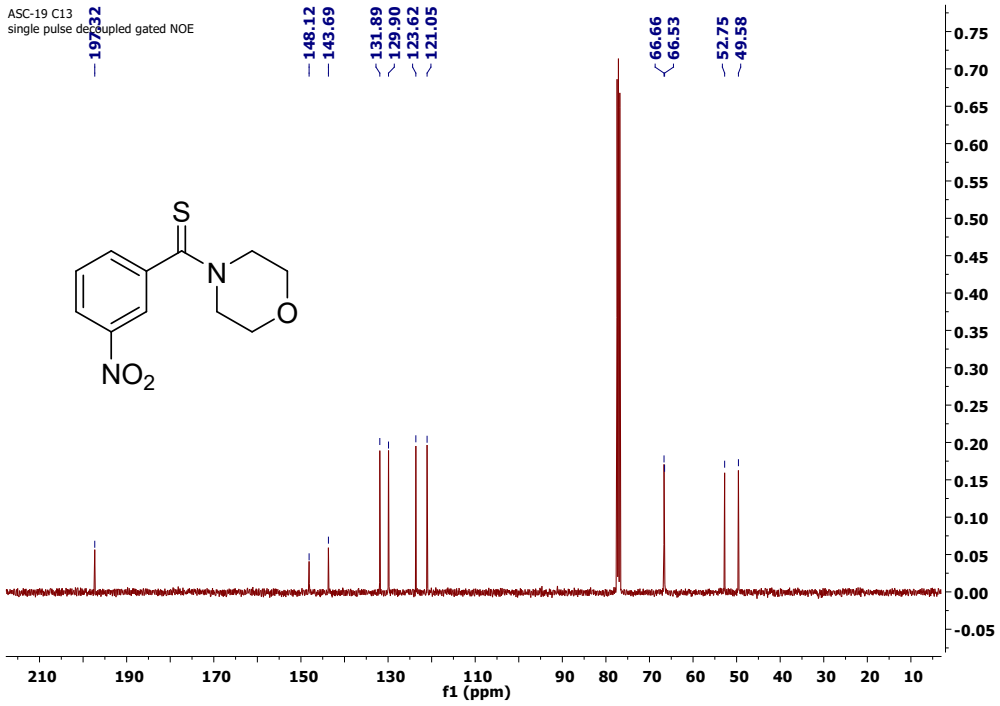


Figure S29. ^{13}C NMR ($CDCl_3$) of **11**.

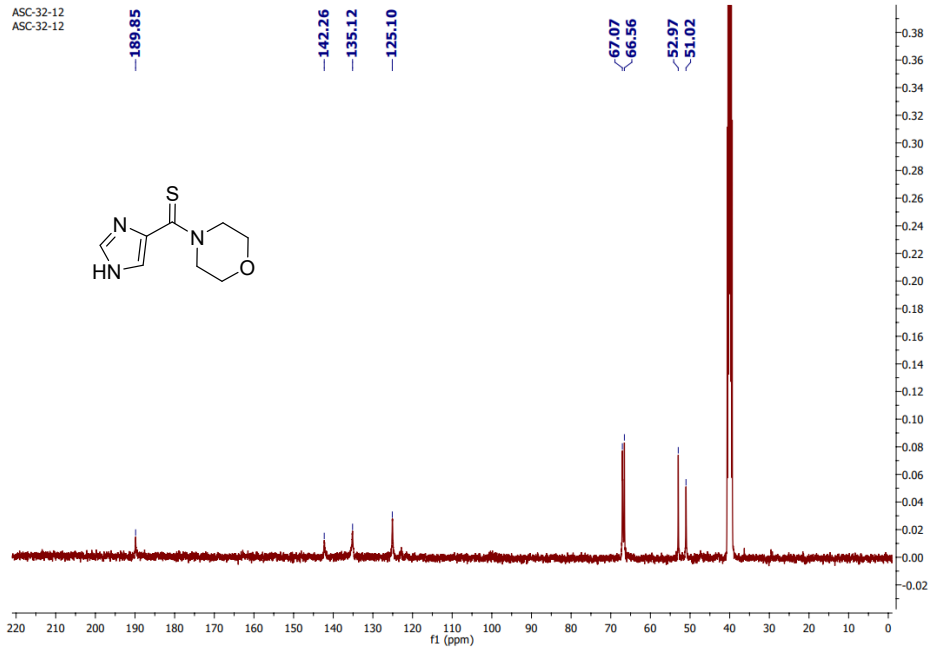


Figure S30. ^{13}C NMR ($CDCl_3$) of **12**.

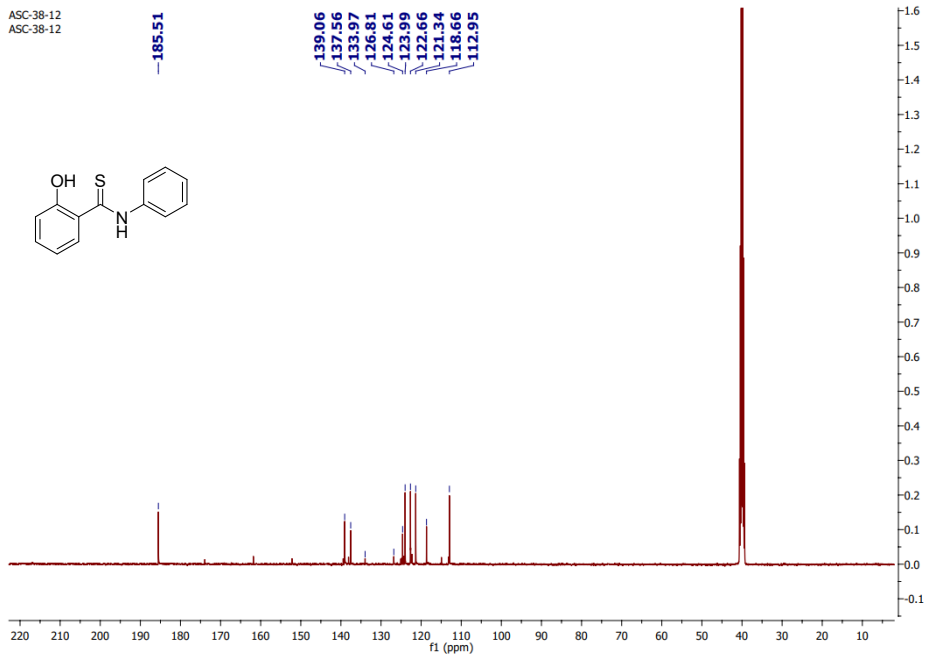


Figure S31. ^{13}C NMR ($CDCl_3$) of **13**.

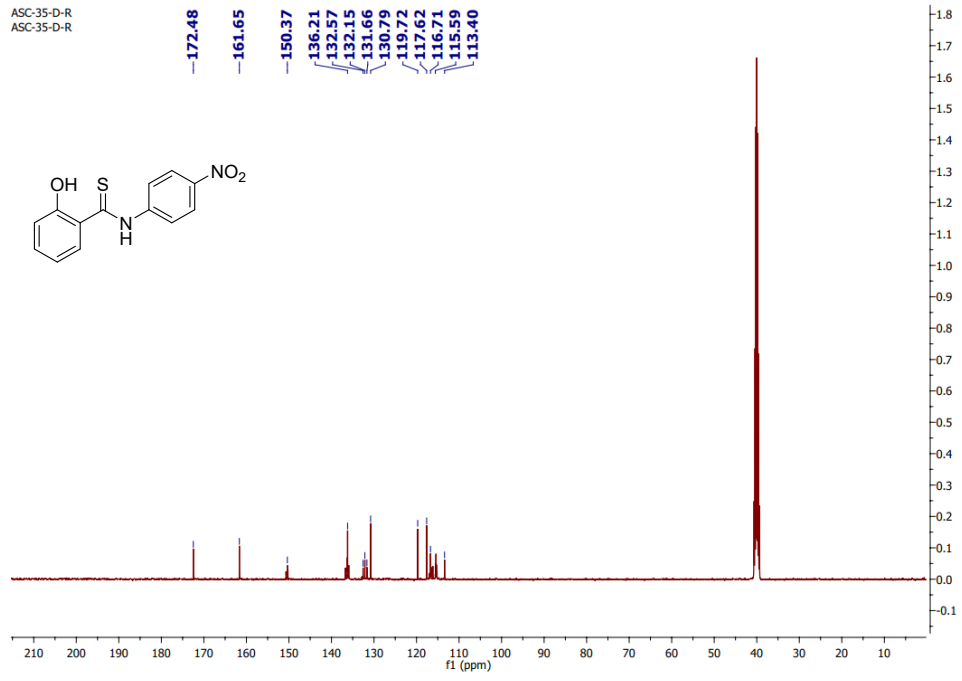


Figure S32. ^{13}C NMR ($CDCl_3$) of **14**.

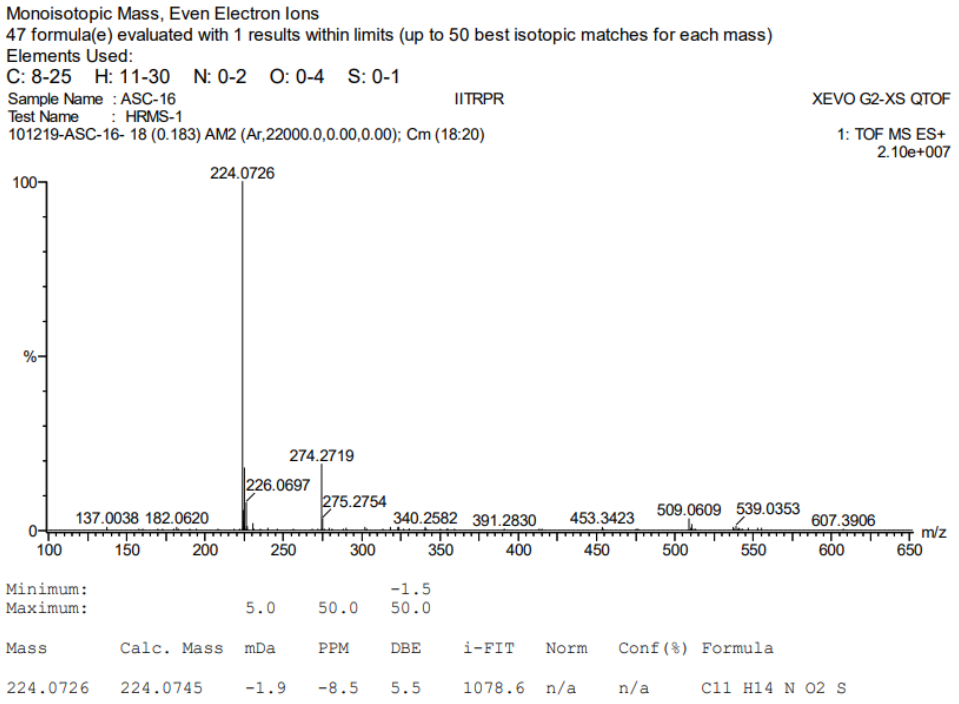


Figure S33. HRMS of **1**.

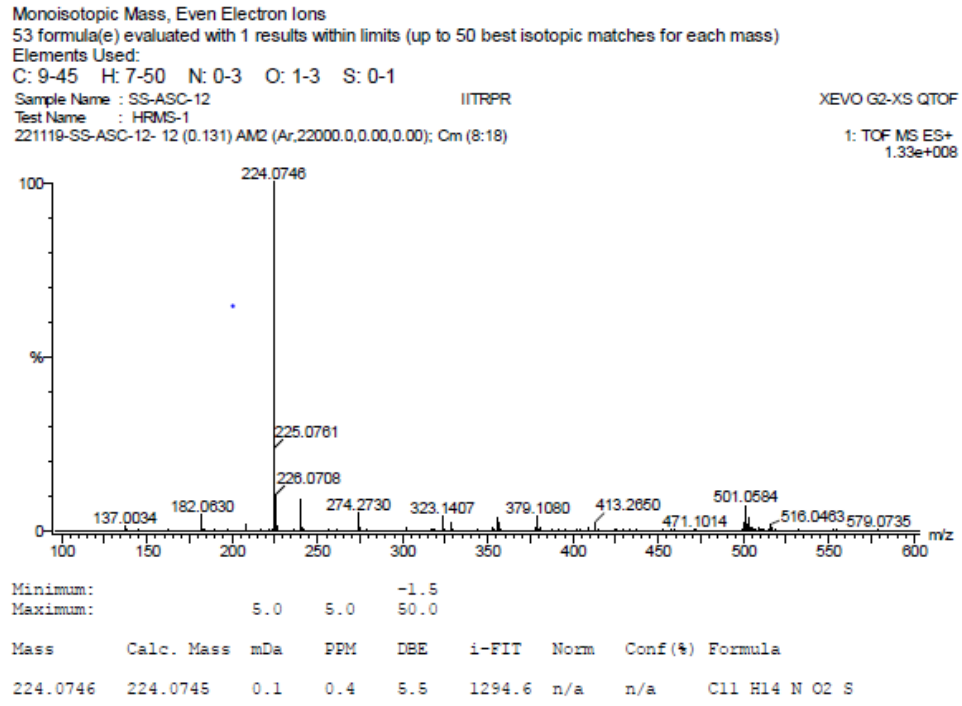


Figure S34. HRMS of **2**.

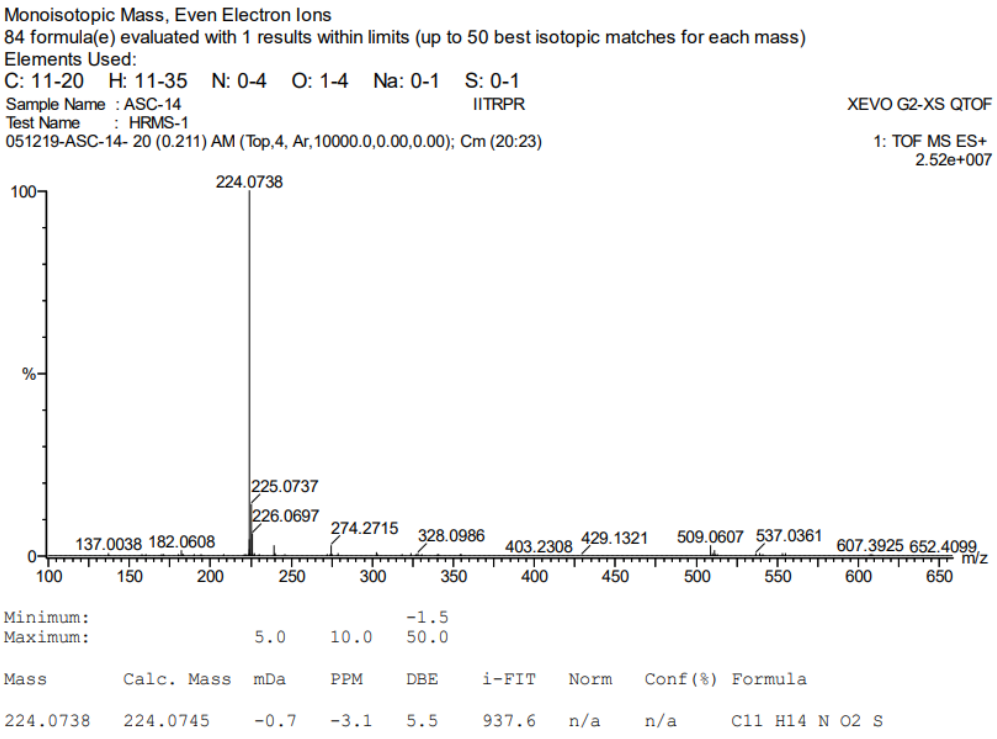


Figure S35. HRMS of **3**.

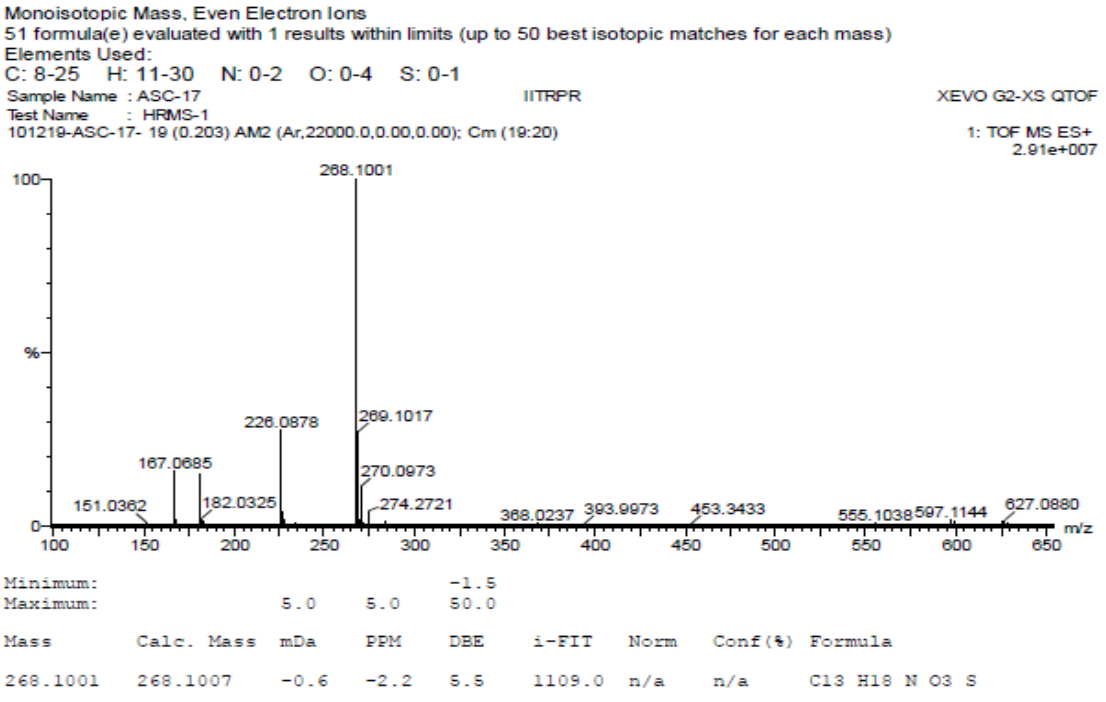


Figure S36. HRMS of **4**.

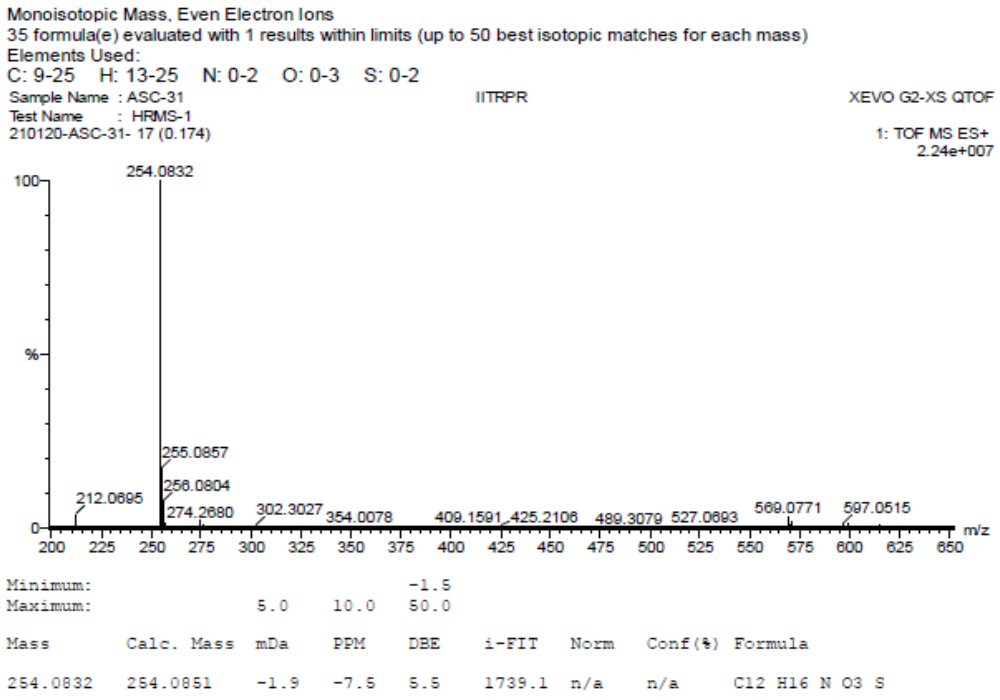


Figure S37. HRMS of **5**.

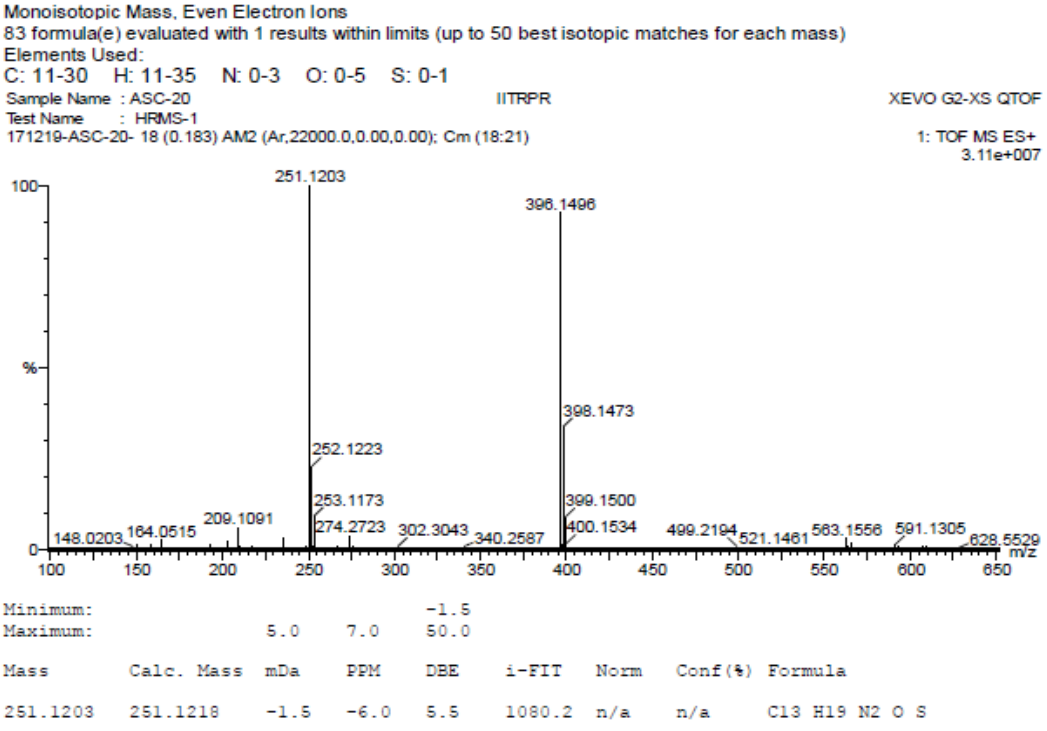


Figure S38. HRMS of **6**.

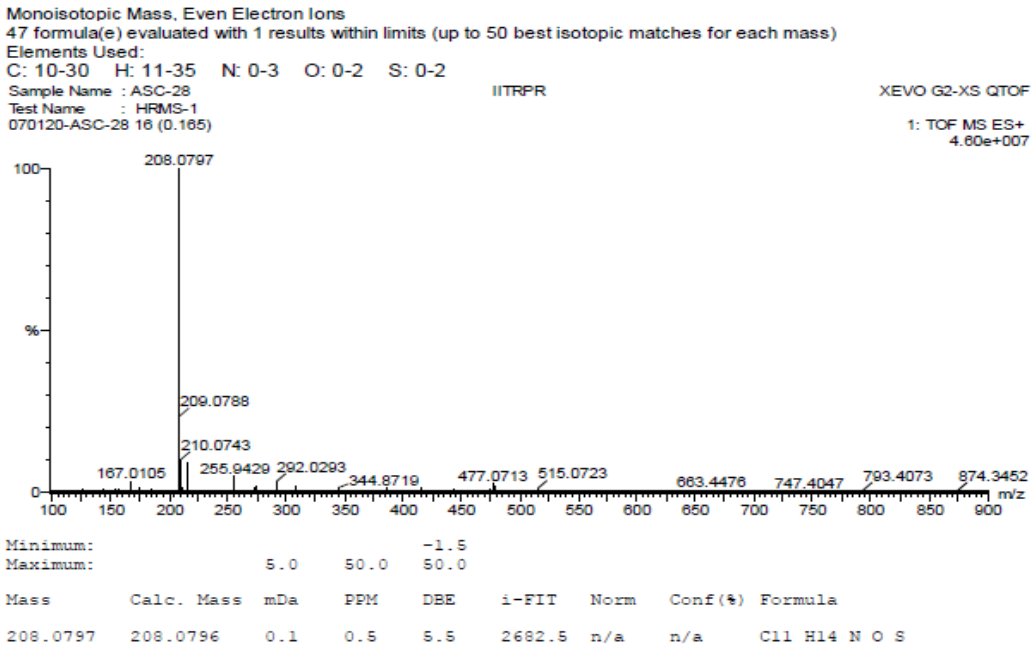


Figure S39. HRMS of **7**.

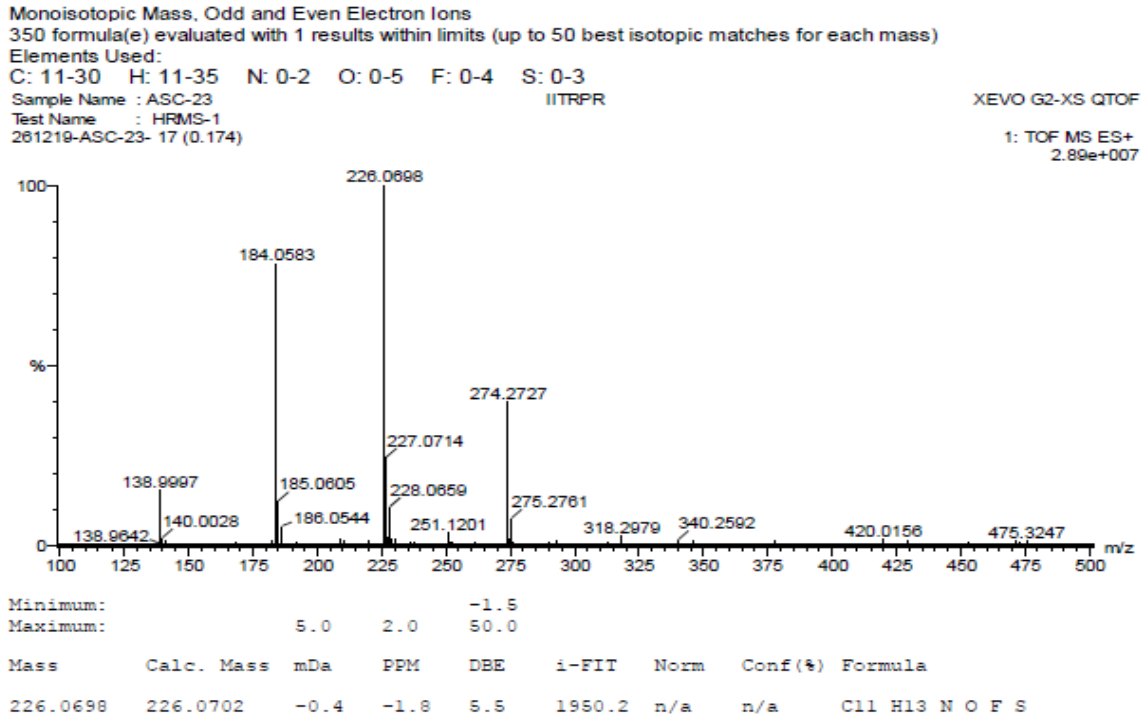
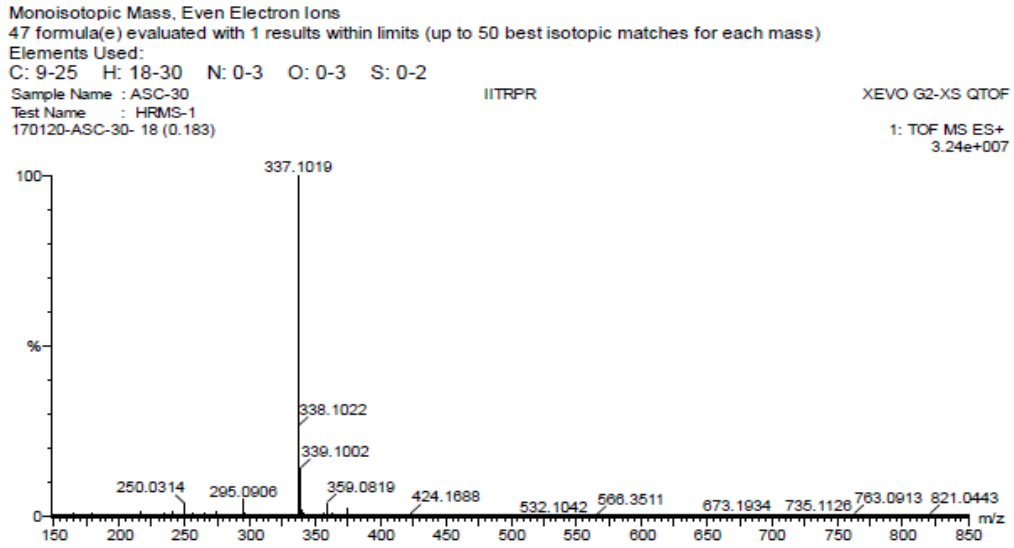
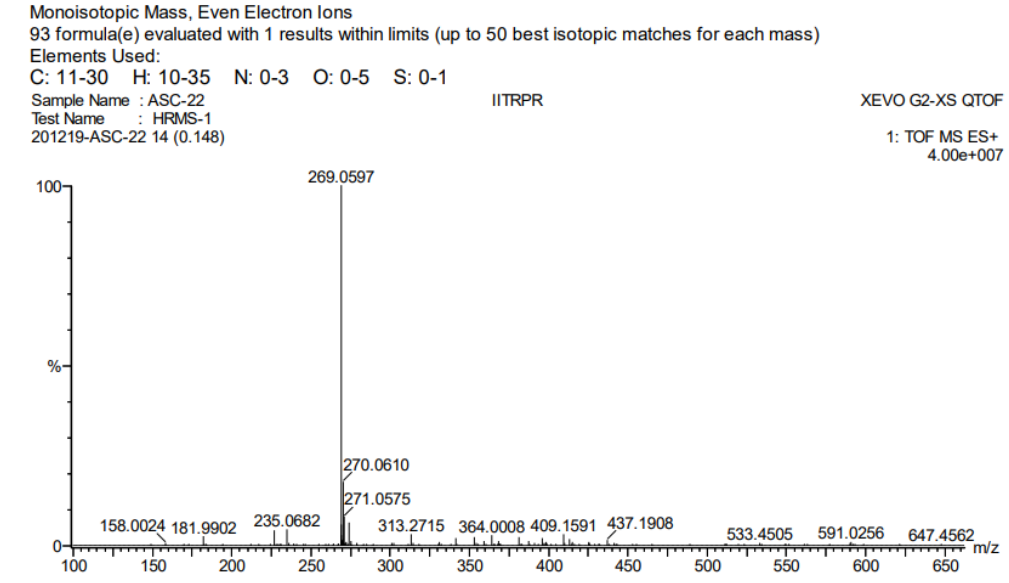


Figure S40. HRMS of **8**.



Minimum:				-1.5				
Maximum:		5.0	8.0	50.0				
Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Norm	Conf(%)	Formula
337.1019	337.1044	-2.5	-7.4	7.5	1848.1	n/a	n/a	C16 H21 N2 O2 S2

Figure S41. HRMS of **9**.



Minimum:				-1.5				
Maximum:		5.0	5.0	50.0				
Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Norm	Conf(%)	Formula
269.0597	269.0596	0.1	0.4	6.5	1219.1	n/a	n/a	C11 H13 N2 O4 S

Figure S42. HRMS of **10**.

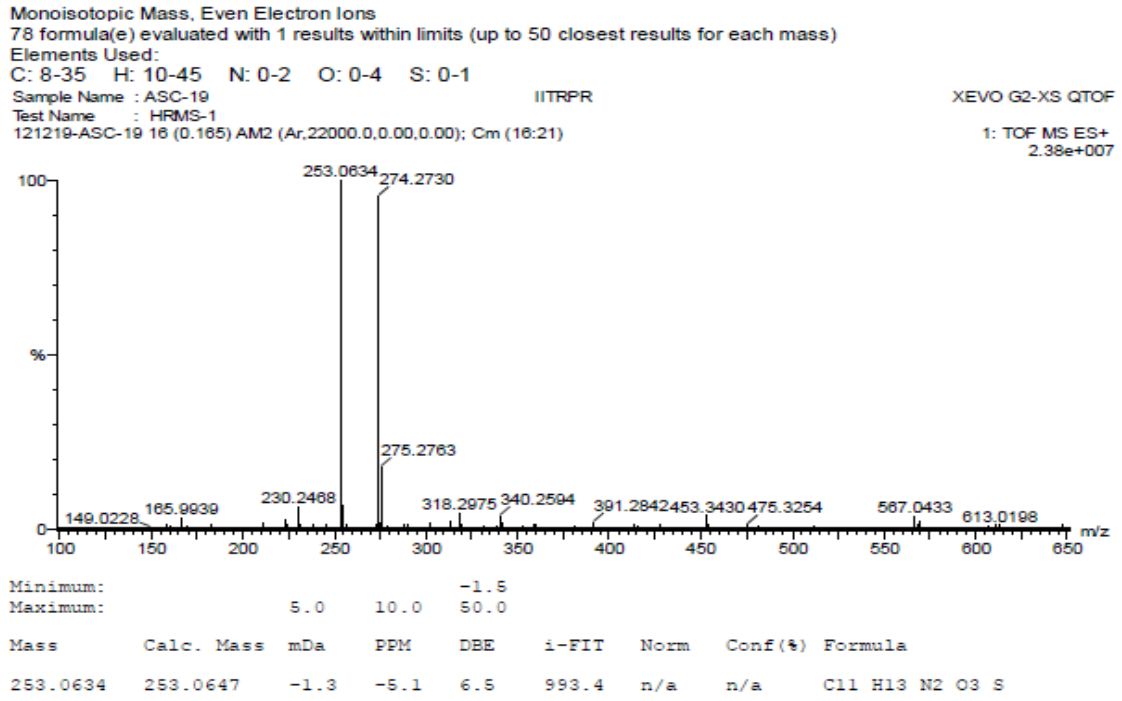


Figure S43. HRMS of **11**.

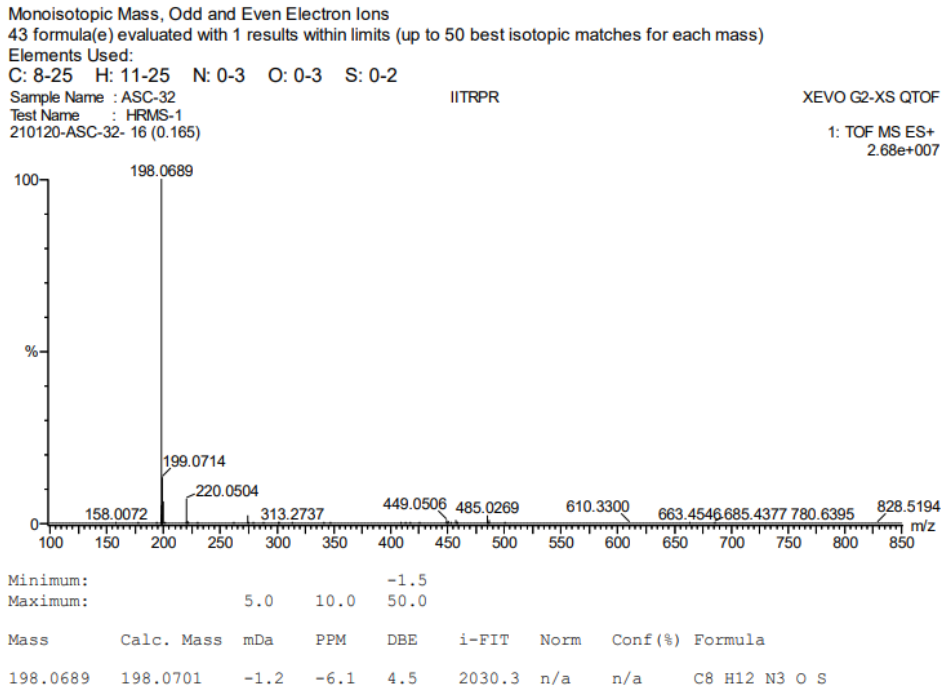


Figure S44. HRMS of **12**.

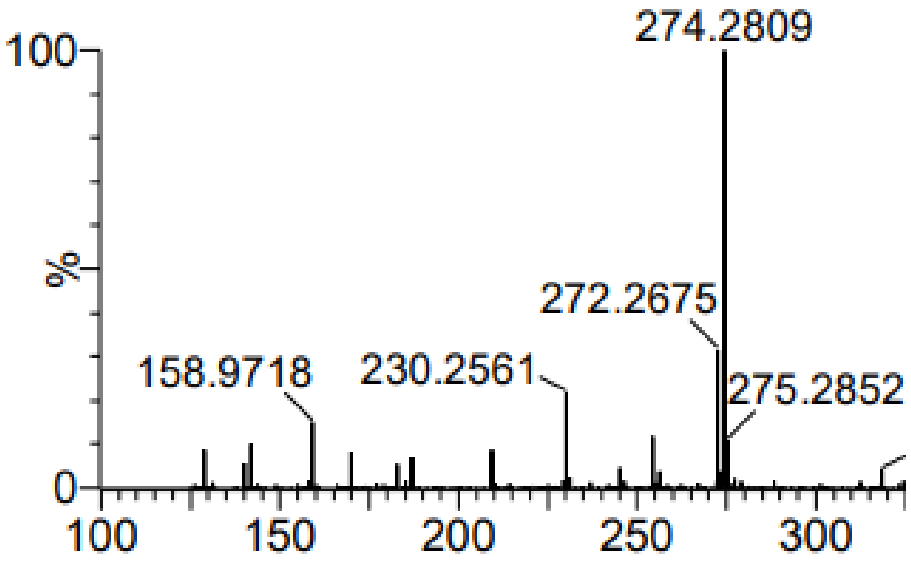


Figure S45. HRMS of **13**.

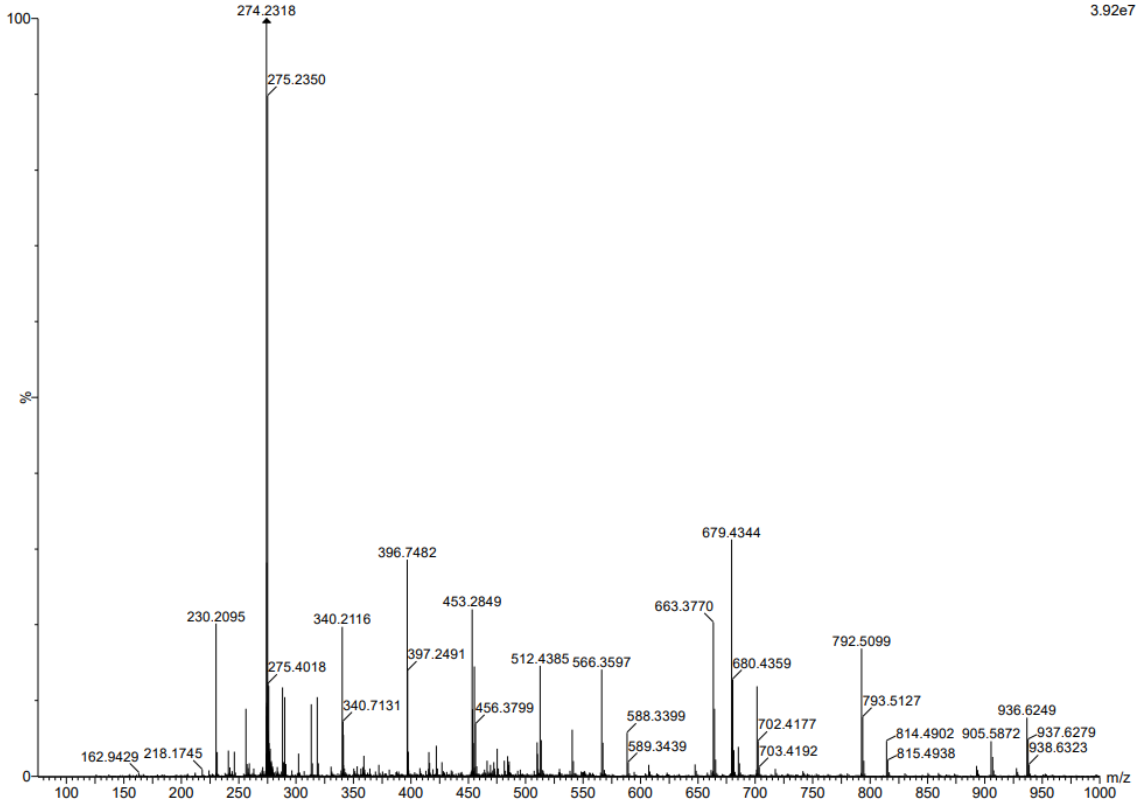


Figure S46. HRMS of **14**.

Table S1. Impact energies of the AgNPs@cellulose–PEVA hybrid catalyst in the Izod and Charpy modes. Here, AgNPs and PEVA denote Ag nanoparticles and poly(ethylene-co-vinyl acetate), respectively.

Entry	Mode	Energy (kJ/m)	Degree
1	Izod	1.865	123
2	Charpy	5.939	81

Table S2. Yields of several reported catalysts for the synthesis of thioamides. Here, AgNPs and PEVA denote Ag nanoparticles and poly(ethylene-co-vinyl acetate), respectively.

Entry	Catalyst	Time (h)	Yield (%)	Reference
1	Pyridine	24	86	[1]
2	-	70	68	[2]
3	Metal complex	18	82	[3]
4	$K_2S_2O_8$	4	51	[4]
5	AgNPs@cellulose–PEVA	2.5	98	This study

References

1. T. B. Nguyen, M. Q. Tran, L. Ermolenko, A. Al-Mourabit, , *Org. Lett.*, 2014, **16**, 310–313. DOI:10.1021/ol403345e.

2. M. Patra, J. Hess, S. Konatschnig, B. Spingler, G. Gasser, , *Organometallics*, 2013, **32**, 6098–6105. DOI:10.1021/om400715m.

3. X. Wang, M. Ji, S. Lim, H. Y. Jang, , *J. Org. Chem.*, 2014, **79**, 7256–7260. DOI:10.1021/jo501378v.

4. J. Wei, Y. Li, X. Jiang, , *Org. Lett.*, 2016, **18**, 340–343. DOI:10.1021/acs.orglett.5b03541.