

Supplementary Materials

Cyanide Anion Determination Based on Nucleophilic Addition to 6-[(*E*)-(4-Nitrophenyl)diazenyl]-1',3,3',4-tetrahydrospiro[chromene-2,2'-indole] Derivatives

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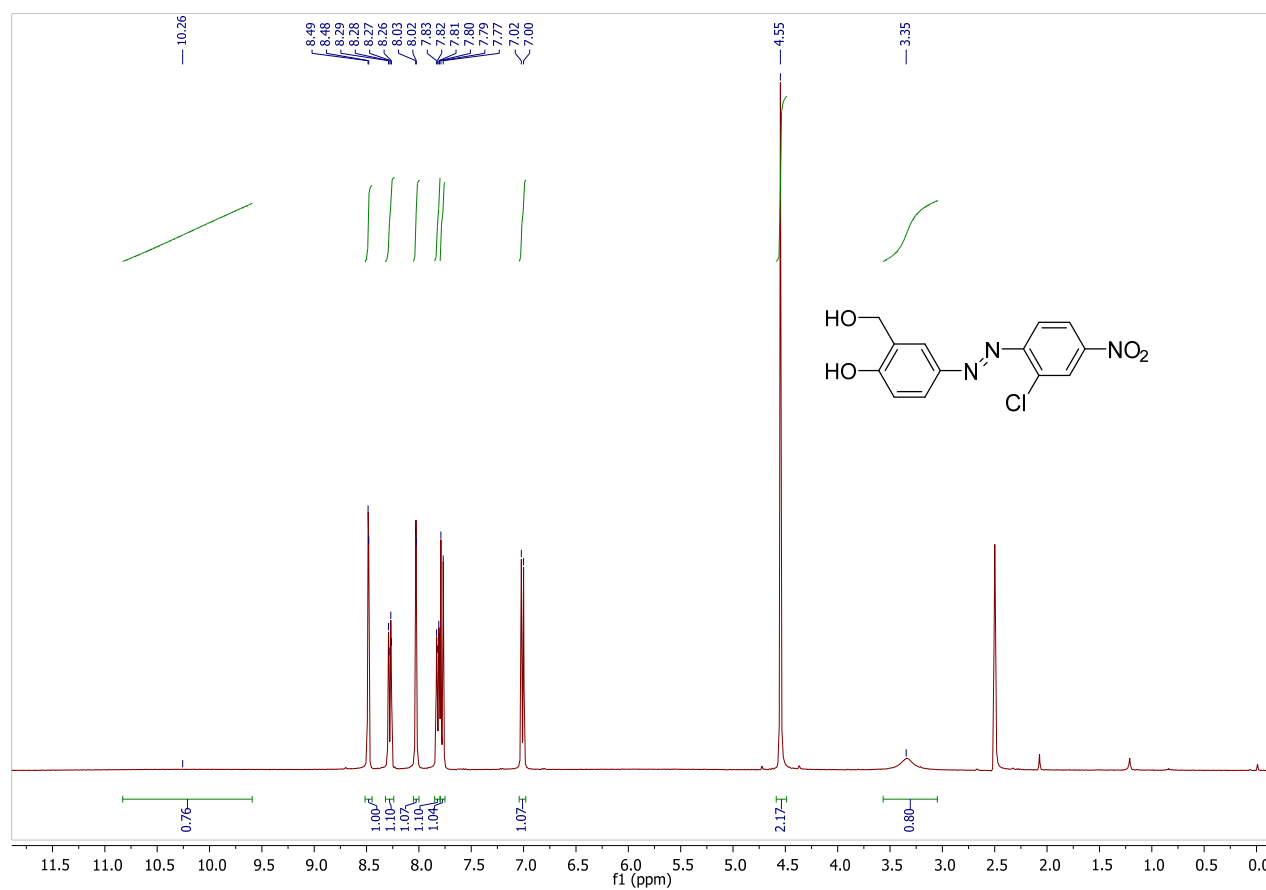


Figure S1. ¹H NMR spectra of 4-[(*E*)-2-Chloro-4'-nitrophenyl]diazenyl-2-hydroxymethylphenol (3b). (DMSO).

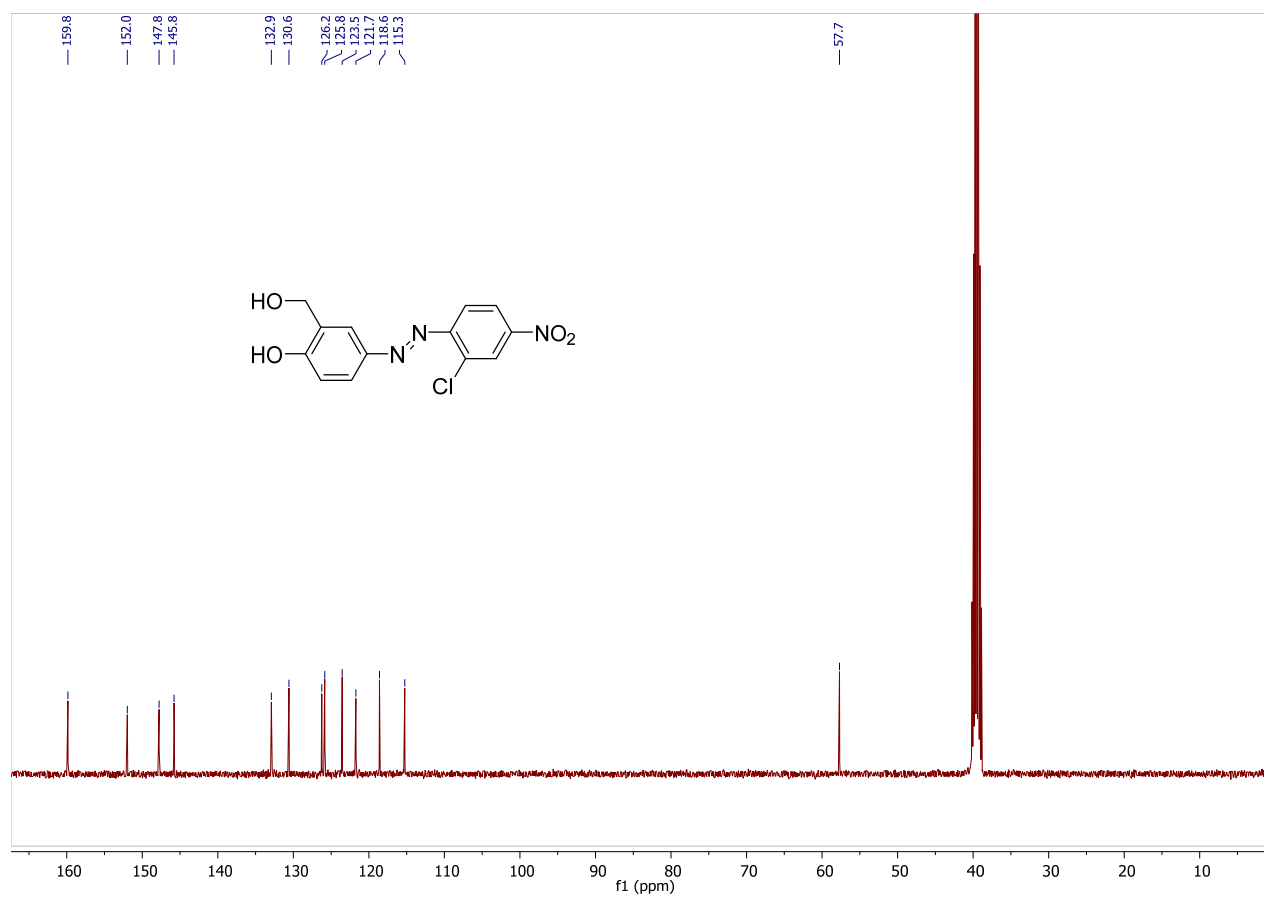


Figure S2. ^{13}C NMR spectra of 4-[(*E*)-2-Chloro-4'-nitrophenyl]diazenyl-2-hydroxymethylphenol (3b). (DMSO).

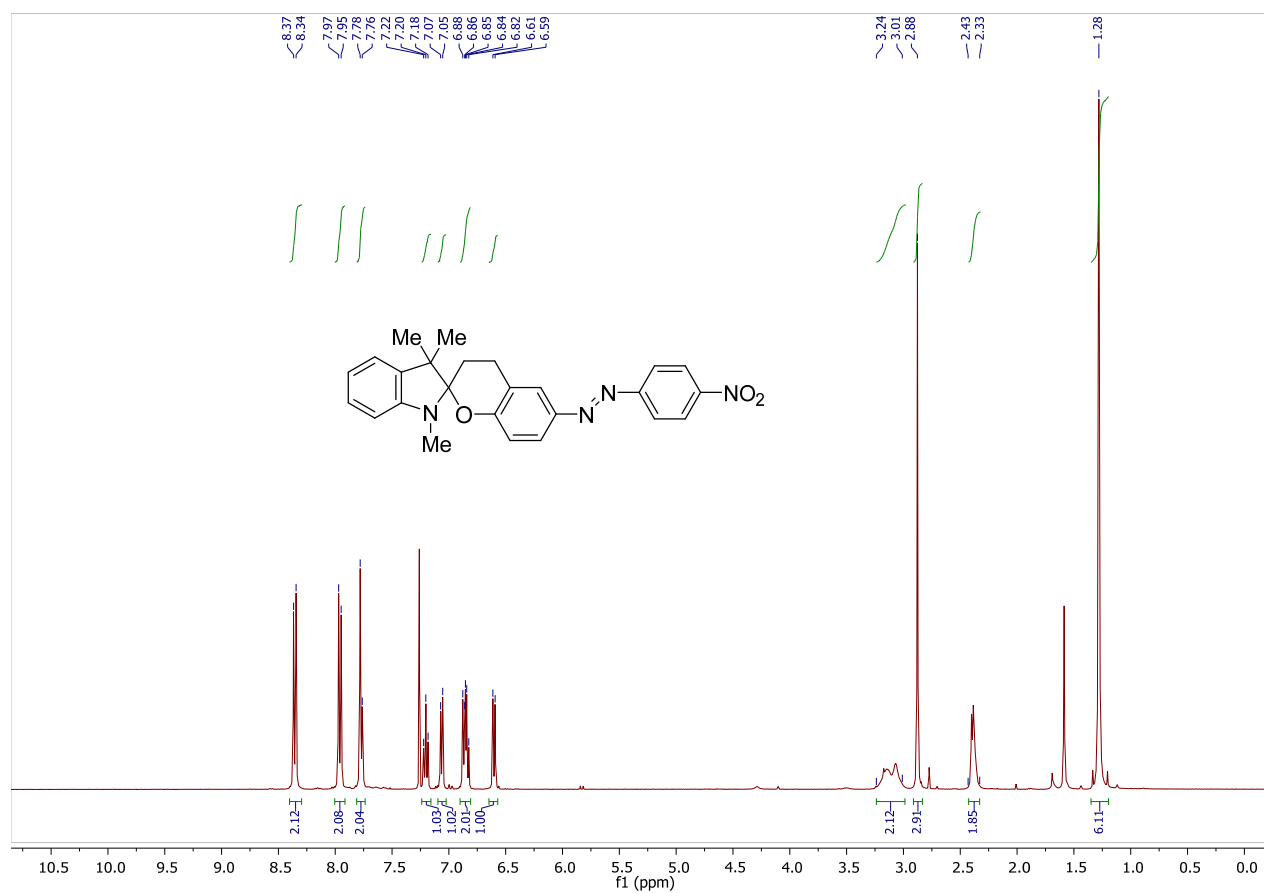


Figure S3. ¹H NMR spectra of 1',3',3'-Trimethyl-6-[(E)-(4-nitrophenyl)diazenyl]-1,3,3',4-tetrahydrospiro[chromene-2,2'-indole] (7a). (CDCl₃).

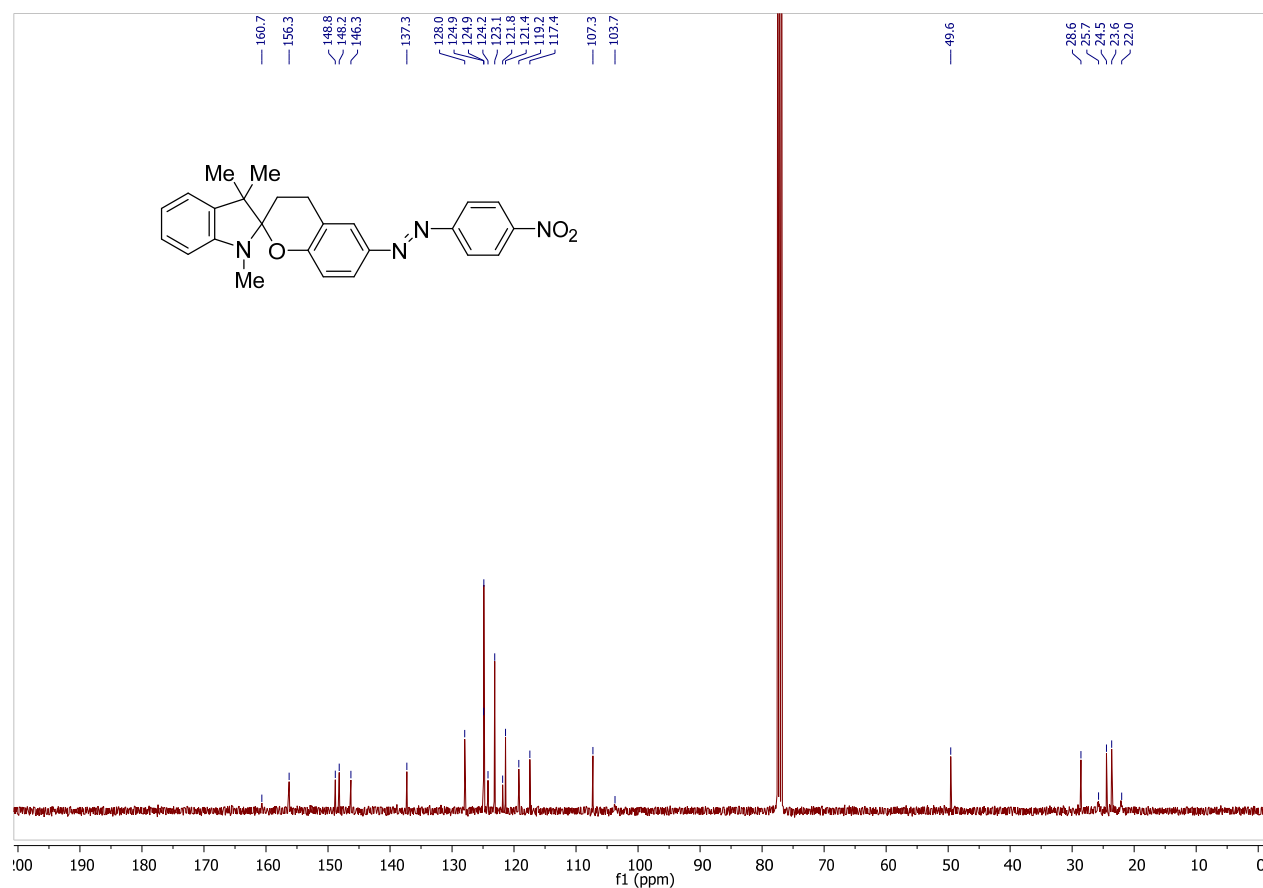


Figure S4. ^{13}C NMR spectra of 1',3',3'-Trimethyl-6-[(*E*)-(4-nitrophenyl)diazenyl]-1,3,3',4-tetrahydrospiro[chromene-2,2'-indole] (7a). (CDCl_3).

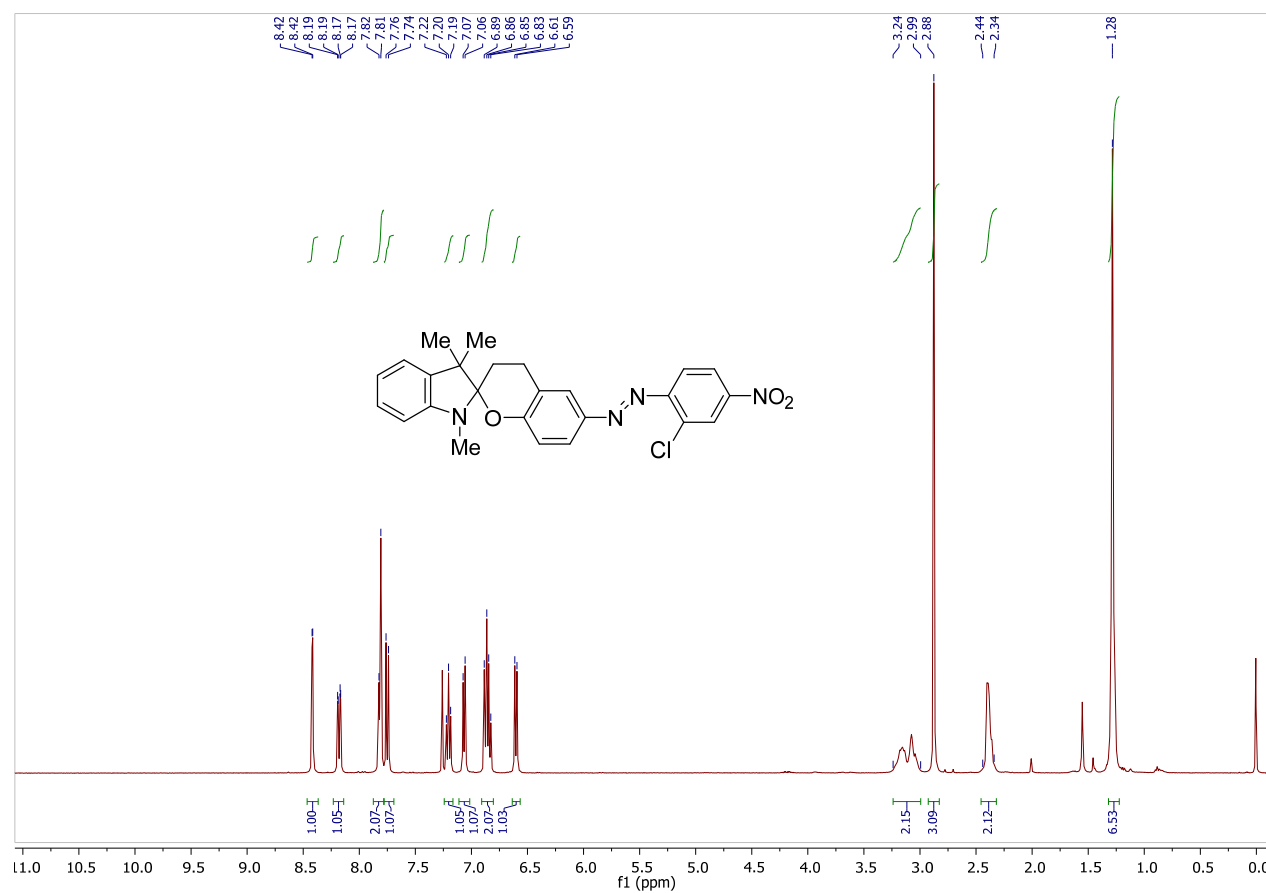


Figure S5. ¹H NMR spectra of (6-[(*E*)-(2-Chloro-4-nitrophenyl)diazenyl]-1',3',3'-trimethyl-1',3,3',4-tetrahydrospiro[chromene-2,2'-indole] (**7b**). CDCl₃).

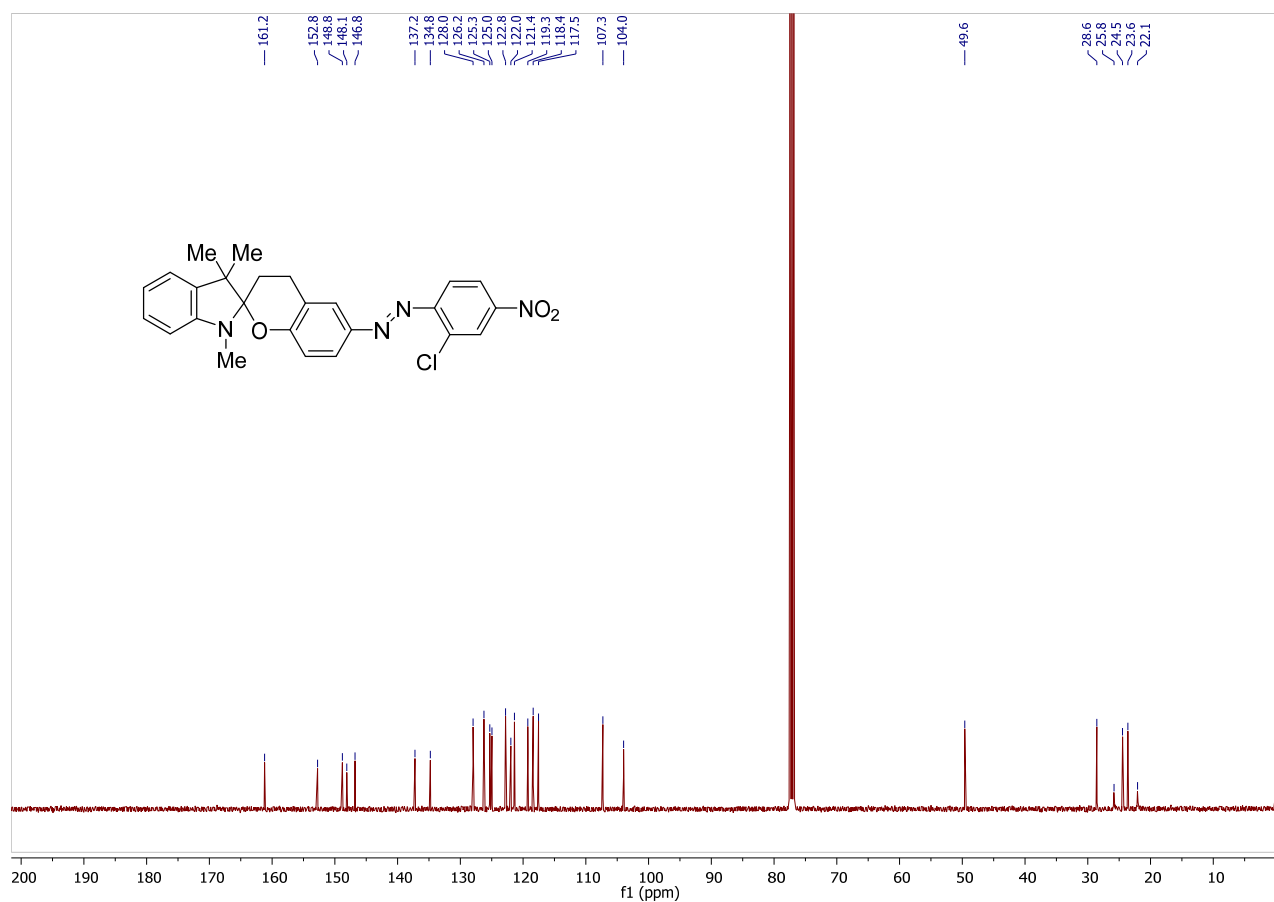


Figure S6. ¹³C NMR spectra of 6-[(*E*)-(2-Chloro-4-nitrophenyl)diazenyl]-1',3',3'-trimethyl-1',3,3',4-tetrahydrospiro[chromene-2,2'-indole] (**7b**). (CDCl₃).

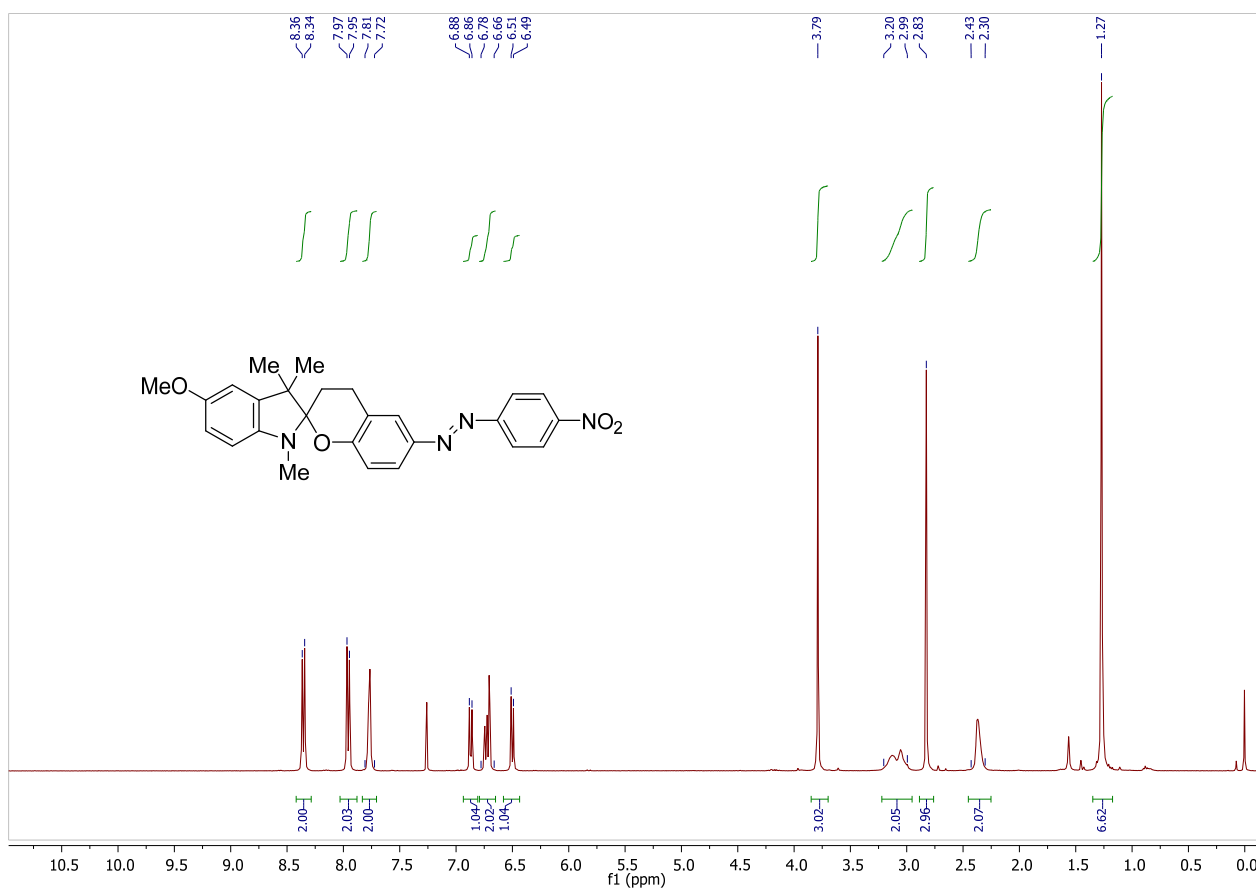


Figure S7. ¹H NMR spectra of 5-Methoxy-1,3,3'-trimethyl-[(E)-(4-nitrophenyl)diazenyl]-1,3,3',4-tetrahydrospiro[chromene-2,2'-indole] (7c). (CDCl₃).

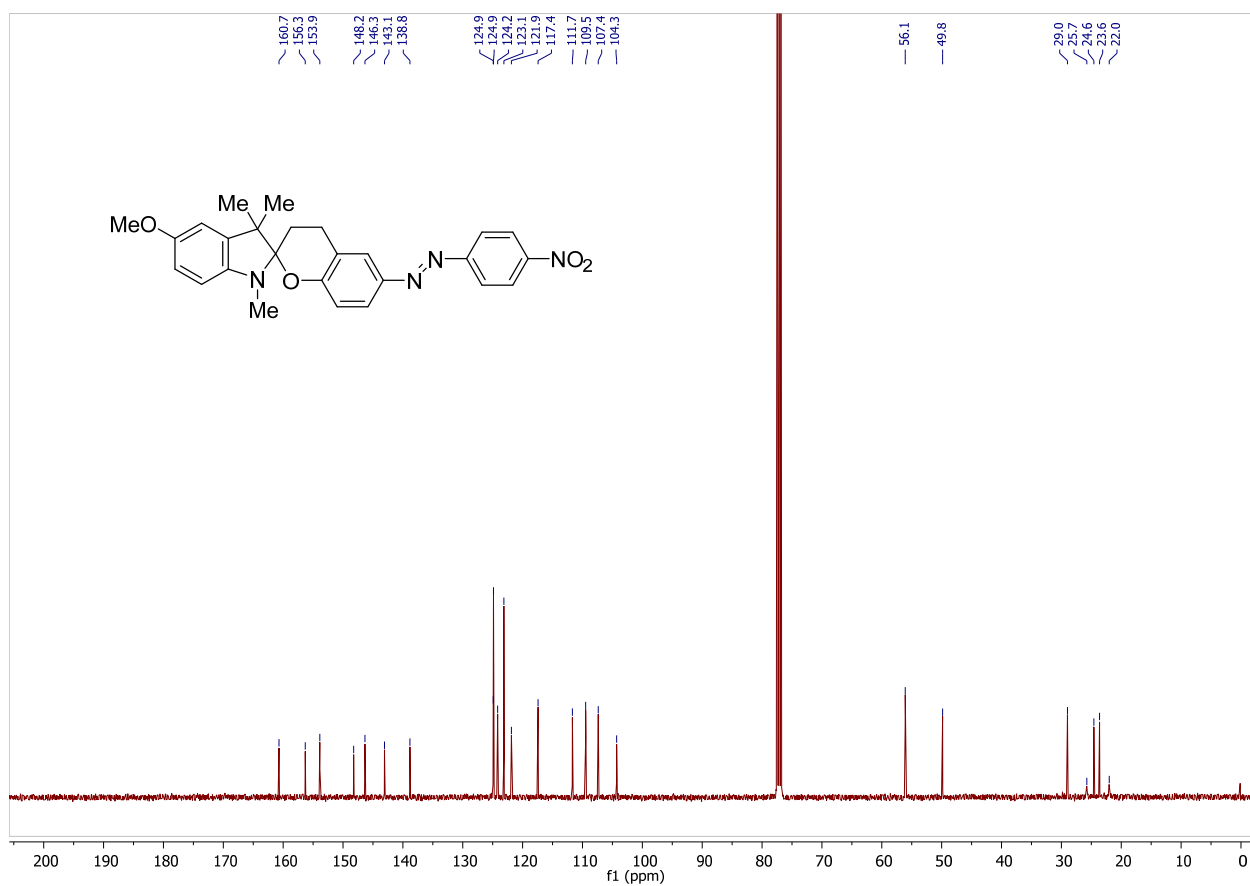


Figure S8. ¹³C NMR spectra of 5'-Methoxy-1',3',3'-trimethyl-6-[(E)-(4-nitrophenyl)diazenyl]-1',3,3',4-tetrahydrospiro[chromene-2,2'-indole] (7c). (CDCl₃).

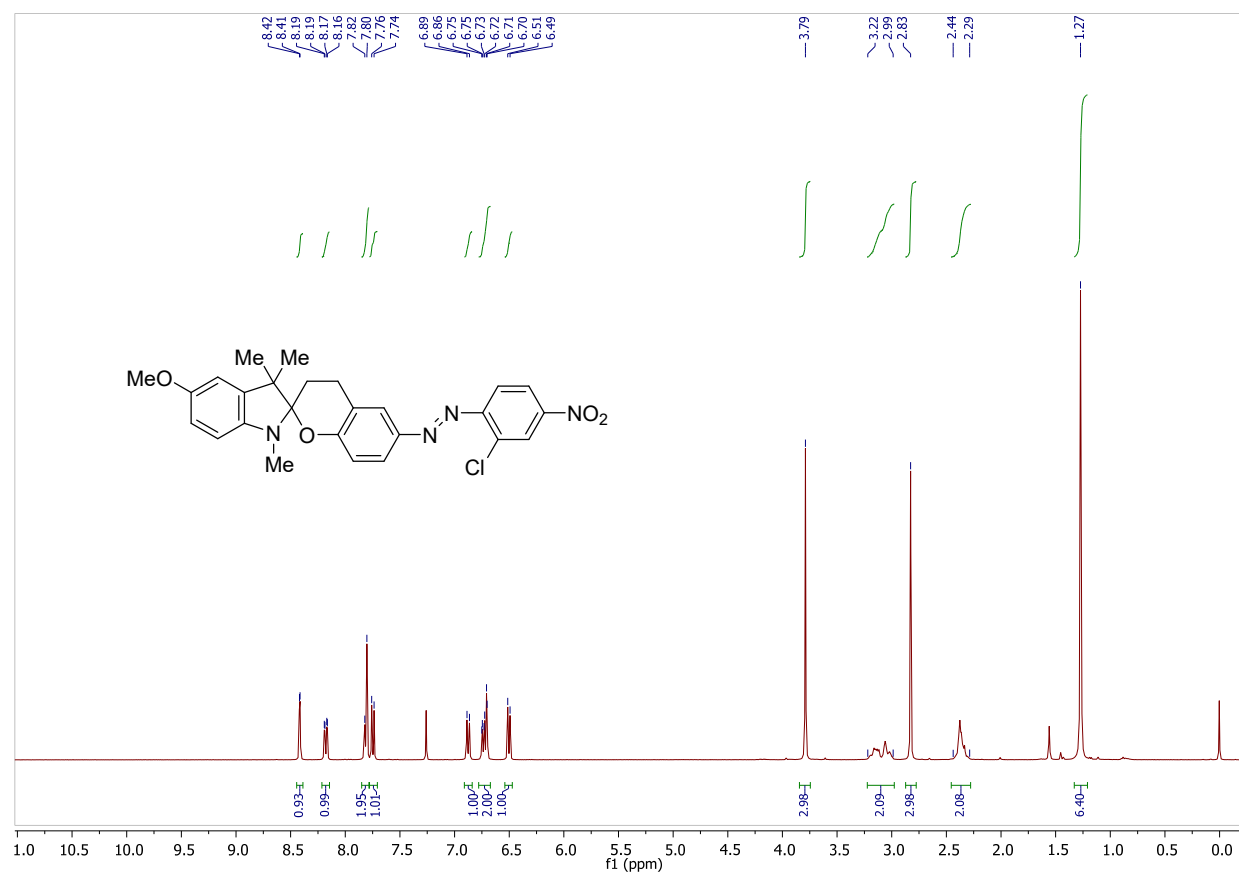


Figure S9. ¹H NMR spectra of 6-[(*E*)-(2-chloro-4-nitrophenyl)diazenyl]-5'-methoxy-1',3',3'-trimethyl-1,3,3',4-tetrahydrospiro[chromene-2,2'-indole] (**7d**). (CDCl₃).

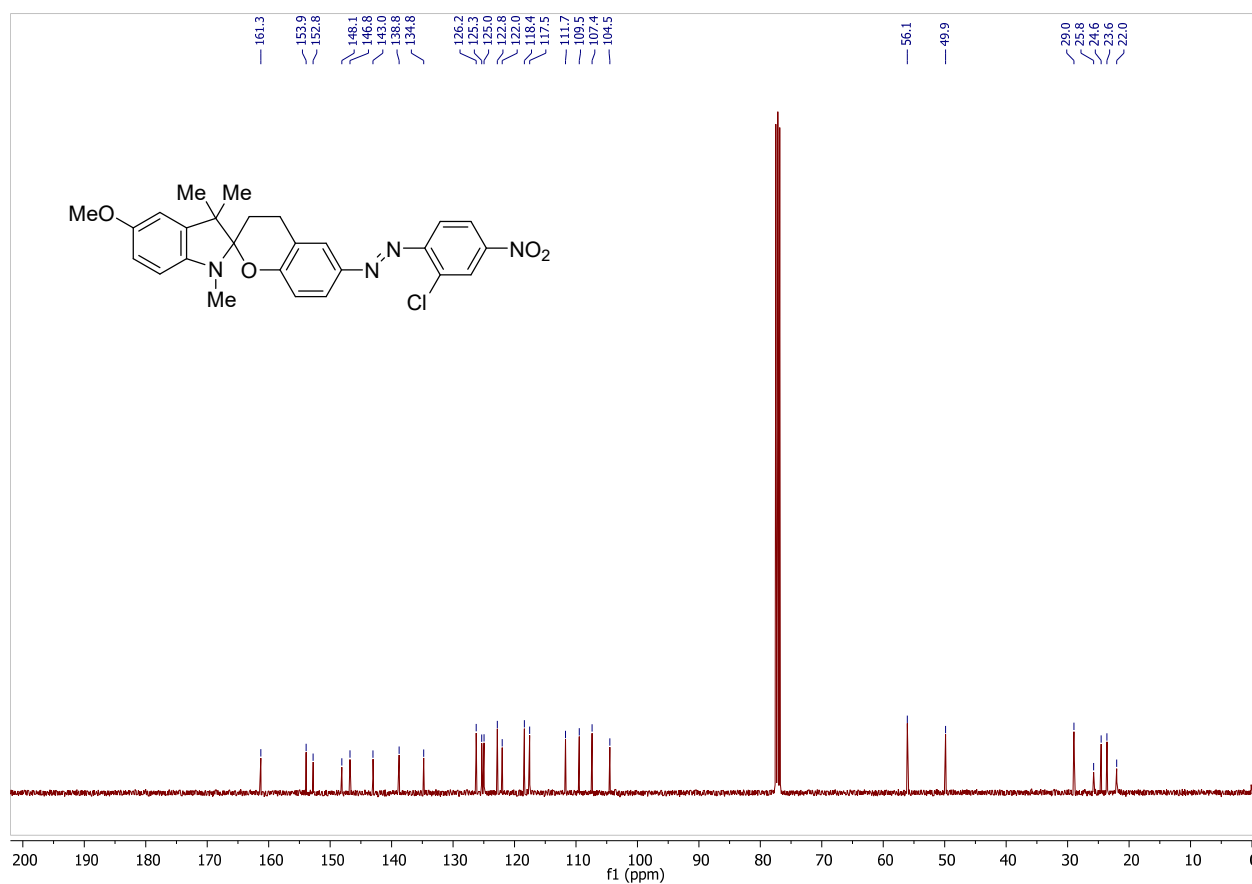


Figure S10. ^{13}C NMR spectra of 6-[(*E*)-(2-chloro-4-nitrophenyl)diazenyl]-5'-methoxy-1',3',3'-trimethyl-1,3,3',4-tetrahydrospiro[chromene-2,2'-indole] (**7d**). (CDCl_3).

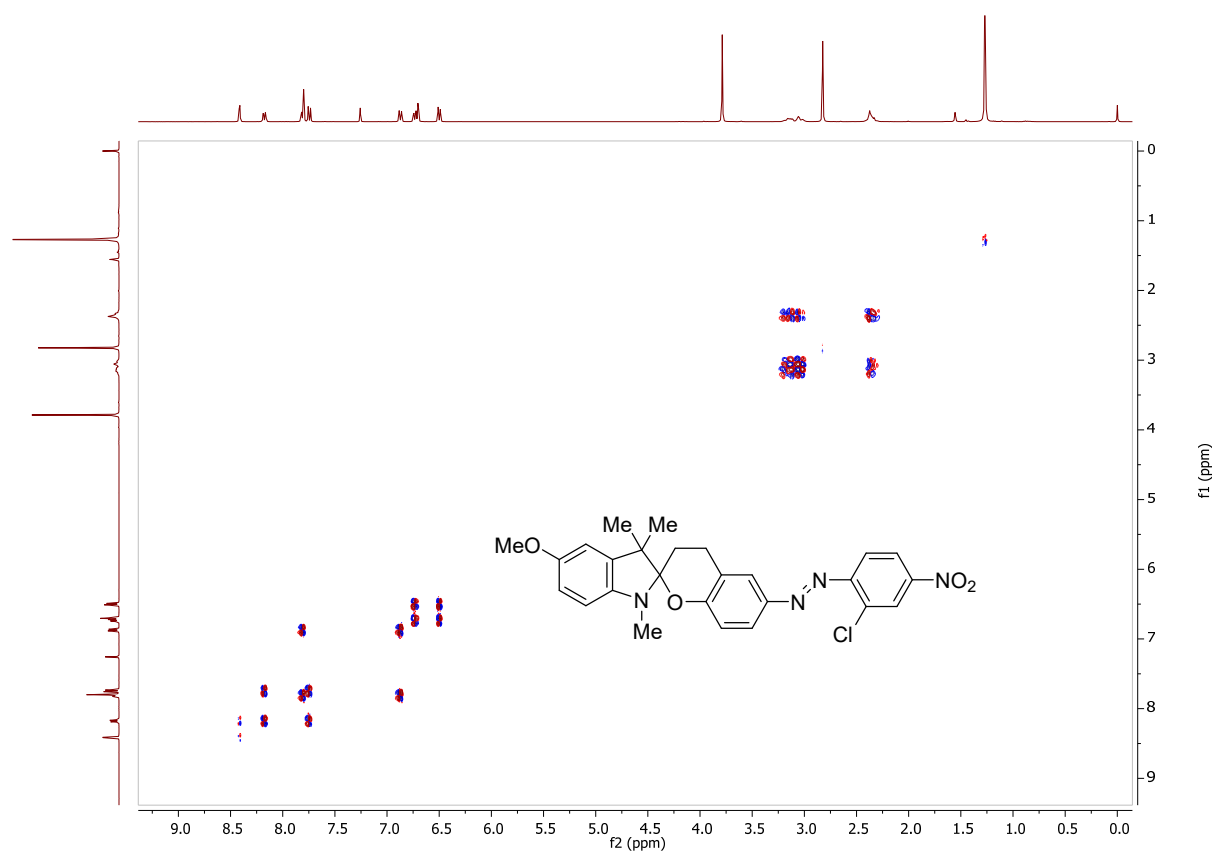


Figure S11. ^1H - ^1H COSY NMR spectra of 6-[(E)-(2-chloro-4-nitrophenyl)diazenyl]-5'-methoxy-1',3',3'-trimethyl-1,3,3',4-tetrahydrospiro[chromene-2,2'-indole] (**7d**). (CDCl_3).

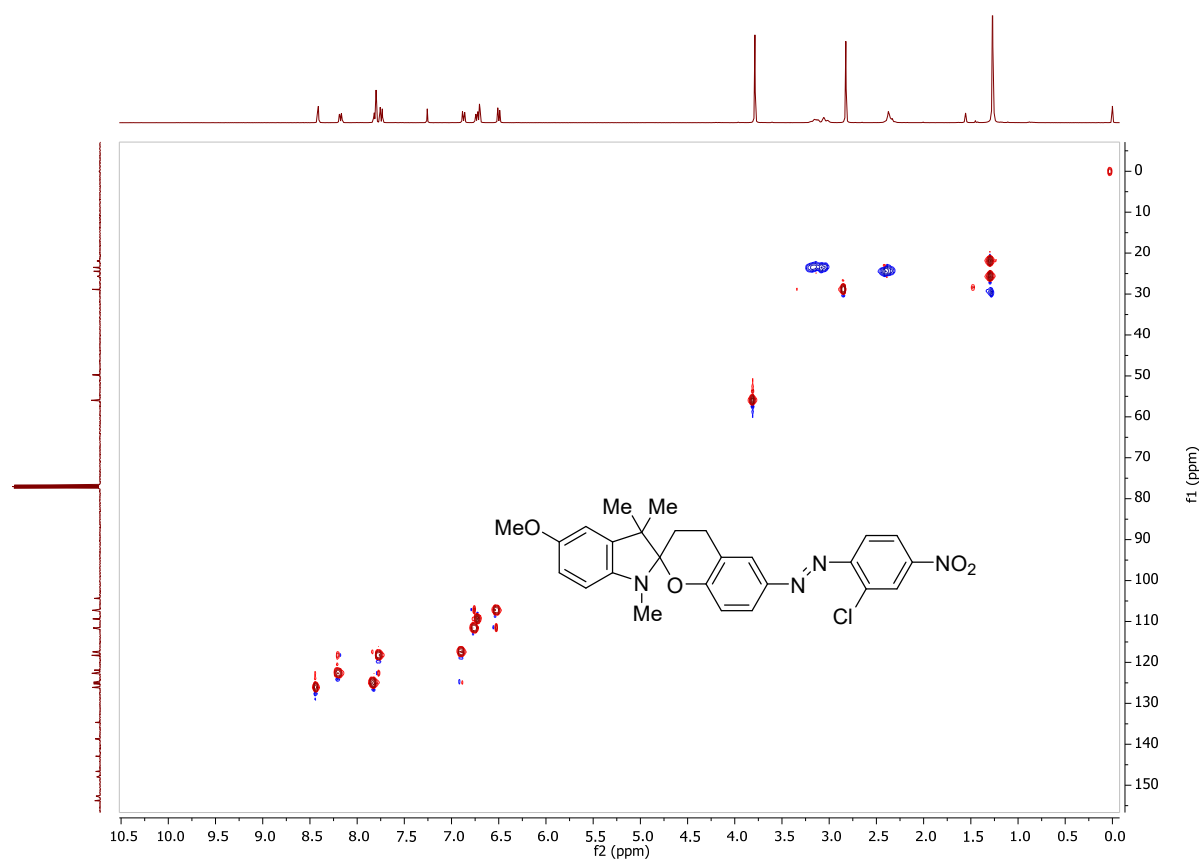


Figure S12. ¹H-¹³C HSQC NMR spectra of 6-[(*E*)-(2-Chloro-4-nitrophenyl)diazenyl]-5'-methoxy-1',3',3'-trimethyl-1,3,3',4-tetrahydrospiro[chromene-2,2'-indole] (**7d**). (CDCl₃).

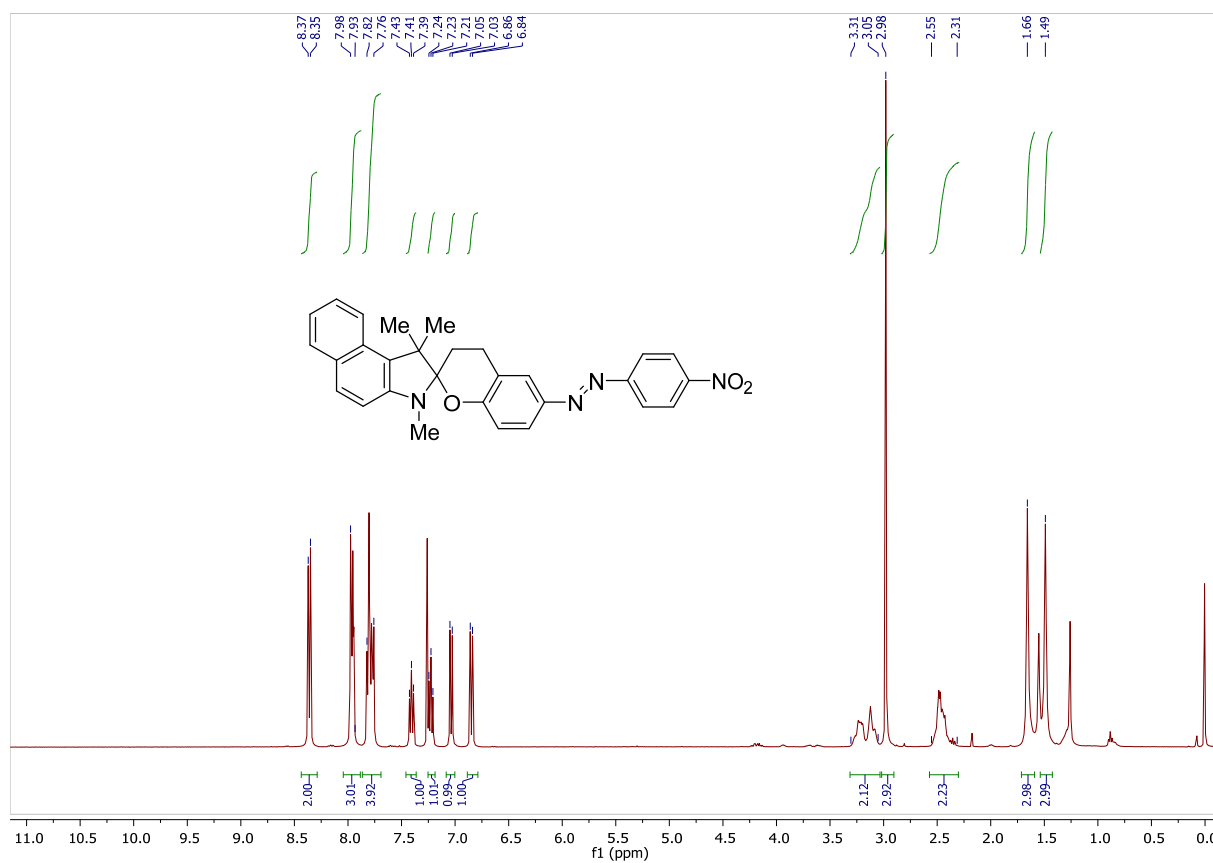


Figure S13. ¹H NMR spectra of 1',1',3'-Trimethyl-6-[(*E*)-4-(nitrophenyl)diazenyl]-1,3,3',4-tetrahydrospiro[chromene-2,2'-benz[e][2H]indole] (**7e**). (CDCl₃).

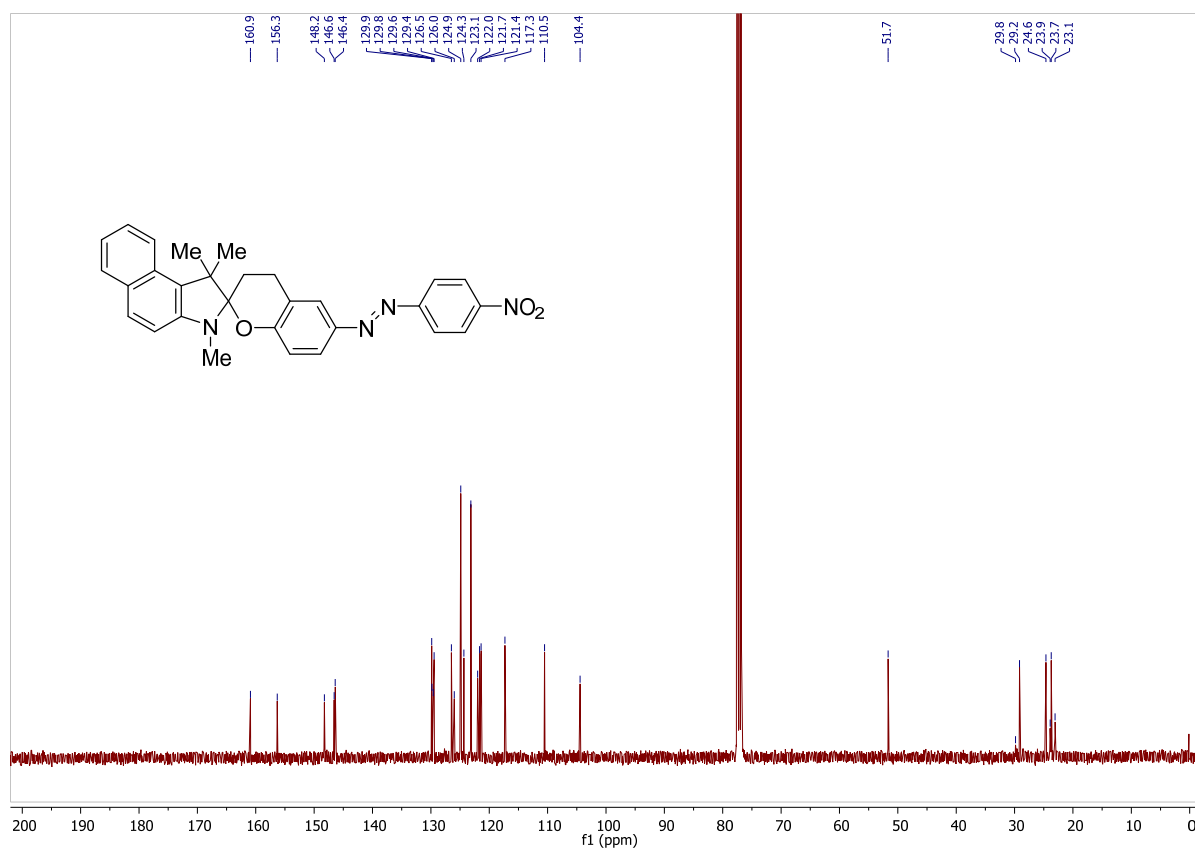


Figure S14. ^{13}C NMR spectra of 1',1',3'-Trimethyl-6-[(*E*)-4-(nitrophenyl)diazenyl]-1,3,3',4'-tetrahydrospiro[chromene-2,2'-benz[e][2H]indole] (**7e**). (CDCl_3).

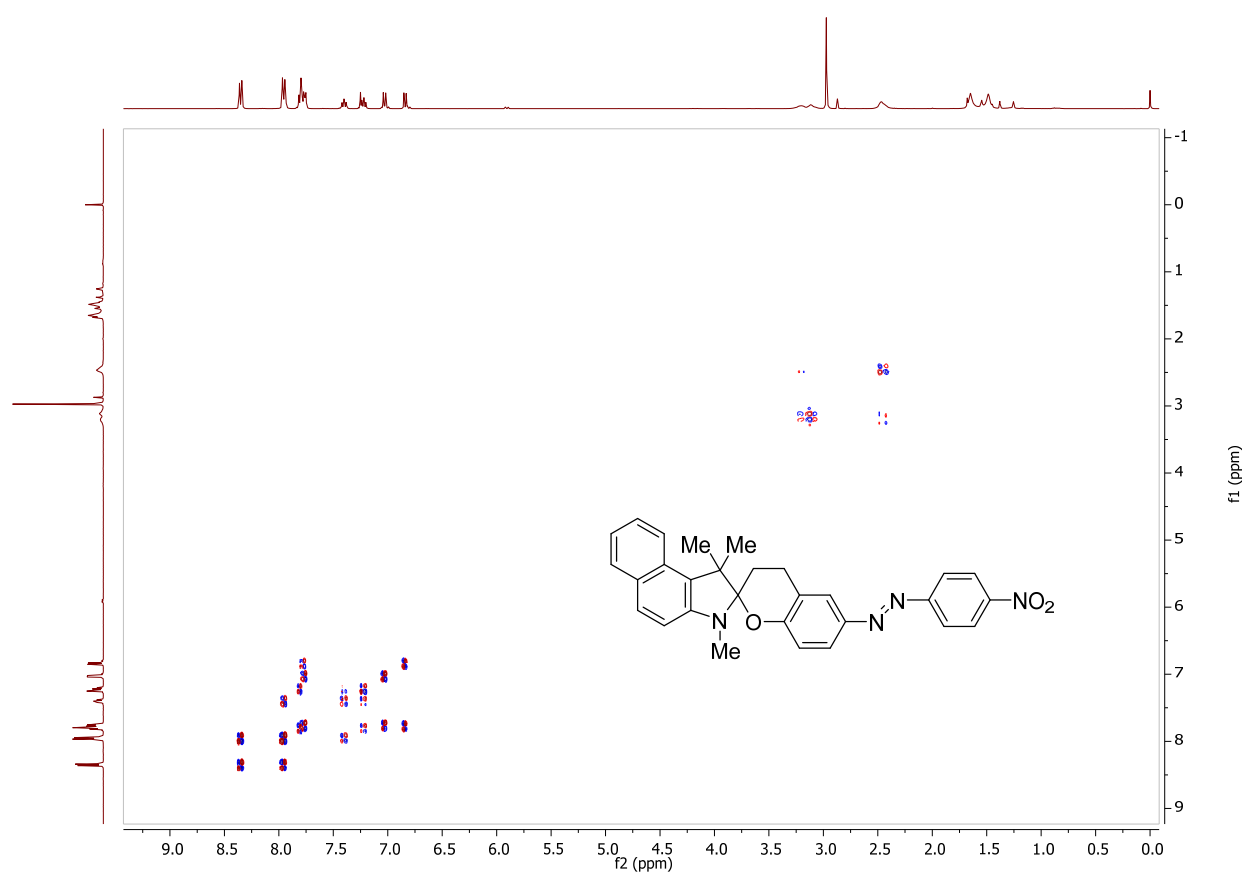


Figure S15. ^1H - ^1H COSY NMR spectra of 1',1',3'-Trimethyl-6-[(*E*)-4-(nitrophenyl)diazenyl]-1',3,3',4-tetrahydrospiro[chromene-2,2'-benz[e][2H]indole] (**7e**). (CDCl_3).

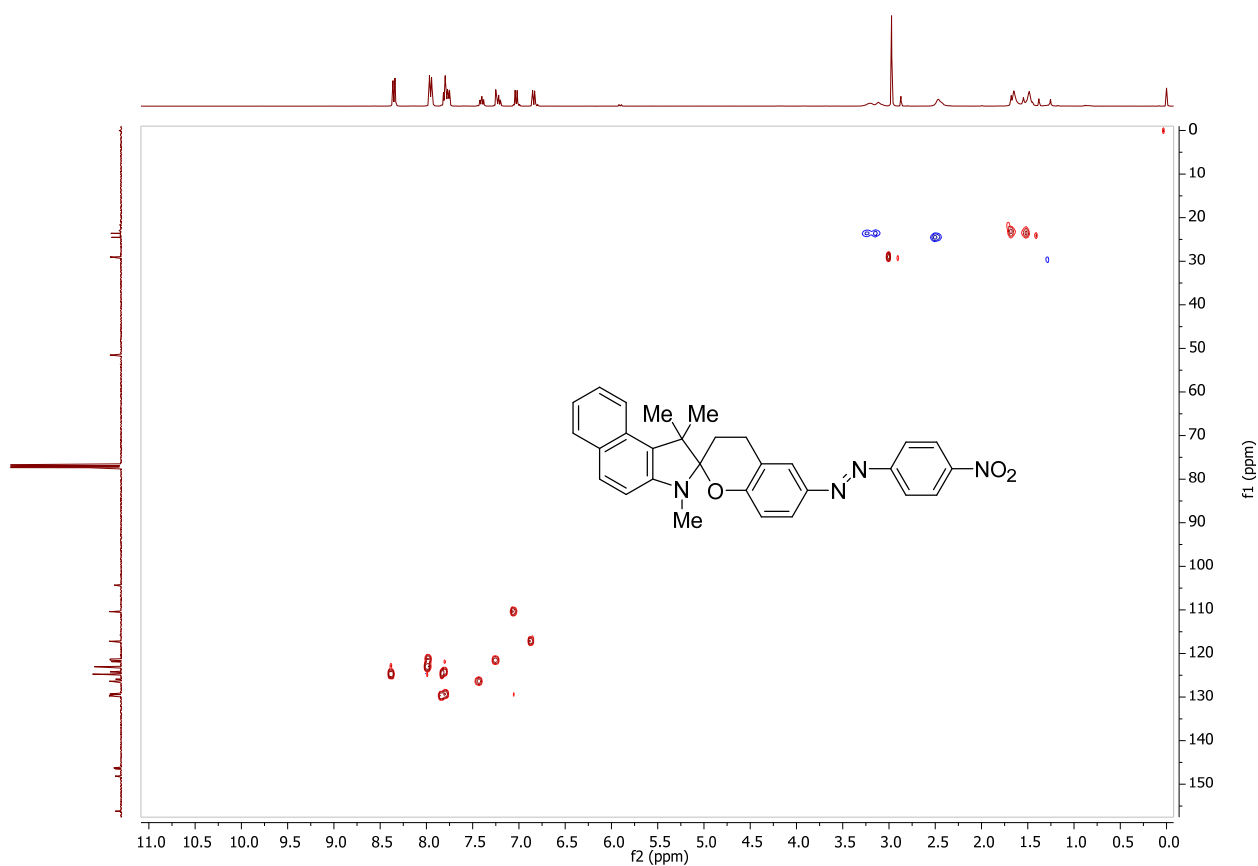


Figure S16. ^1H - ^{13}C HSQC NMR of 1',1',3',4-tetramethyl-6-[(*E*)-4-(nitrophenyl)diazenyl]-1',3,3',4-tetrahydrospiro[chromene-2,2'-benz[e][2H]indole] (7e). (CDCl_3).

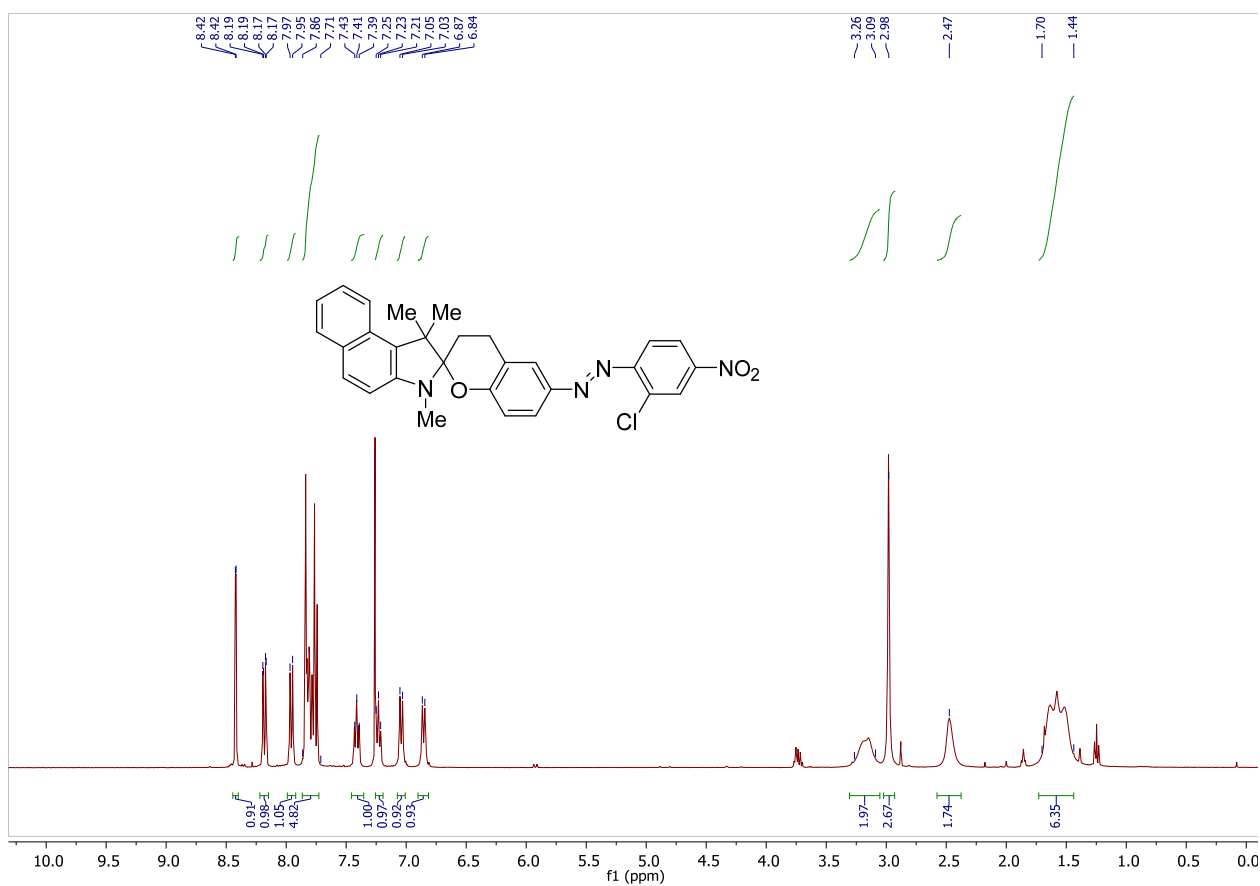


Figure S17. ¹H NMR of 6'-[(E)-(2-Chloro-4-nitrophenyl)diazenyl]-1',1',3',3'-trimethyl-1,3,3',4-tetrahydrospiro[chromene-2,2'-benz[e][2H]indole] (7f). (CDCl₃).

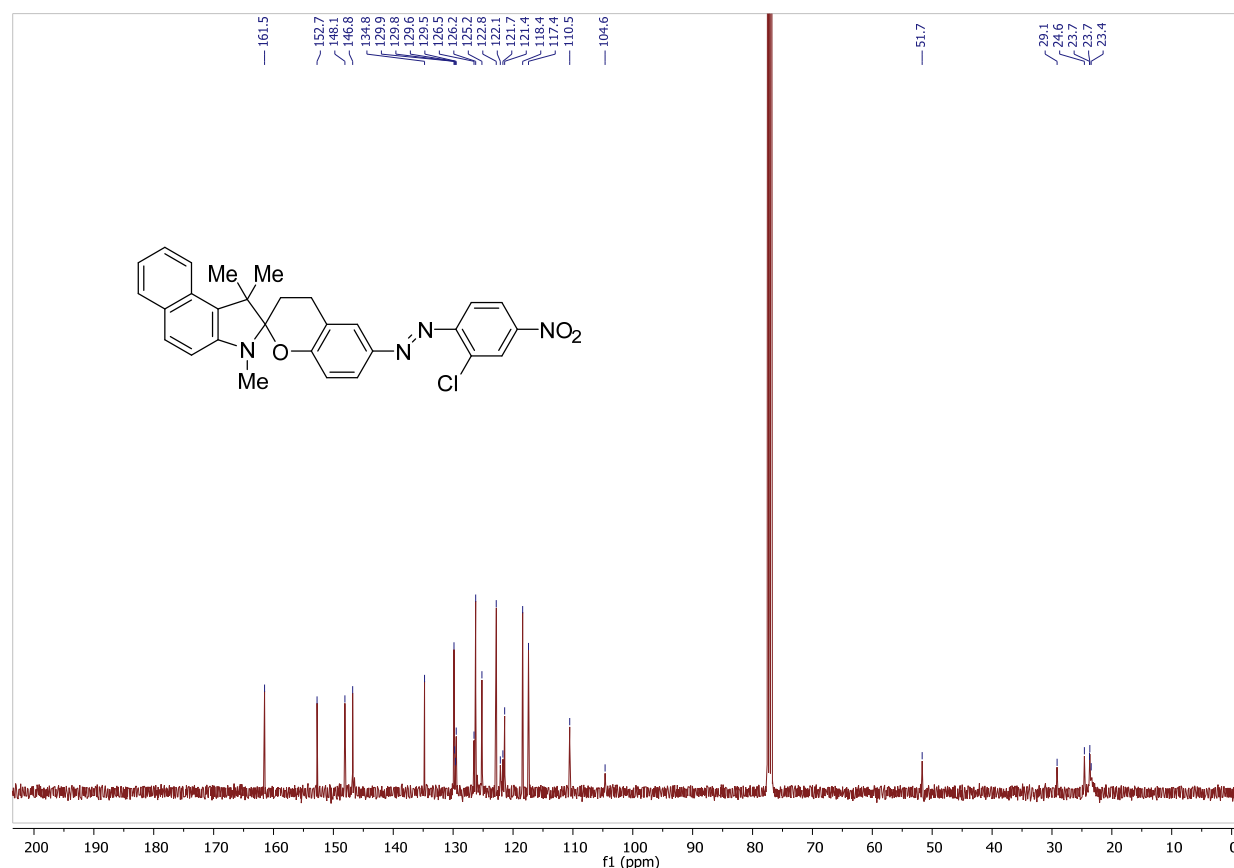


Figure S18. ^{13}C NMR spectra of 6'-[(*E*)-(2-Chloro-4-nitrophenyl)diazenyl]-1',1',3'-trimethyl-1',3,3',4-tetrahydrospiro[chromene-2,2'-benz[e][2H]indole] (**7f**). (CDCl_3).

Table S1. Data for plotting calibration curve.

[CN $^-$] ($\times 10^{-7}$ M)	Experiment 1 (A-A $_0$)	Experiment 2 (A-A $_0$)	Experiment 3 (A-A $_0$)	Average (A-A $_0$)	Positive error value	Negative error value
1.8	0.0001	0.0000	-0.0001	0.0000	0.0001	0.0001
5.4	0.0010	0.0008	0.0003	0.0007	0.0003	0.0004
9	0.0016	0.0006	0.0002	0.0008	0.0008	0.0006
18	0.0011	0.0019	0.0012	0.0014	0.0005	0.0002
27	0.0020	0.0026	0.0017	0.0021	0.0005	0.0004
45	0.0052	0.0033	0.0038	0.0041	0.0011	0.0003
63	0.0084	0.0054	0.0084	0.0074	0.0010	0.0020
108	0.0199	0.0180	0.0188	0.0189	0.0010	0.0009
198	0.0340	0.0430	0.0370	0.0380	0.0050	0.0010