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Supporting Information

Antioxidant Activity of the Anti-inflammatory Compound Ebselen: A Reversible Cyclization Pathway via Selenenic and Seleninic Acid Intermediates

Bani Kanta Sarma and Govindasamy Mugesh*

[a] Department of Inorganic and Physical Chemistry
Indian Institute of Science
Bangalore 560 012, INDIA

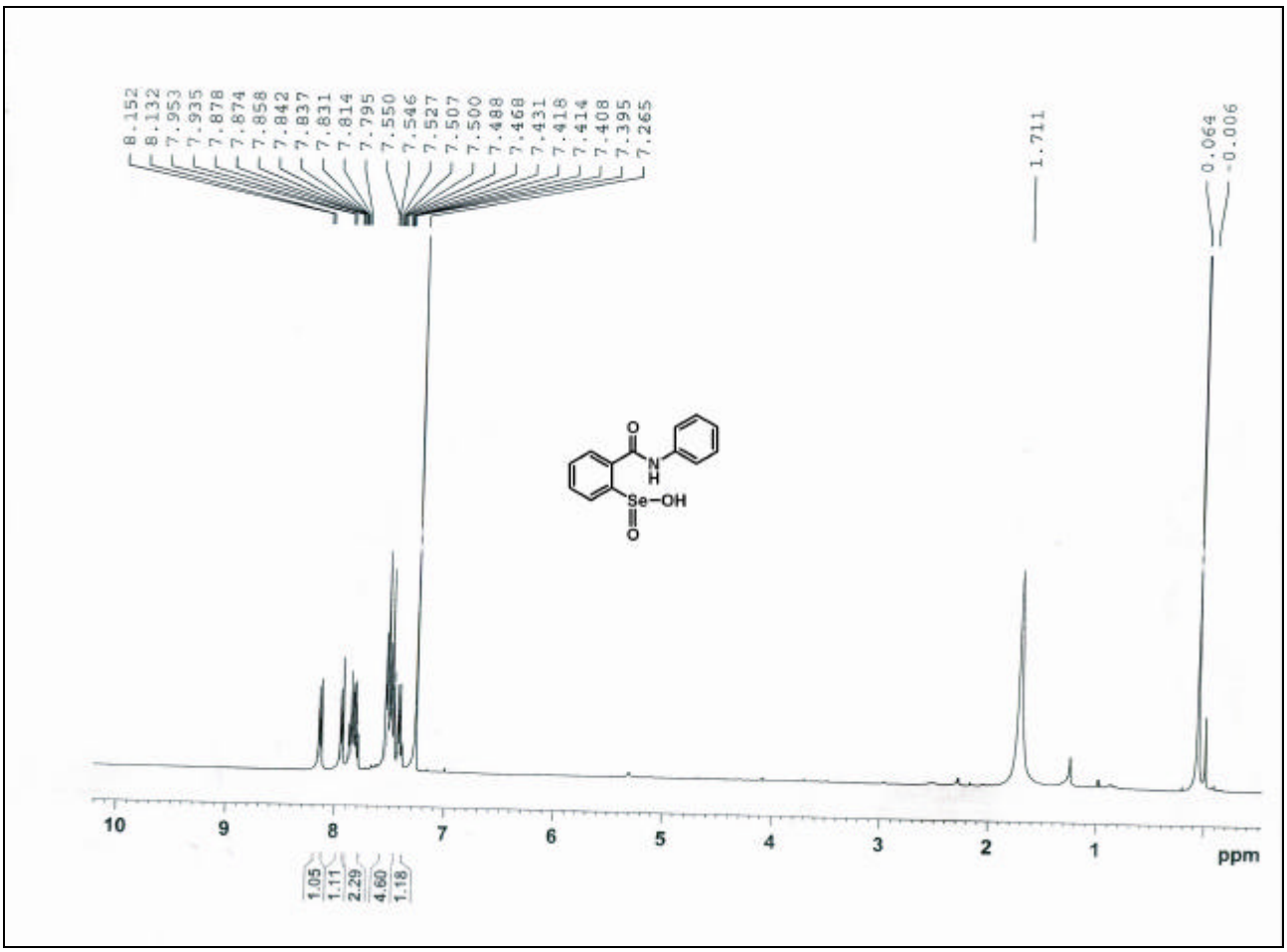


Figure S1. ^{1}H NMR spectra of pure seleninic acid (**9**) in $CDCl_3$.

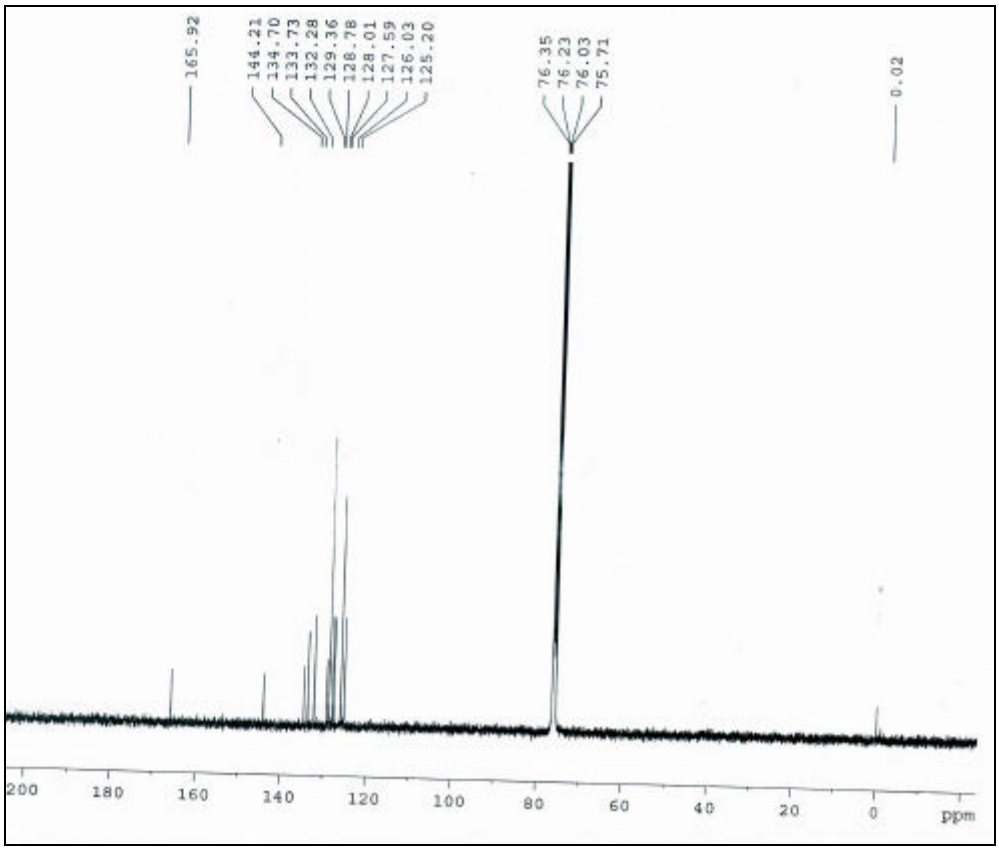


Figure S2. ^{13}C NMR spectra of pure seleninic acid (**9**) in $CDCl_3$.

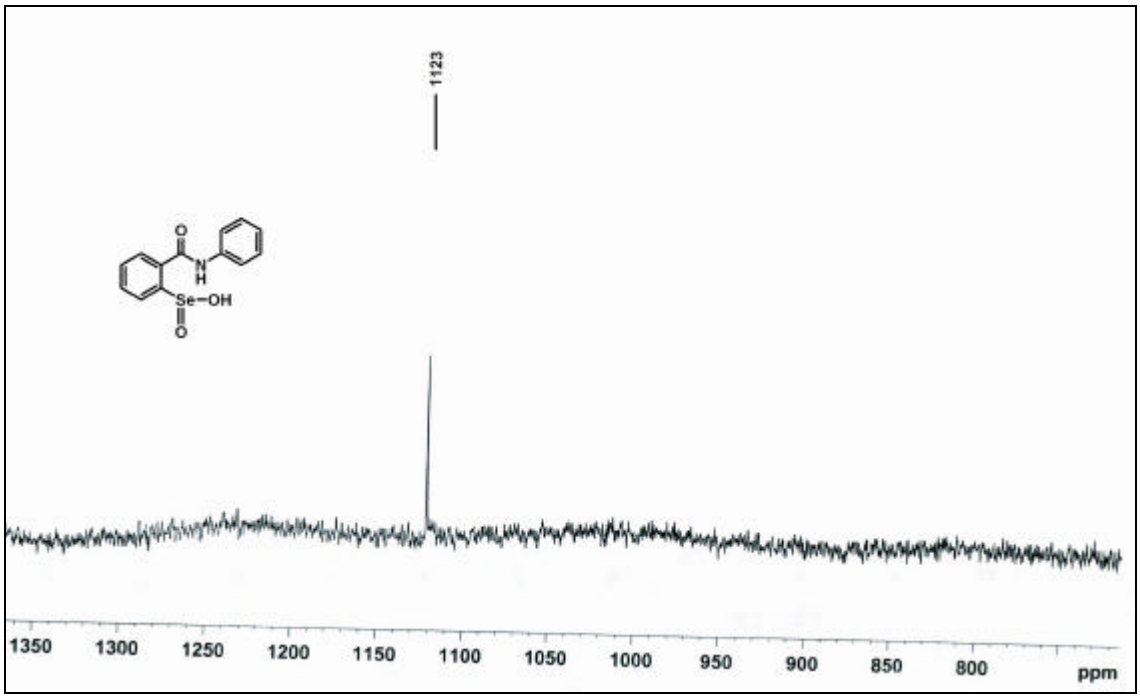


Figure S3. ^{77}Se NMR spectra of pure seleninic acid (**9**) in $CDCl_3$.

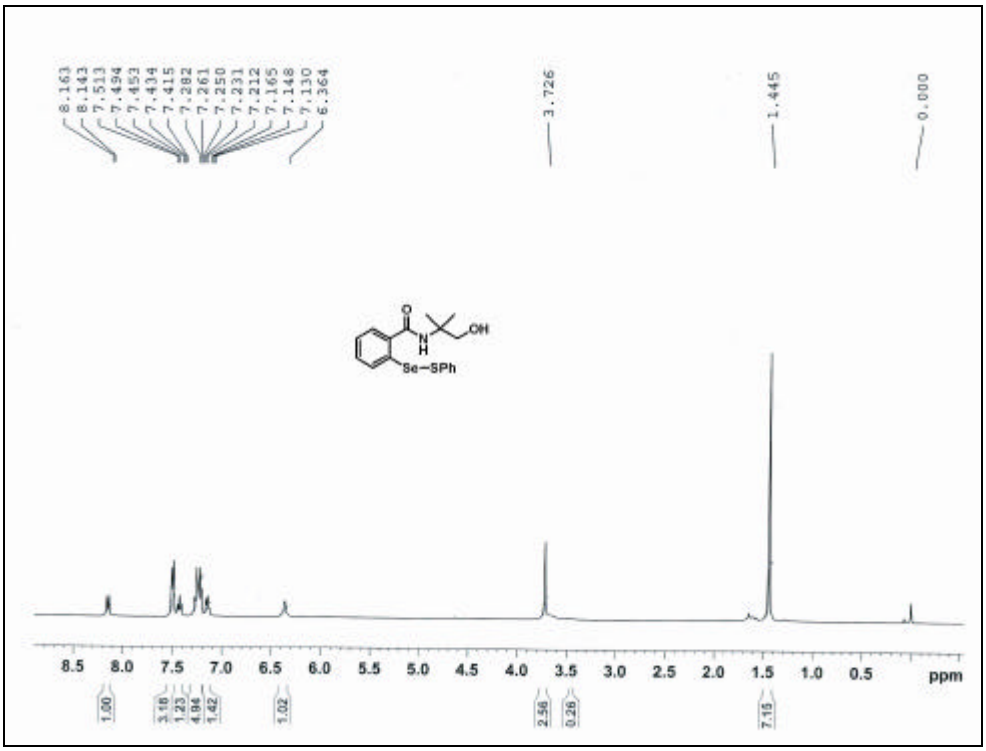


Figure S4. ^{1}H-NMR spectra of pure selenenyl sulfide (**14**) in $CDCl_3$.

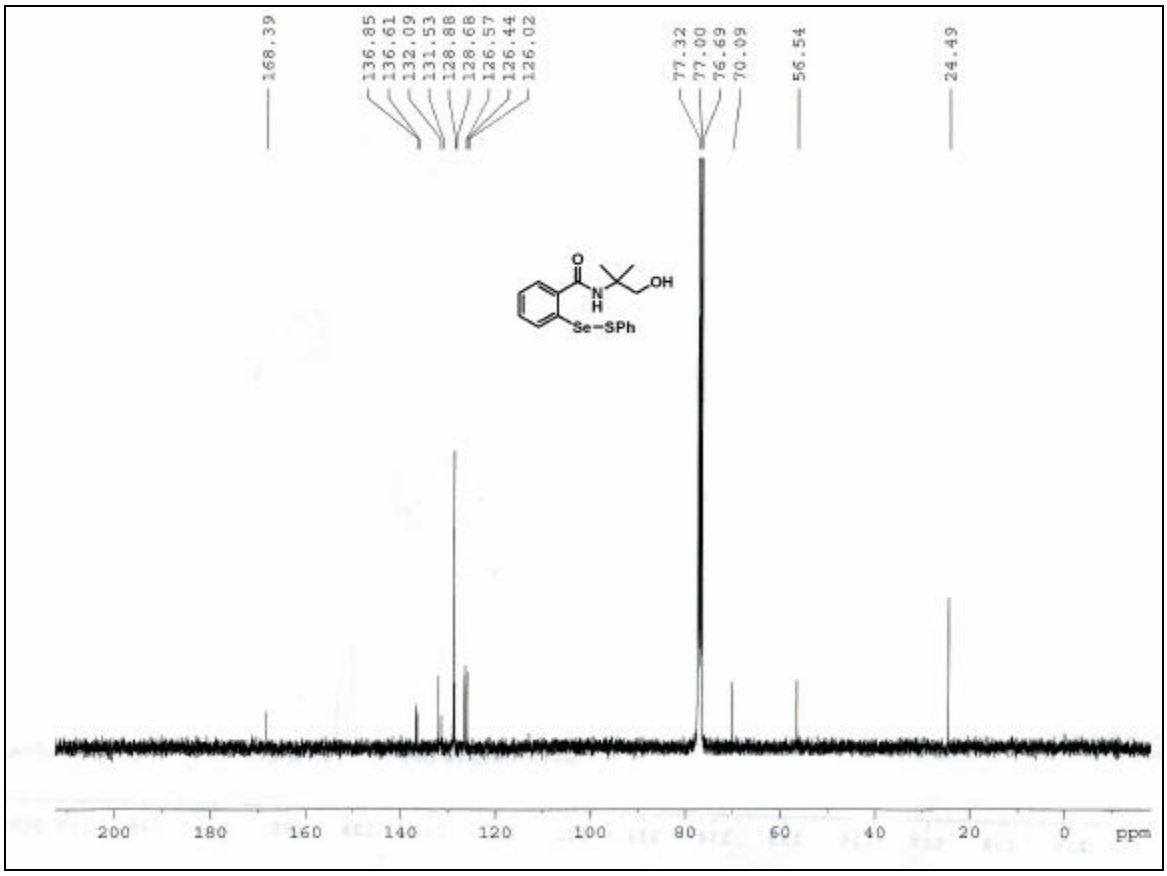


Figure S5. ^{13}C-NMR spectra of pure selenenyl sulfide (**14**) in $CDCl_3$.

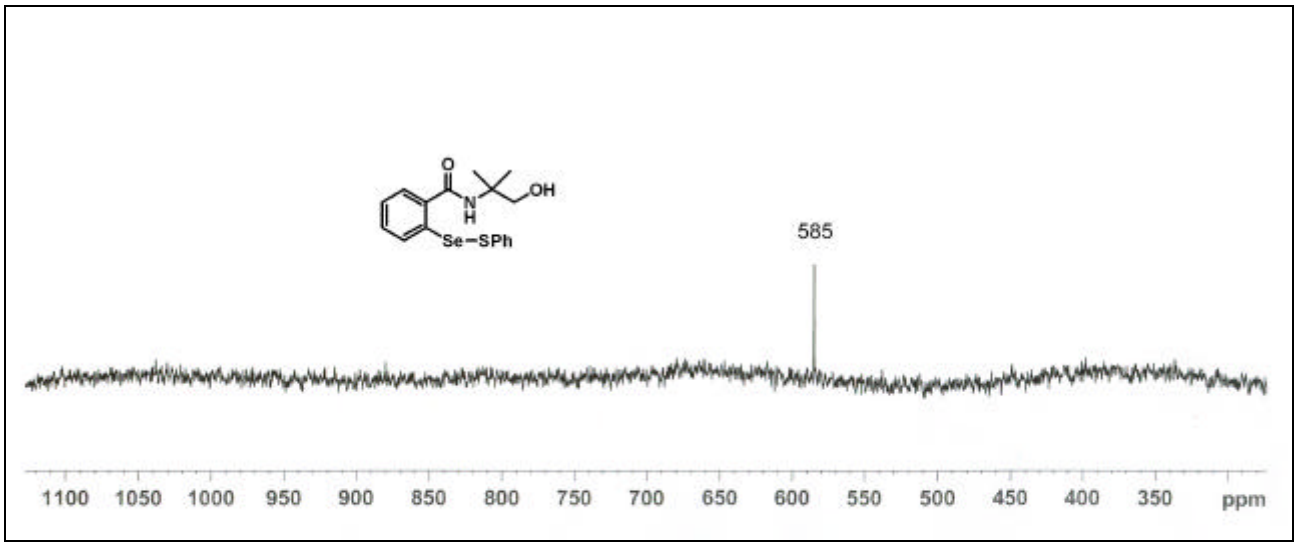


Figure S6. ^{77}Se-NMR spectra of pure selenenyl sulfide (**14**) in $CDCl_3$.

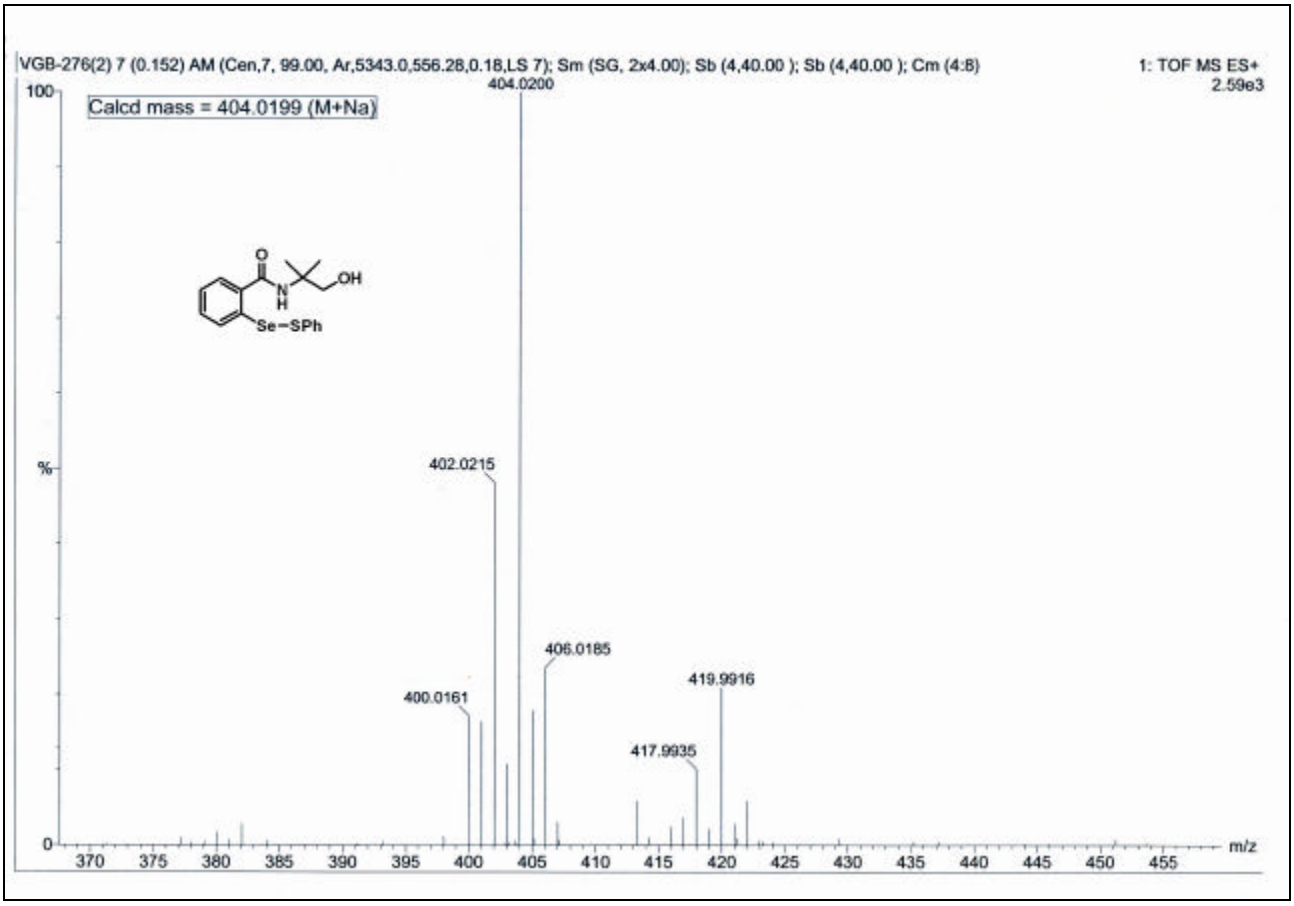


Figure S7. ESI-HRMS spectra of pure selenenyl sulfide (**14**).

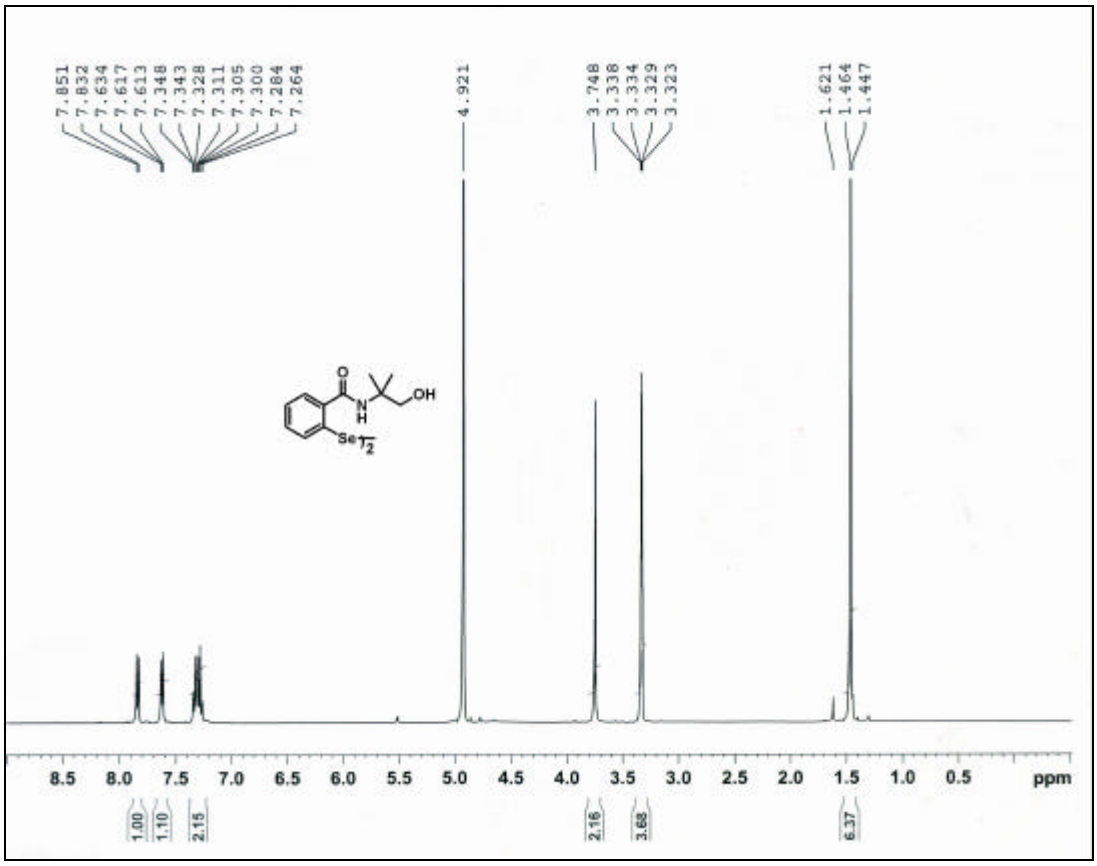


Figure S8. ^{1}H NMR spectra of pure diselenide (**16**) in MeOH-d_4.

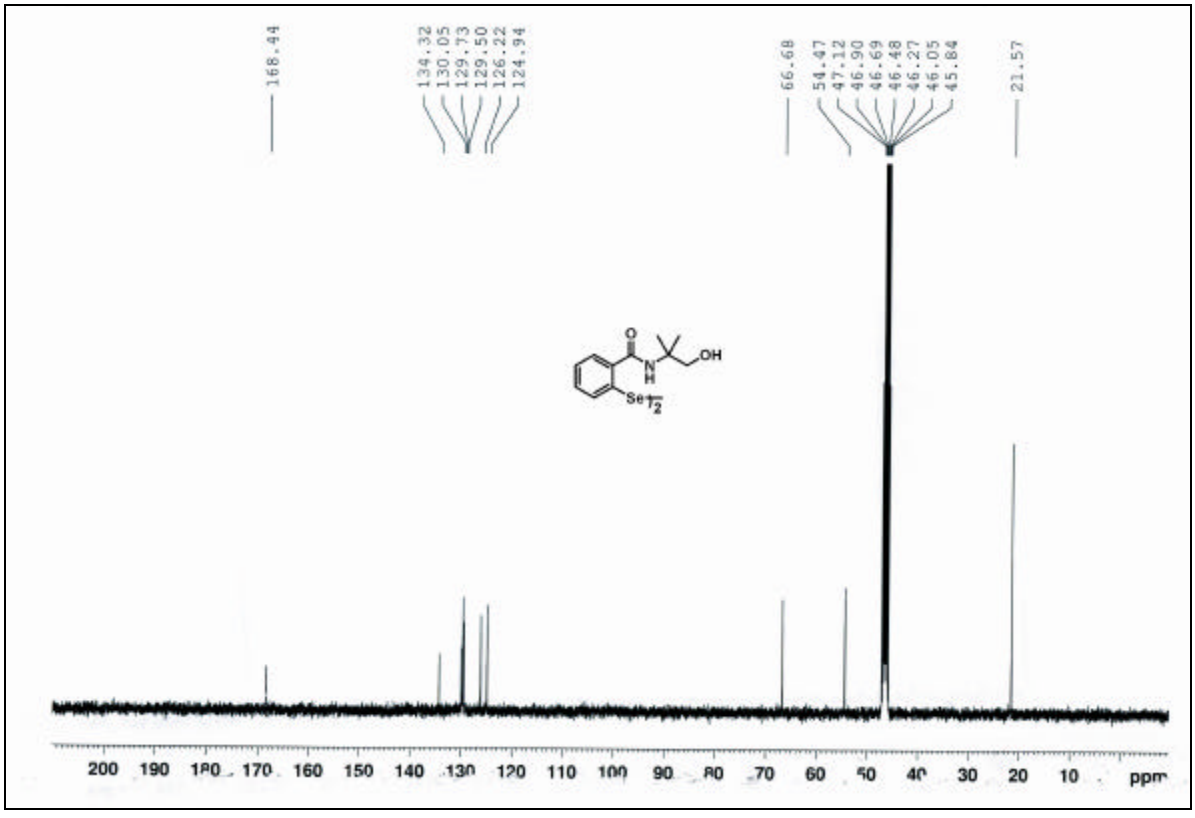


Figure S9. ^{13}C NMR spectra of pure diselenide (**16**) in MeOH-d_4.

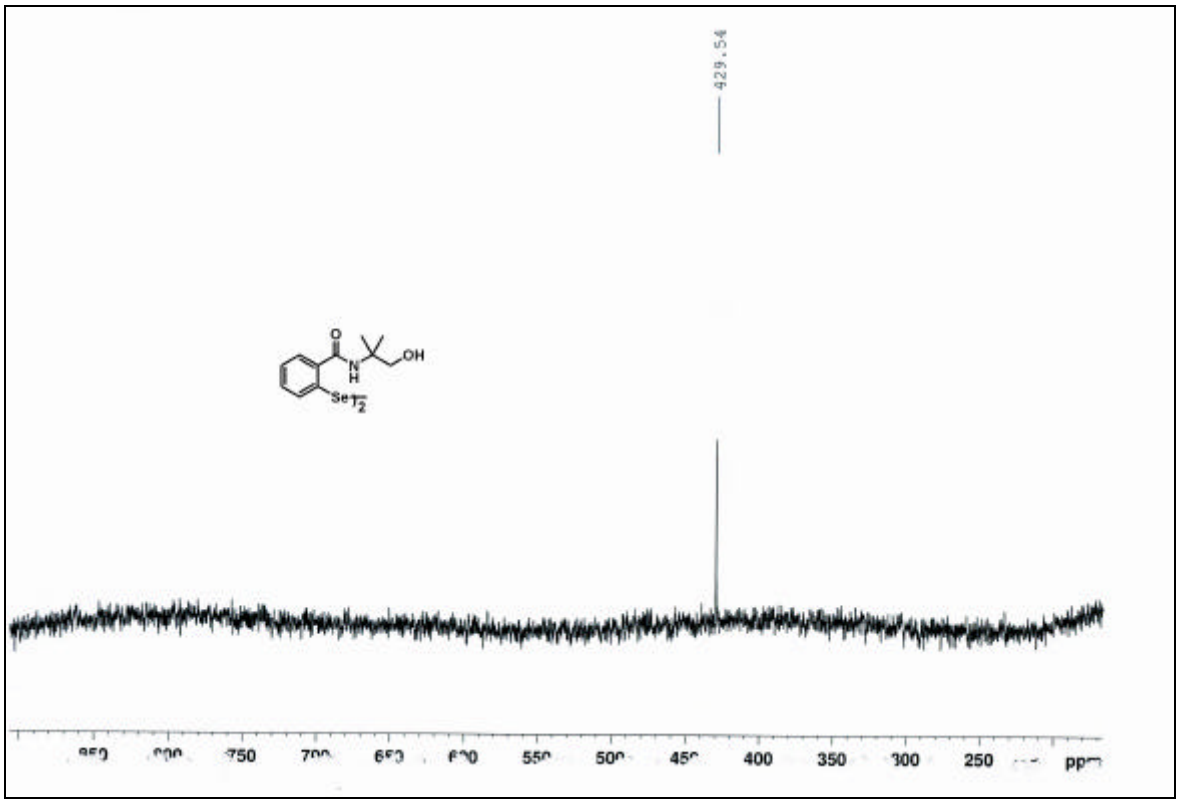


Figure S10. ^{77}Se NMR spectra of pure diselenide (**16**) in MeOH-d_4.

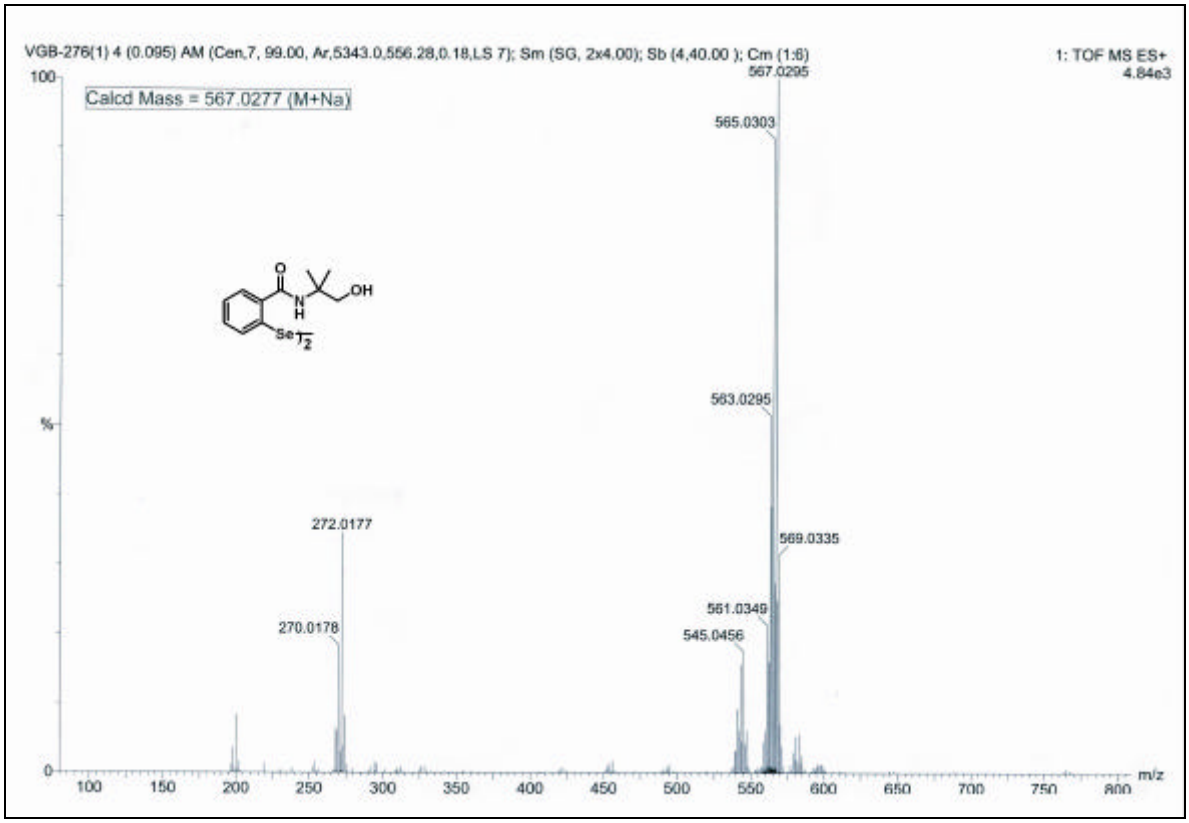


Figure S11. ESI-HRMS spectra of pure diselenide (**16**).

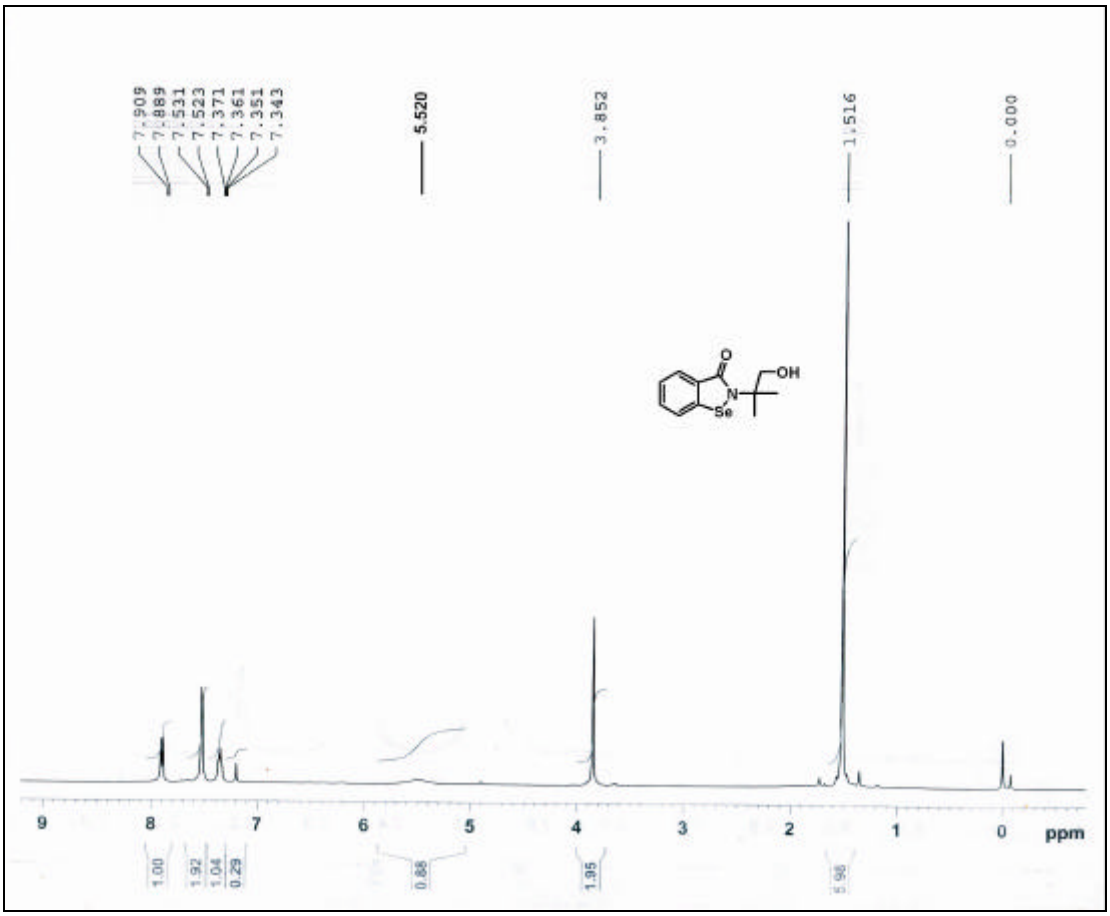


Figure S12. ^{1}H-NMR spectra of pure selenenyl amide (**17**) in $CDCl_3$.

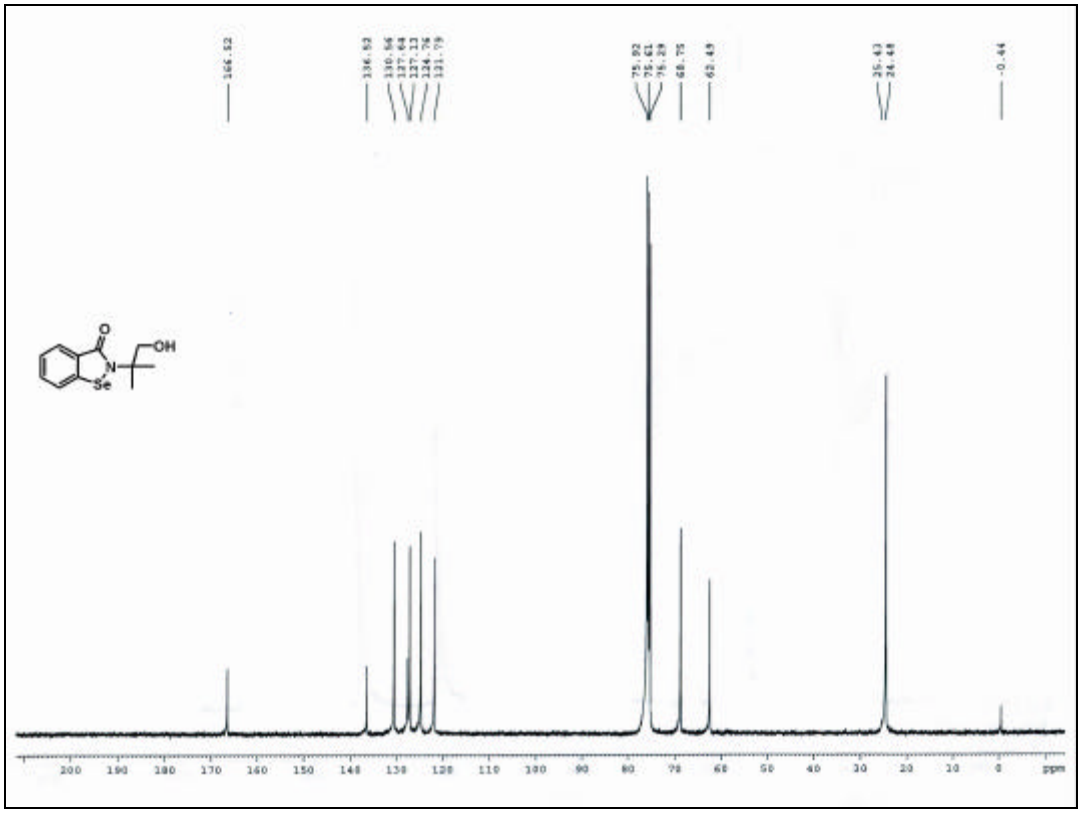


Figure S13. ^{13}C-NMR spectra of pure selenenyl amide (**17**) in $CDCl_3$.

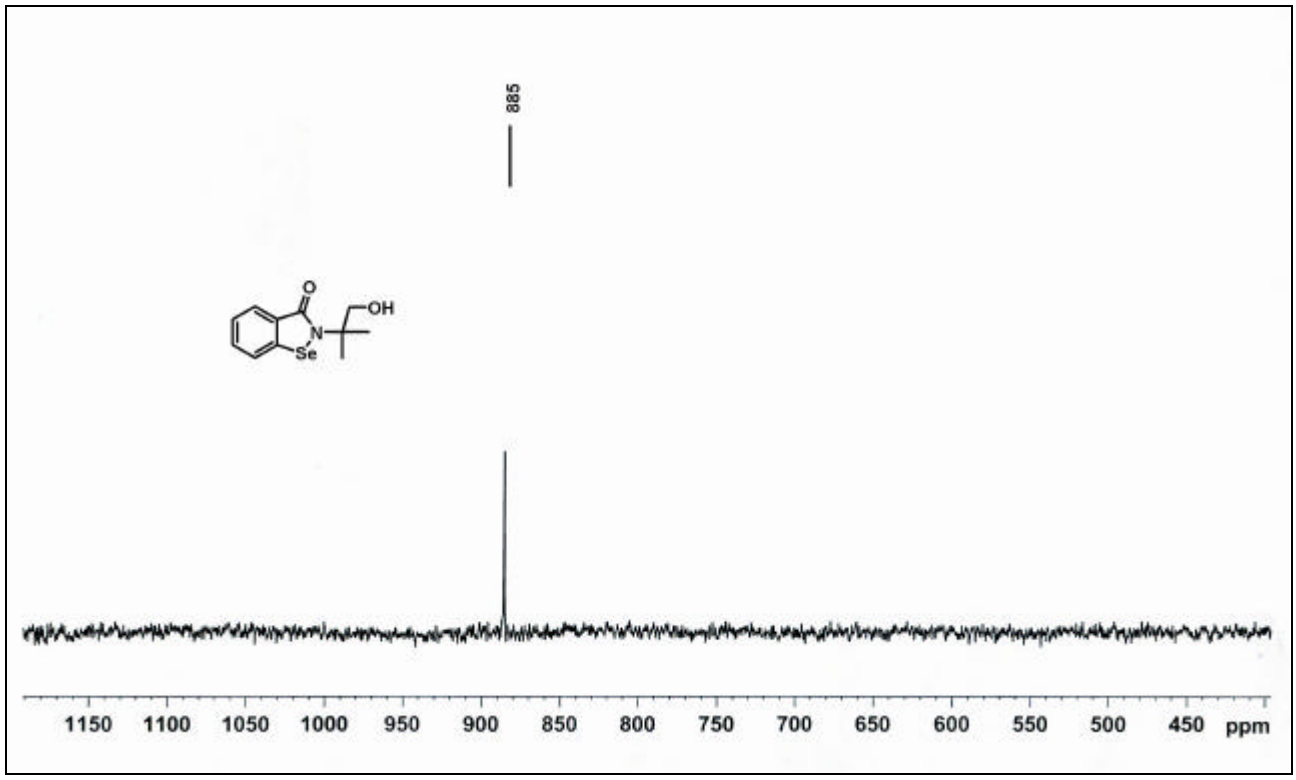


Figure S14. ^{77}Se-NMR spectra of pure selenenyl amide (**17**) in $CDCl_3$.

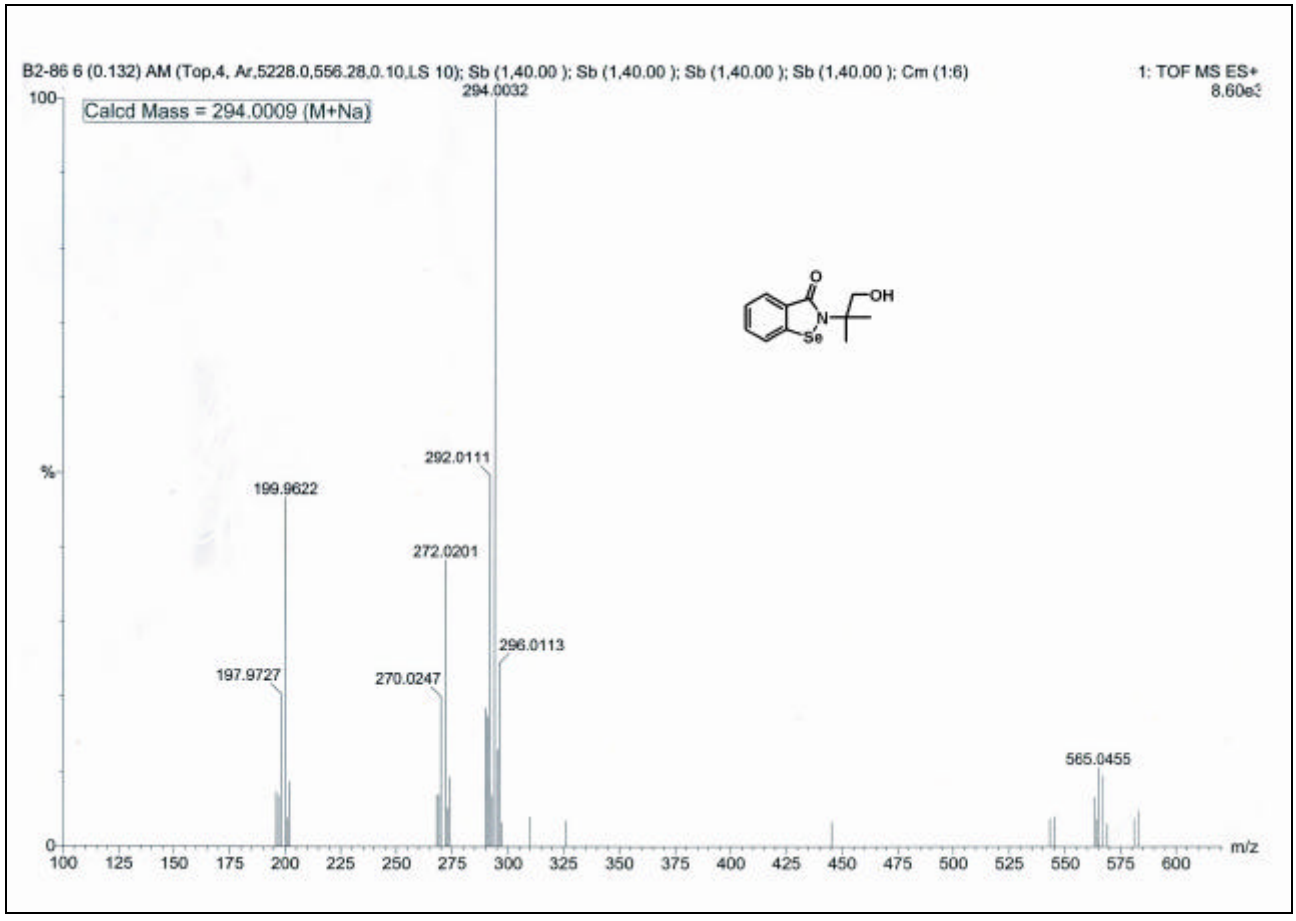


Figure S15. ESI-HRMS spectra of pure selenenyl amide (**17**).

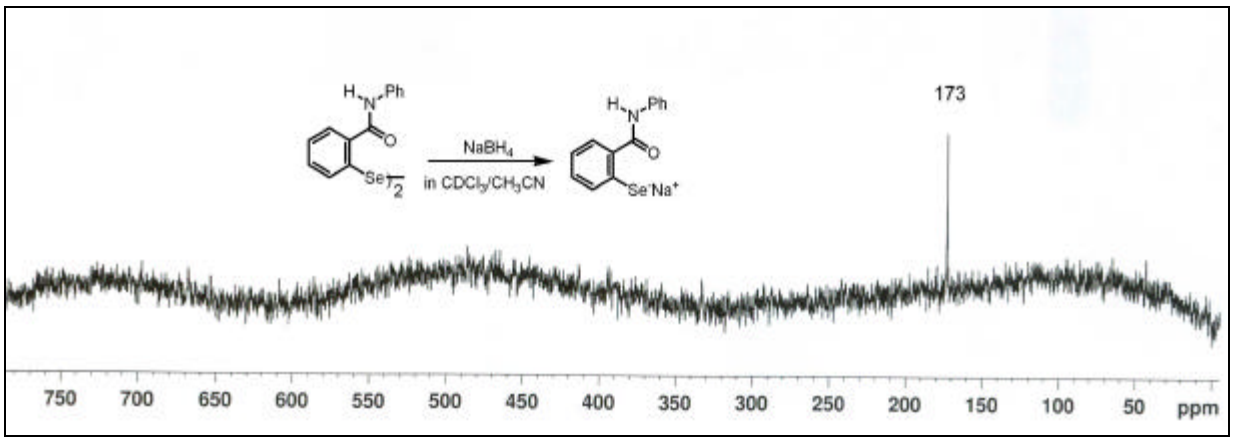


Figure S16. ^{77}Se NMR spectra for the reaction of ebselen diselenide (**6**) with $NaBH_4$ in $CDCl_3/CH_3CN$ mixture.

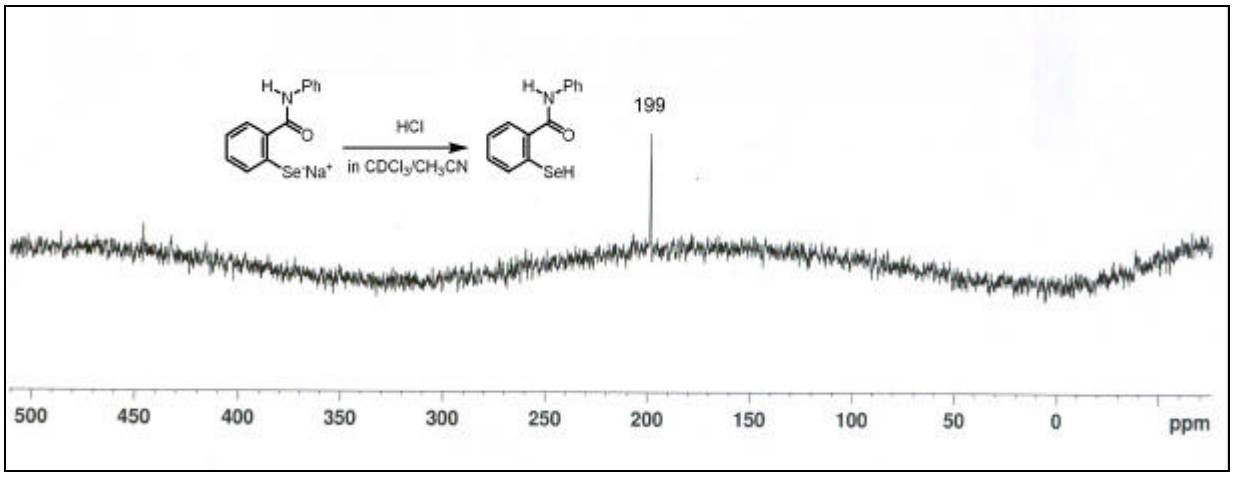


Figure S17. ^{77}Se NMR spectra of ebselen selenol (**8**) obtained from the acidification of the sodium selenolate (in $CDCl_3/CH_3CN$ mixture).

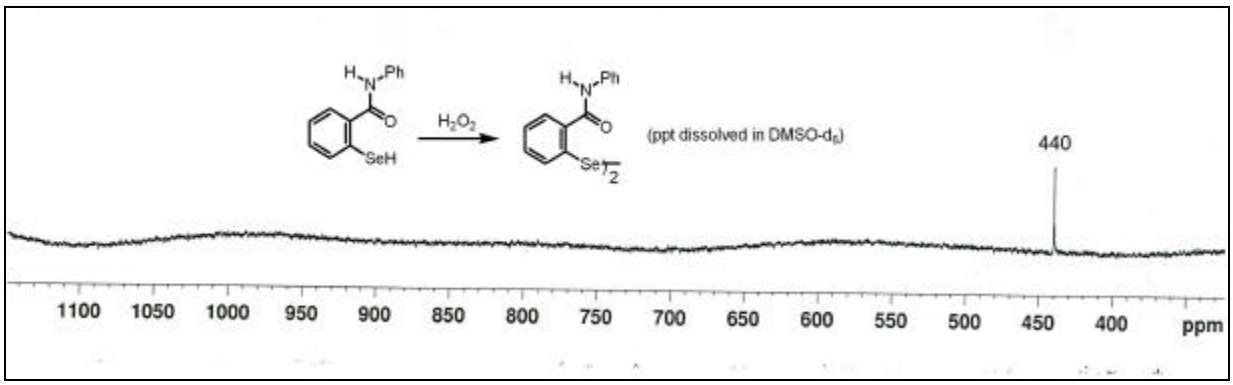


Figure S18. ^{77}Se NMR spectra of ebselen diselenide (**6**) obtained from the reaction of ebselen selenol (**8**) with H_2O_2. The diselenide (**6**) precipitates out in $CDCl_3/CH_3CN$ mixture. The precipitate was dissolved in DMSO-d_6 and ^{77}Se NMR was recorded.

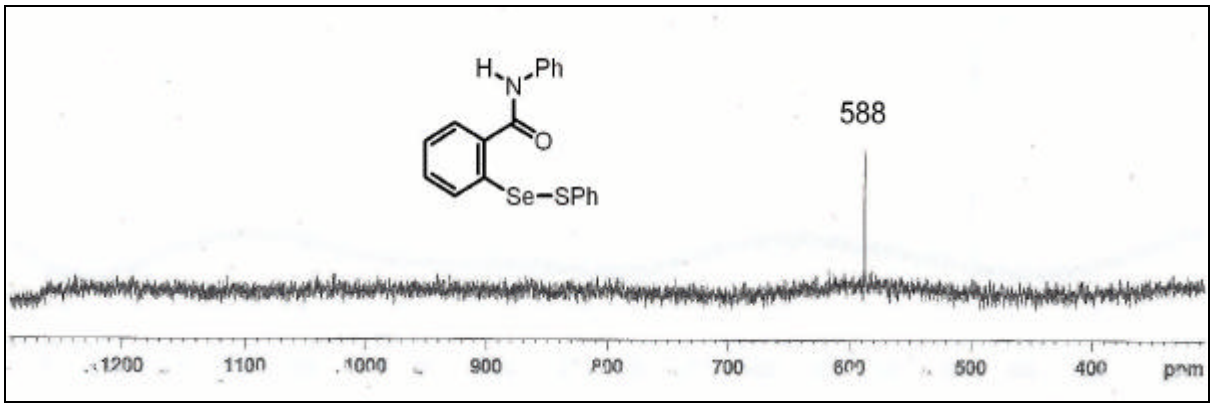


Figure S19. ^{77}Se NMR spectra of ebselen selenenyl sulfide (**5**) in $CDCl_3$.

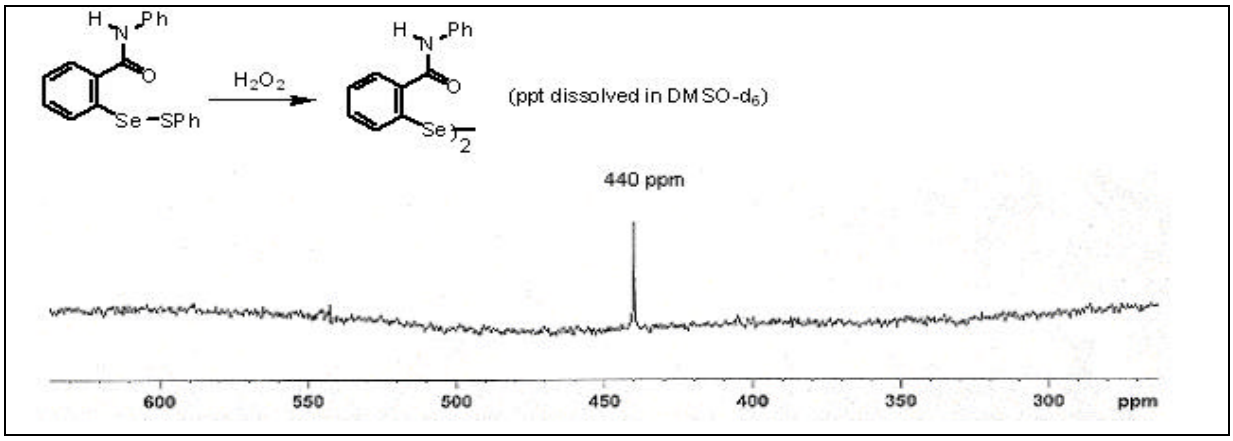


Figure S20. ^{77}Se NMR spectra of ebselen diselenide (**6**) obtained from the reaction of ebselen selenenyl sulfide (**5**) with H_2O_2. The diselenide precipitates out in $CDCl_3$. The precipitate was dissolved in DMSO-d_6 and ^{77}Se NMR was recorded.

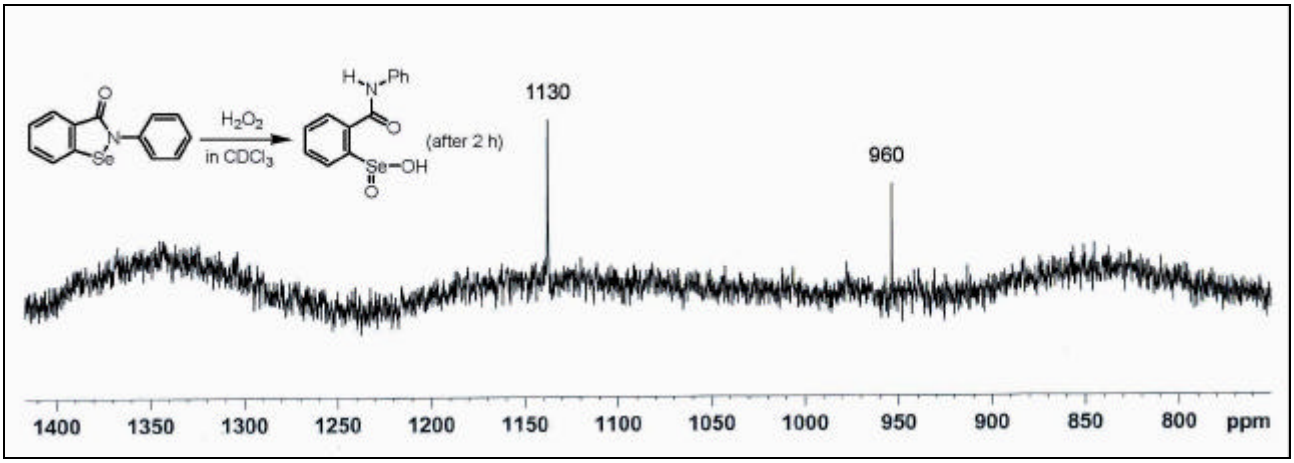


Figure 21. ^{77}Se NMR spectra of the reaction of ebselen (**1**) with H_2O_2 to regenerate the seleninic acid (**9**) recorded after 2 h.

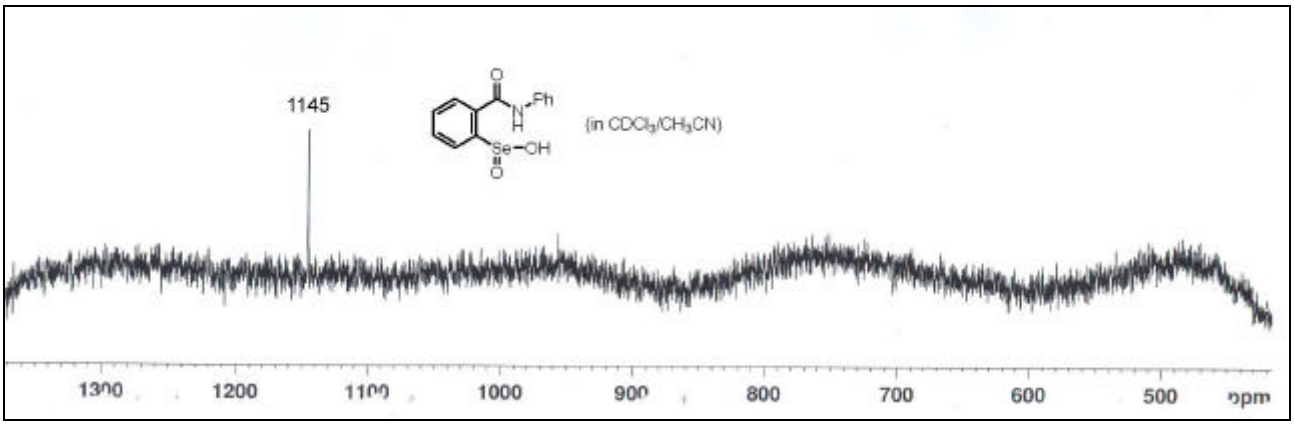


Figure S22. ^{77}Se NMR spectra of pure ebselen seleninic acid (**9**) in $CDCl_3/CH_3CN$.

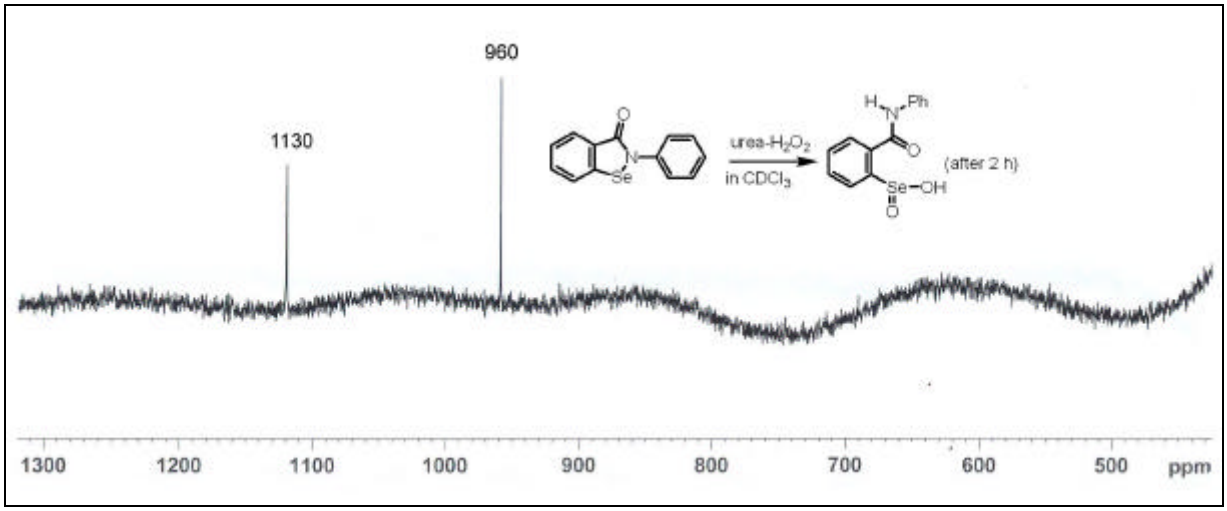


Figure S23. ^{77}Se NMR spectra of the reaction of ebselen (**1**) with urea-H_2O_2 adduct to regenerate the seleninic acid (**9**) recorded after 2 h.

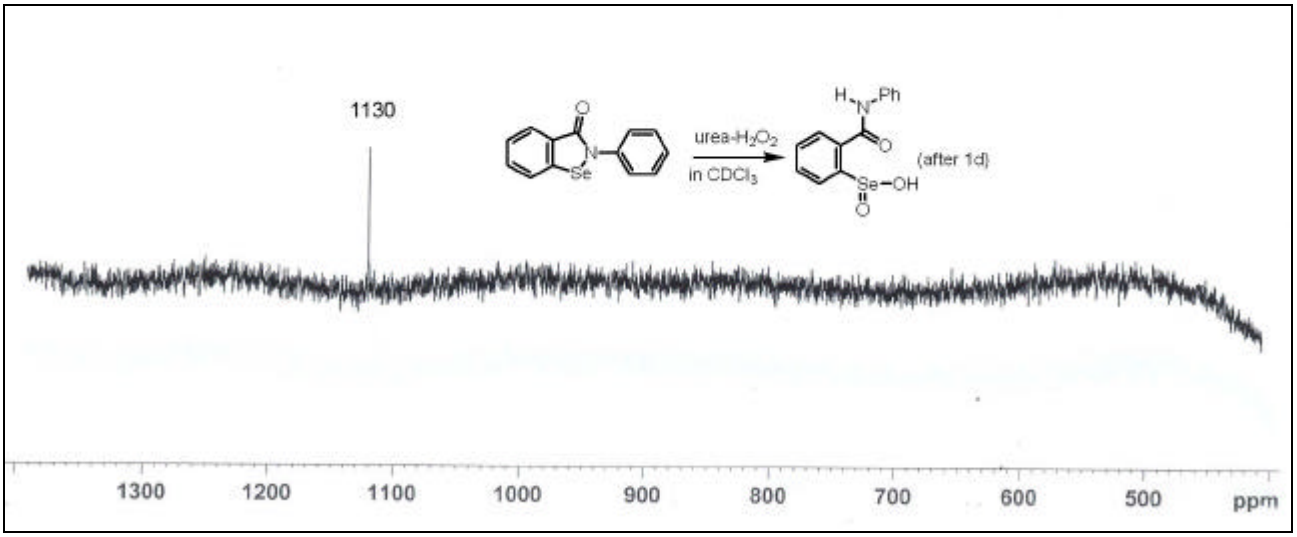


Figure S24. ^{77}Se NMR spectra for the reaction of ebselen (**1**) with urea-H_2O_2 adduct in $CDCl_3$. Ebselen (**1**) completely converts to seleninic acid (**9**) after 1 day.

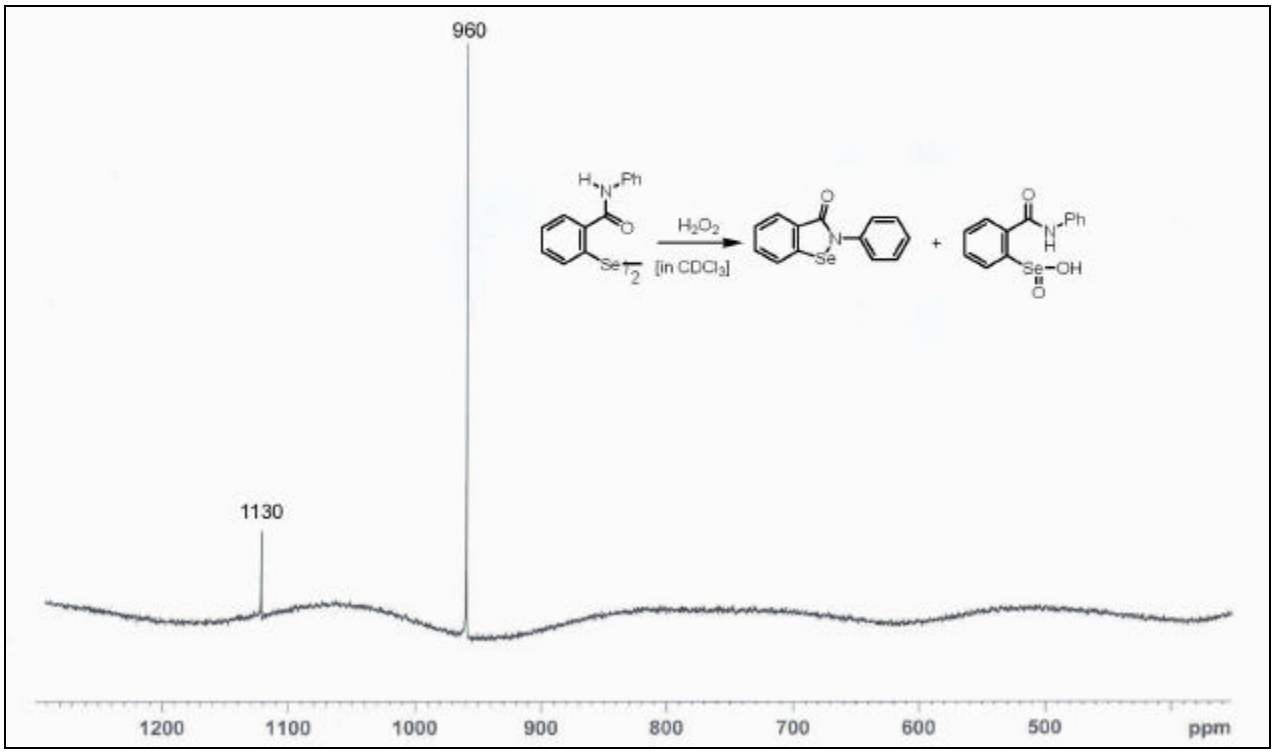


Figure S25. ^{77}Se NMR spectra of the reaction of diselenide **6** with H_2O_2 to regenerate the seleninic acid (**9**) and ebselen (**1**).

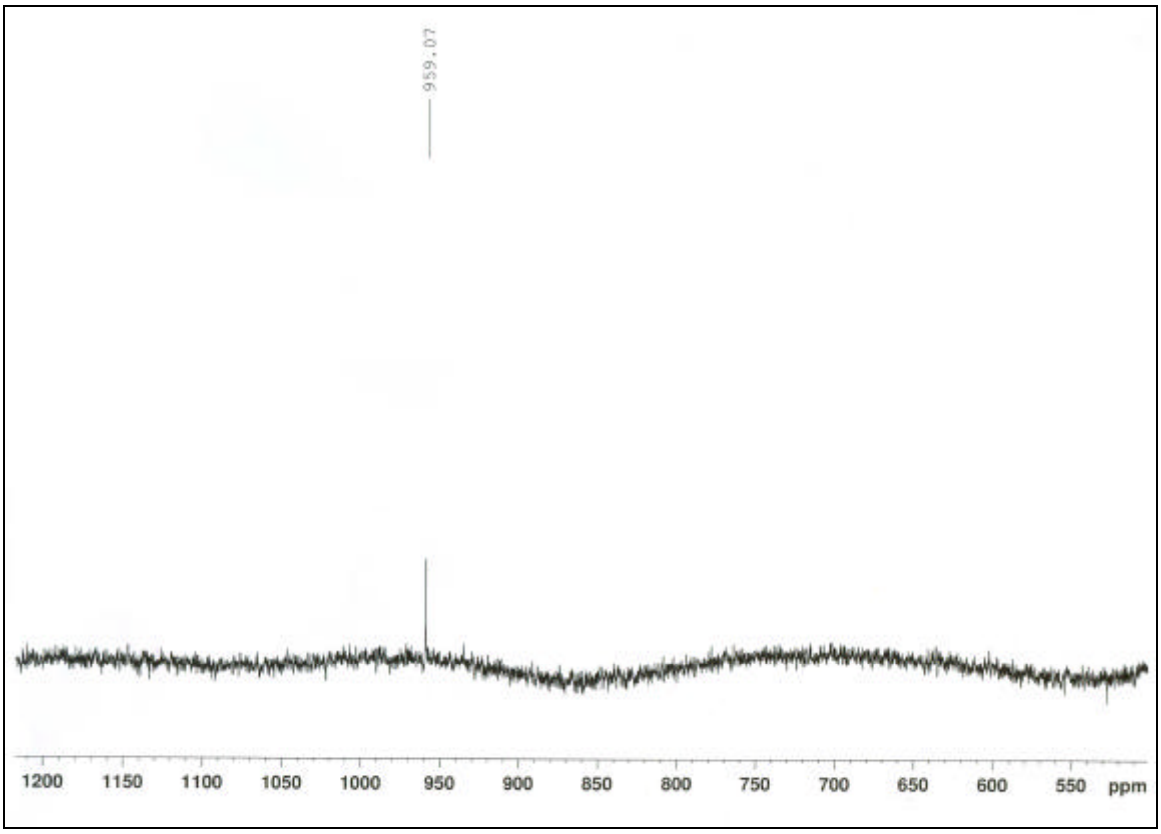


Figure S26. ^{77}Se NMR spectra obtained after refluxing the seleninic acid **9** in CH_3CN/MeOH for 24 h. The ^{77}Se NMR spectra clearly indicate the formation of ebselen (**1**).

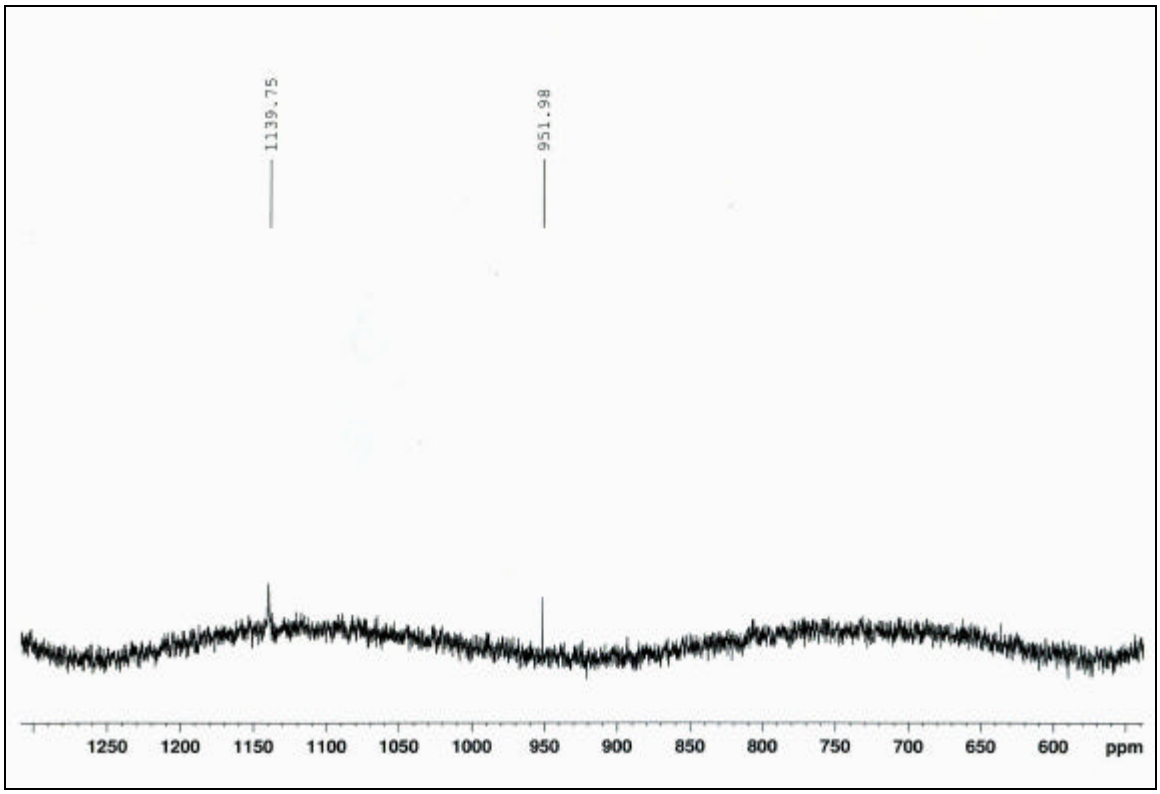


Figure S27. ^{77}Se NMR spectra of the reaction of the seleninic acid **9** with 1 equiv of PhSH. The ^{77}Se NMR spectra clearly indicate the formation of ebselen (**1**).

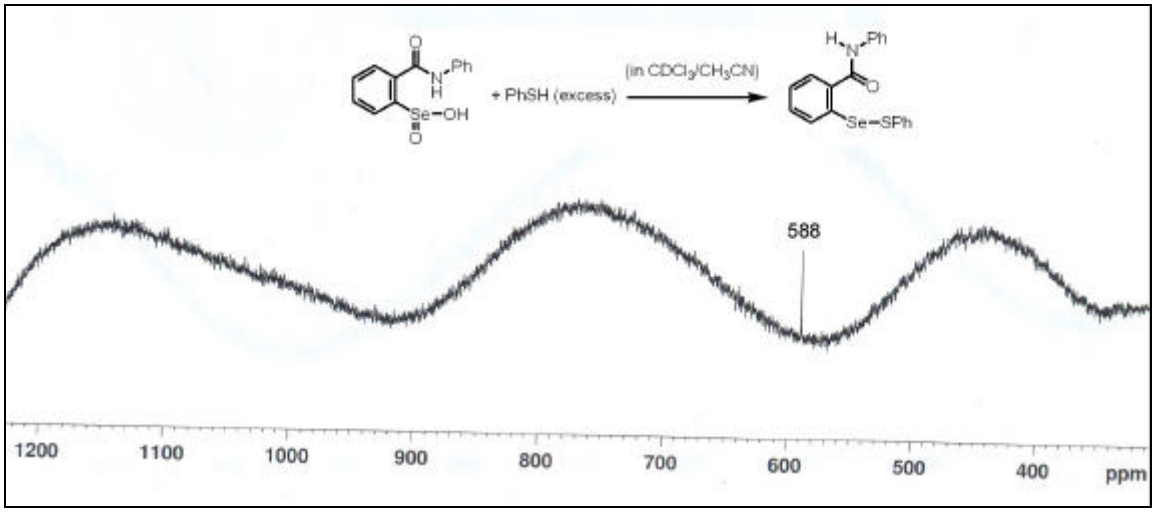


Figure S28. ^{77}Se NMR spectra of the reaction of seleninic acid **9** with excess PhSH. The ^{77}Se NMR spectra clearly indicate the formation of the selenenyl sulfide **5**.

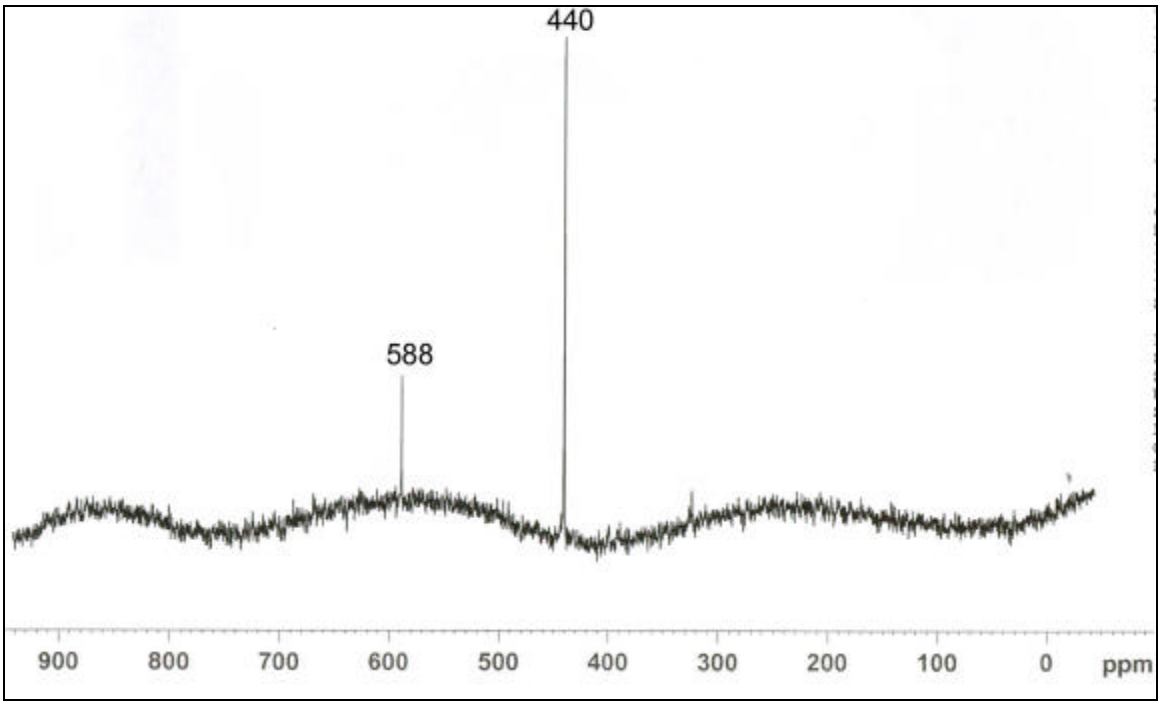


Figure S29. ^{77}Se NMR spectra of the reaction of diselenide (**6**) with PhSH in DMSO-d6. The ^{77}Se NMR spectra clearly indicate the formation of the selenenyl sulfide **5**.

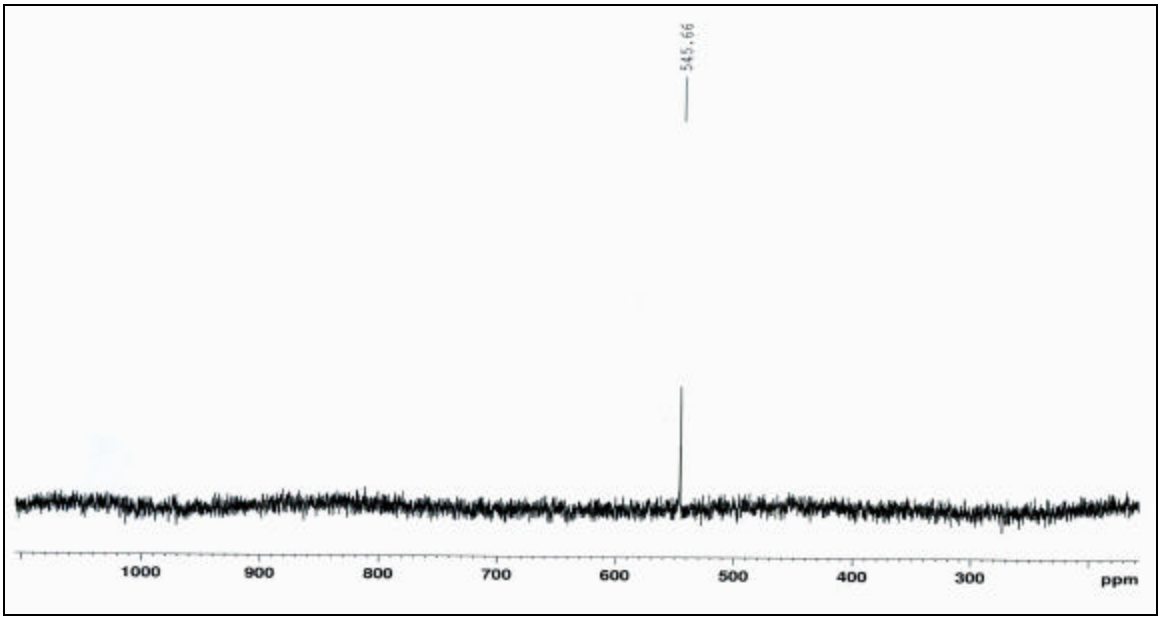


Figure 30. ^{77}Se NMR Spectra of pure selenenyl sulfide (**5**) in DMSO-d6.

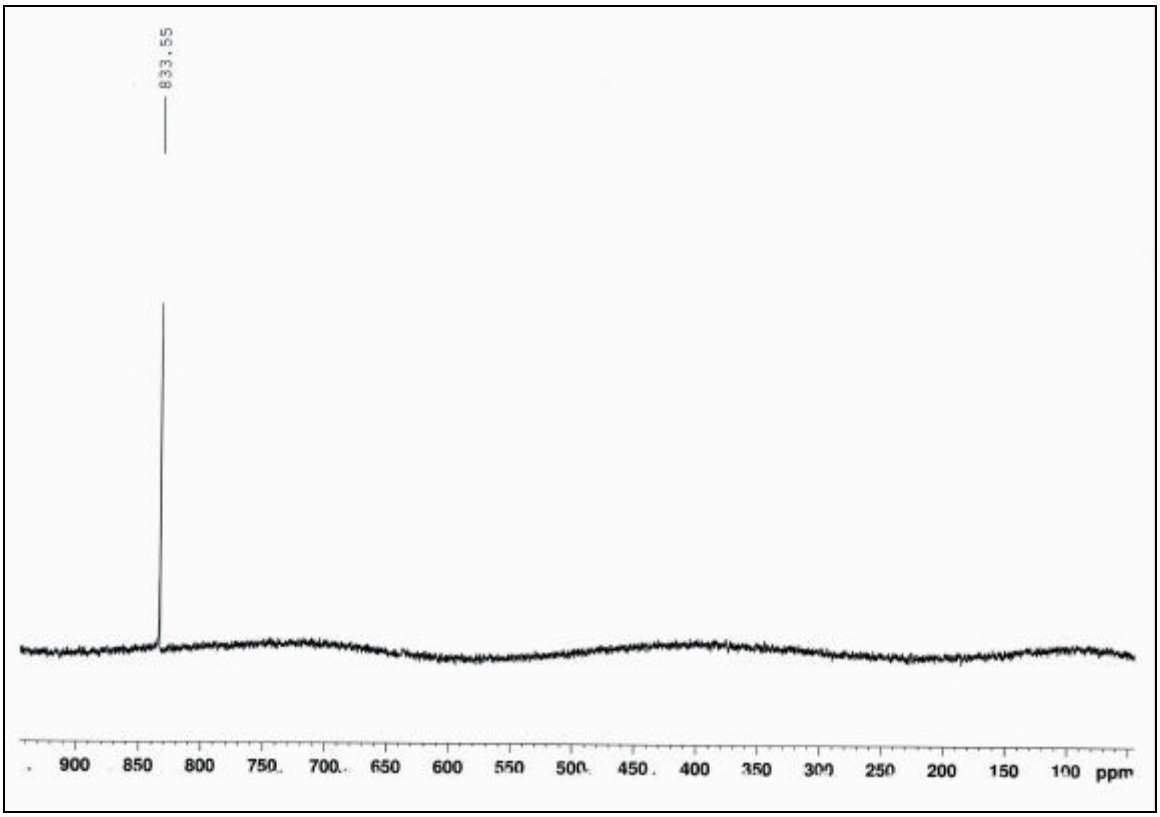


Figure 31. ^{77}Se NMR Spectra of pure methyl selenoxide **19** in MeOH-d_4.

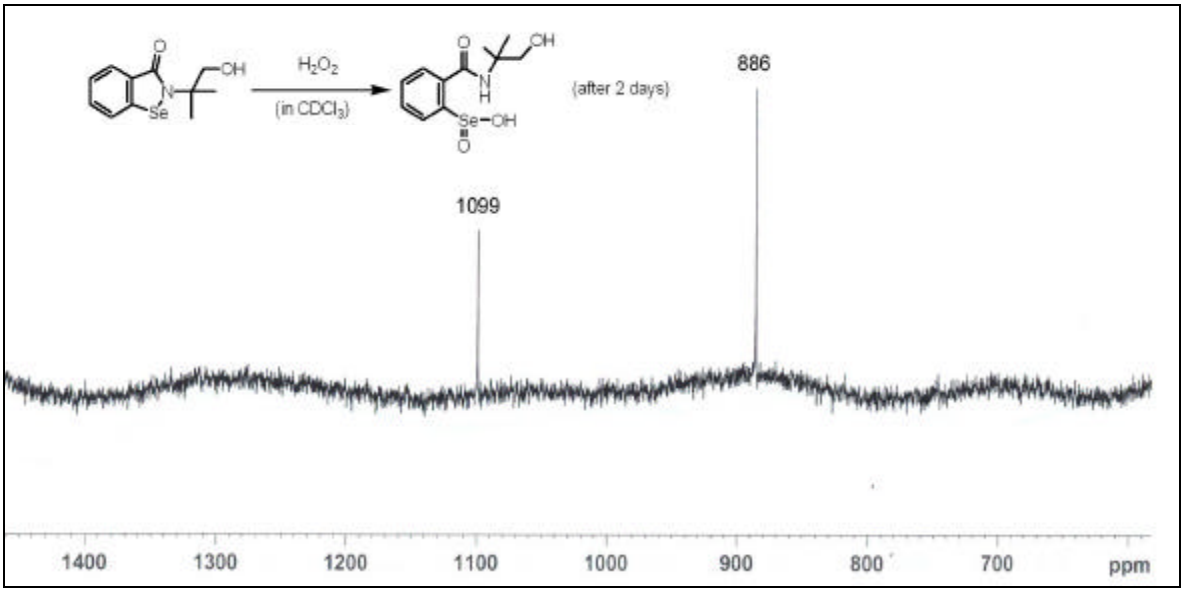


Figure 32. ^{77}Se NMR spectra of the reaction of selenenyl amide **17** with H_2O_2 recorded after 2 h. The ^{77}Se NMR spectra clearly indicate the formation of the seleninic acid **24**.

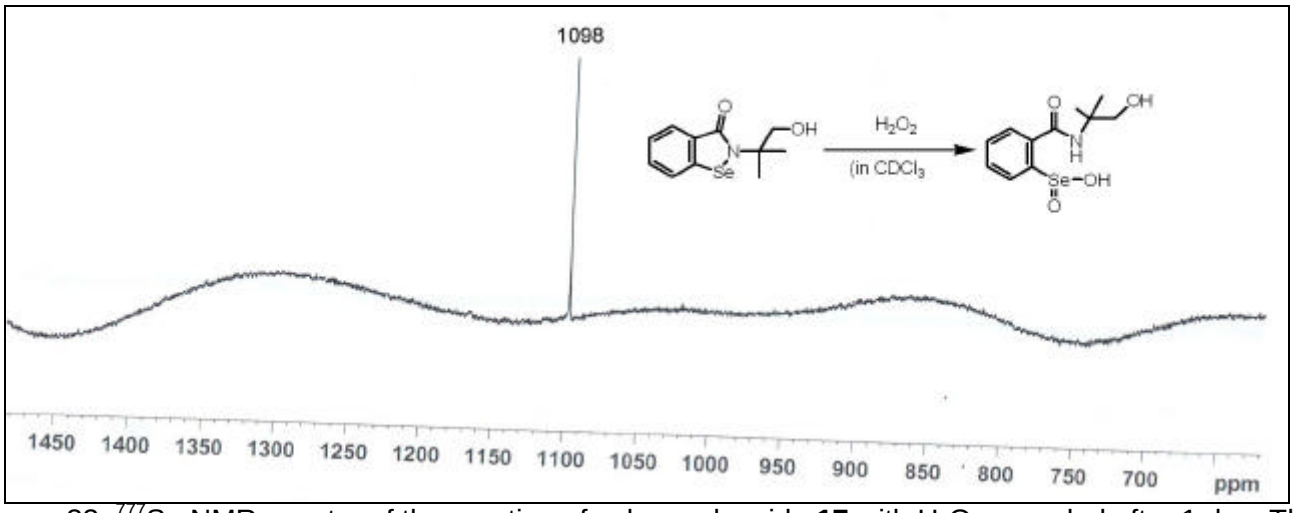


Figure 33. [777]Se NMR spectra of the reaction of selenenyl amide **17** with H_2O_2 recorded after 1 day. The [77]Se NMR spectra clearly indicate the complete conversion of **17**to **24** after 1 day.

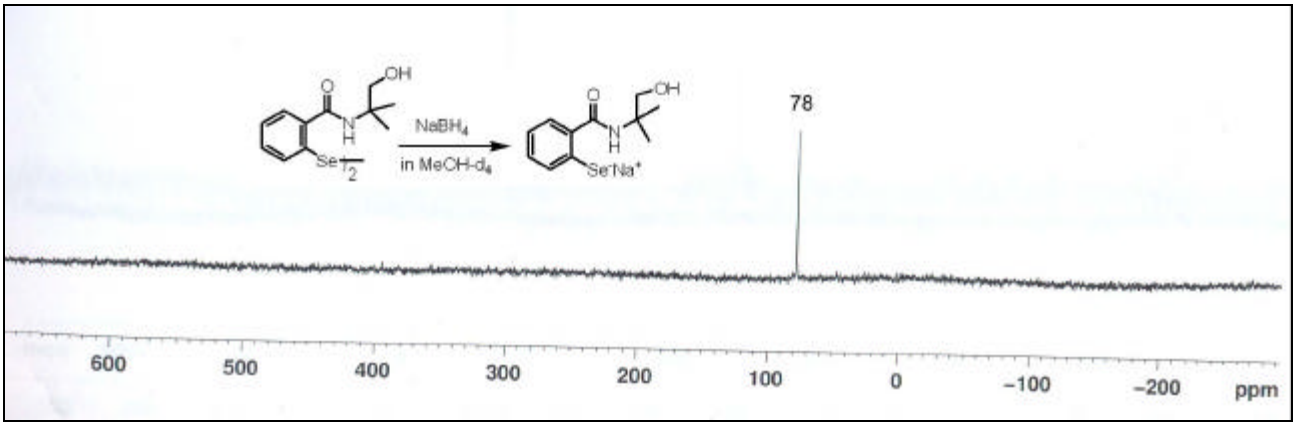


Figure S34. [77]Se NMR spectra for the reaction of diselenide (**16**) with $NaBH_4$ in MeOH-d_4.

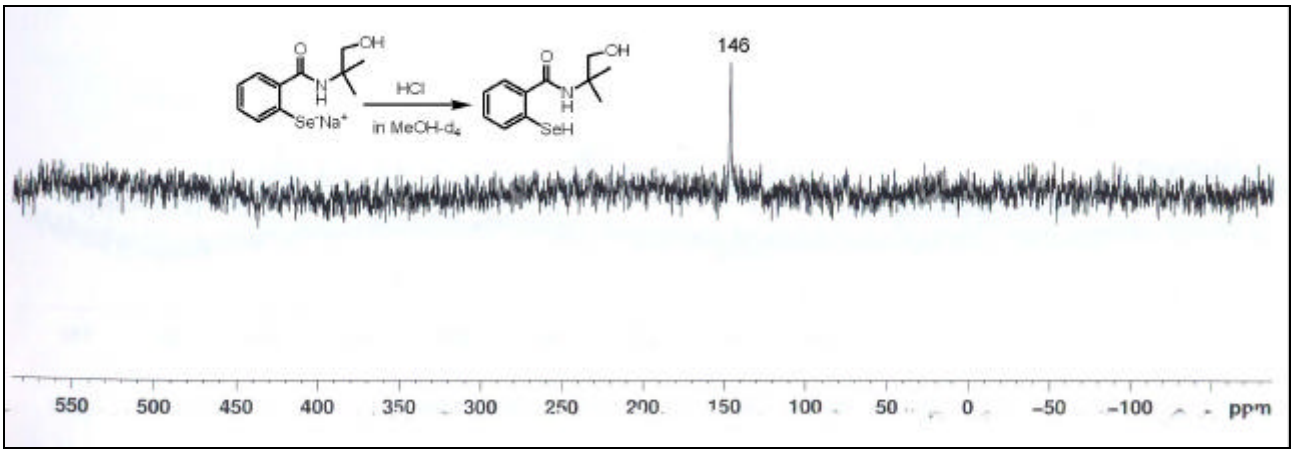


Figure S35. [77]Se NMR spectra of selenol (**15**) obtained from the acidification of the sodium selenolate (in MeOH-d_4).

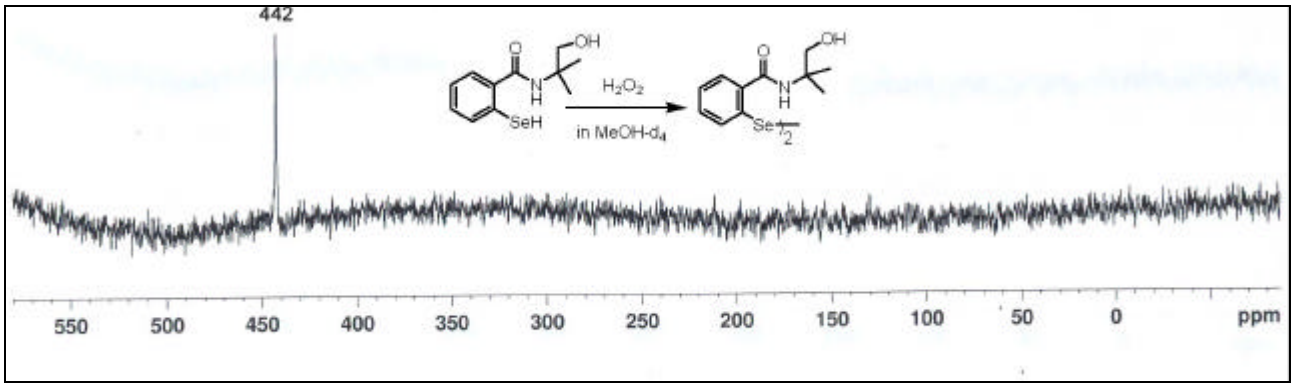


Figure S36. ^{77}Se NMR spectra of diselenide (**16**) obtained from the reaction of selenol (**15**) with H_2O_2 in MeOH-d_4.

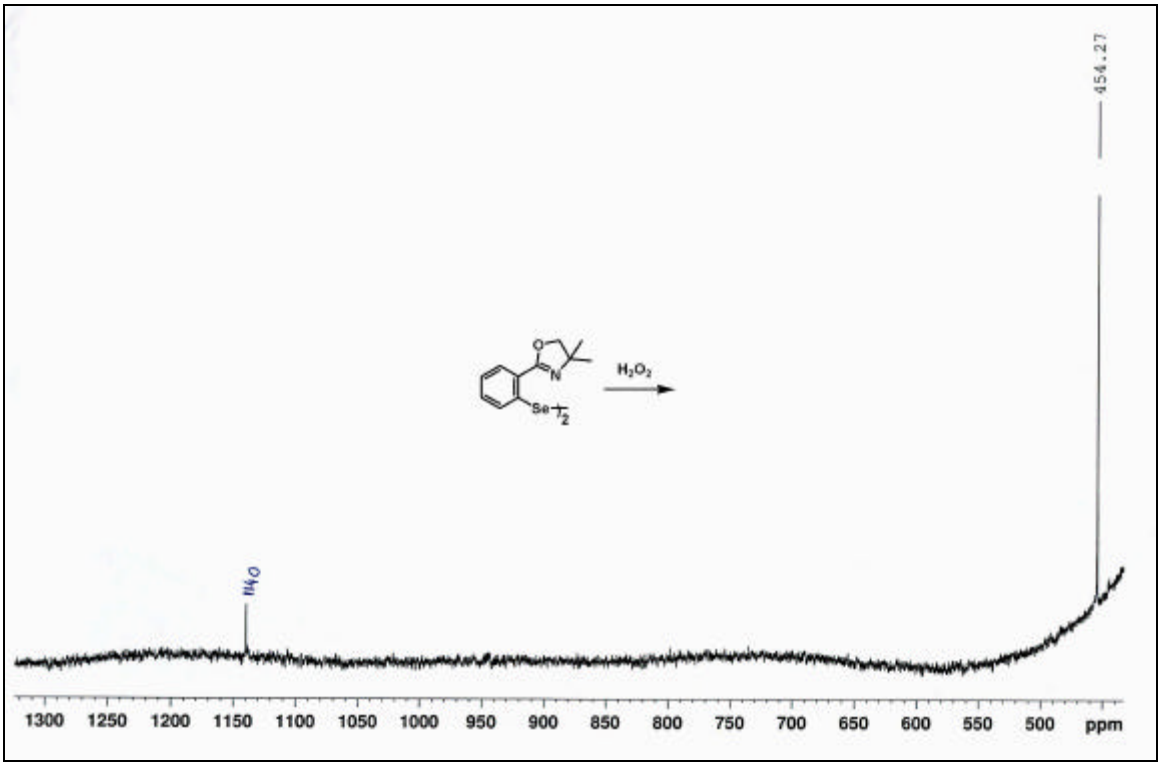


Figure S37. ^{77}Se NMR spectra of the reaction of diselenide (**27**) with H_2O_2 recorded after 5 h in $CDCl_3$.

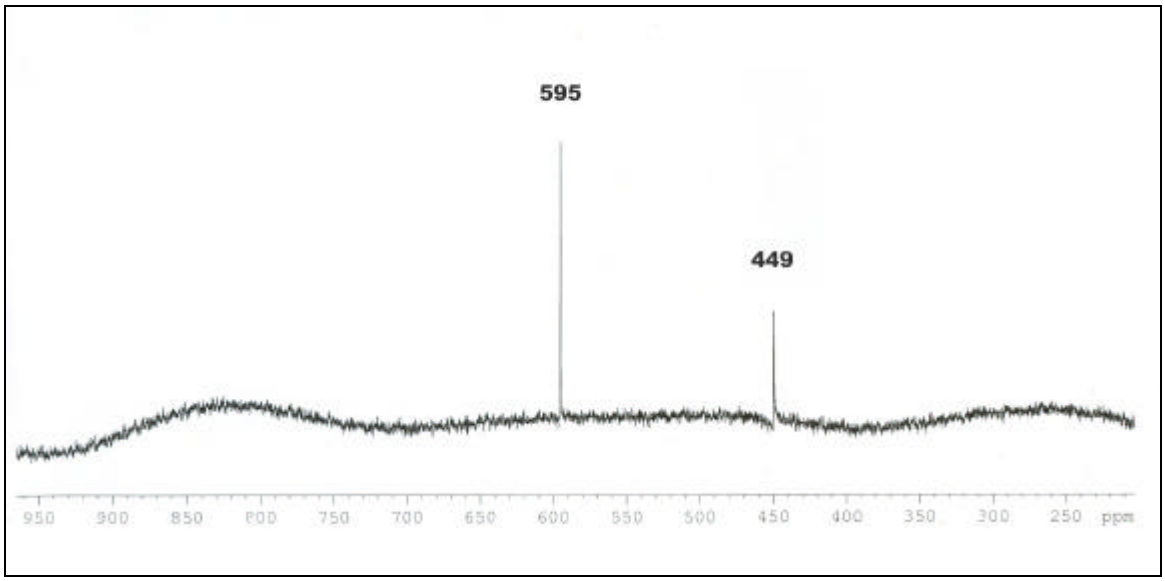


Figure S38. Pure selenenyl sulfide **5** when kept in $CDCl_3$, diselenide 6 precipitated out in solution. DMSO-d6 was added to the reaction mixture and ^{77}Se NMR spectrum was recorded.

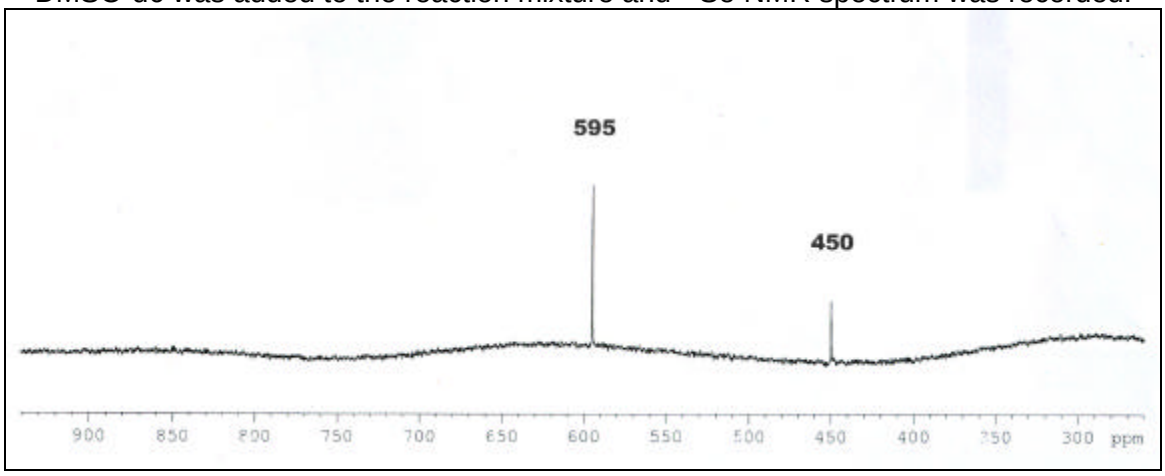


Figure S39. Pure selenenyl sulfide **5** was dissolved in $CDCl_3$ and 10 μL H_2O was added. Diselenide **6** precipitated out in solution. DMSO-d_6 was added to the reaction mixture and ^{77}Se NMR spectrum was recorded.

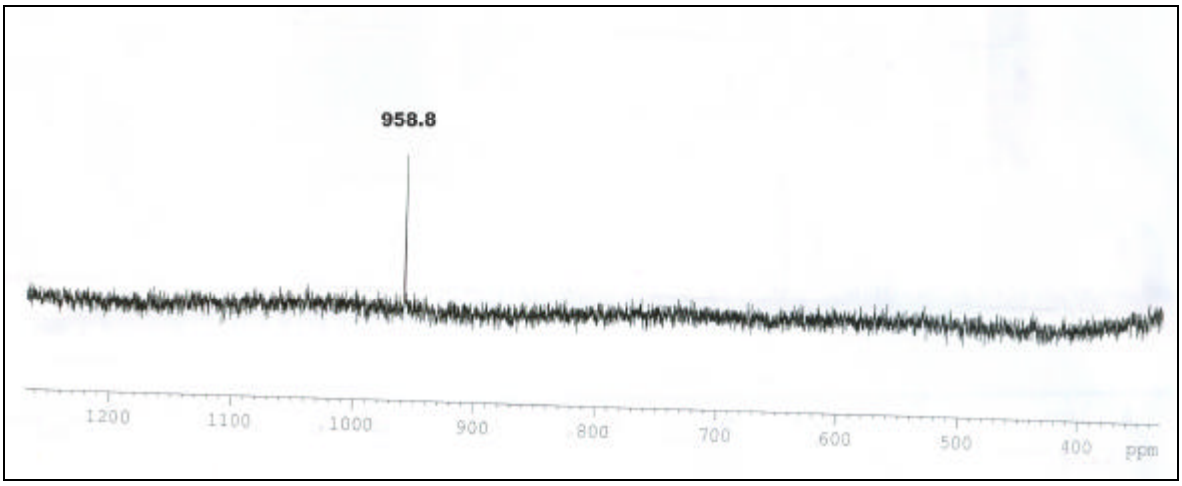


Figure S40. When the precipitate of diselenide **6** obtained from the reaction of **5** with H_2O_2 was stirred or mixed thoroughly with the remaining solution, ebselen was isolated in quantitative yield.

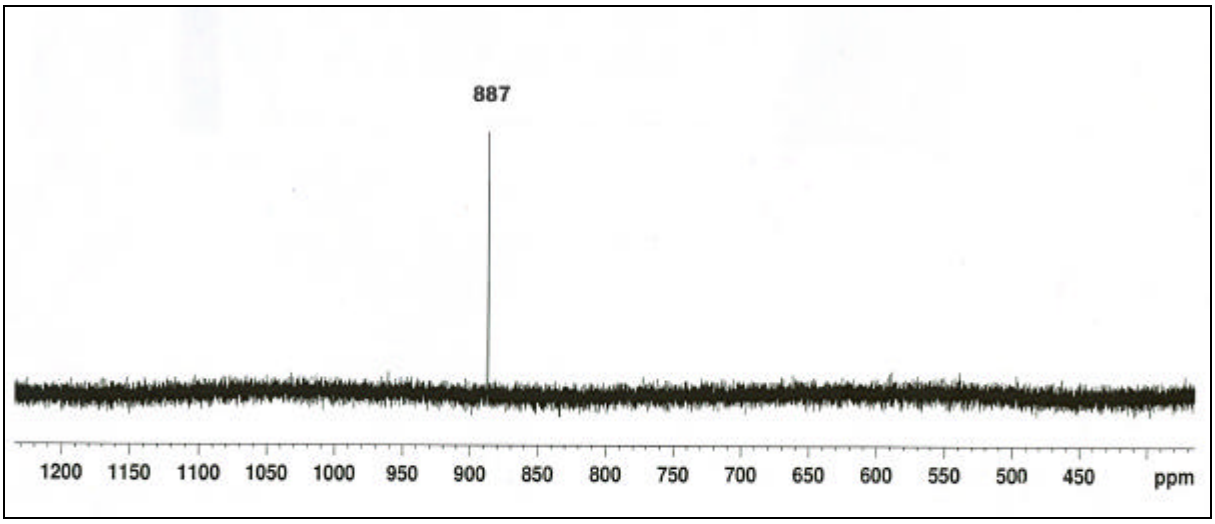


Figure S41. The reaction of **14** with H_2O_2 produced the selenenyl amide **17** in quantitative yield. The diselenide **16** produced *in situ* being soluble in $CDCl_3$ immediately reacted with H_2O_2 to produce **17** and hence **16** could not be detected in the reaction of **14** with H_2O_2.

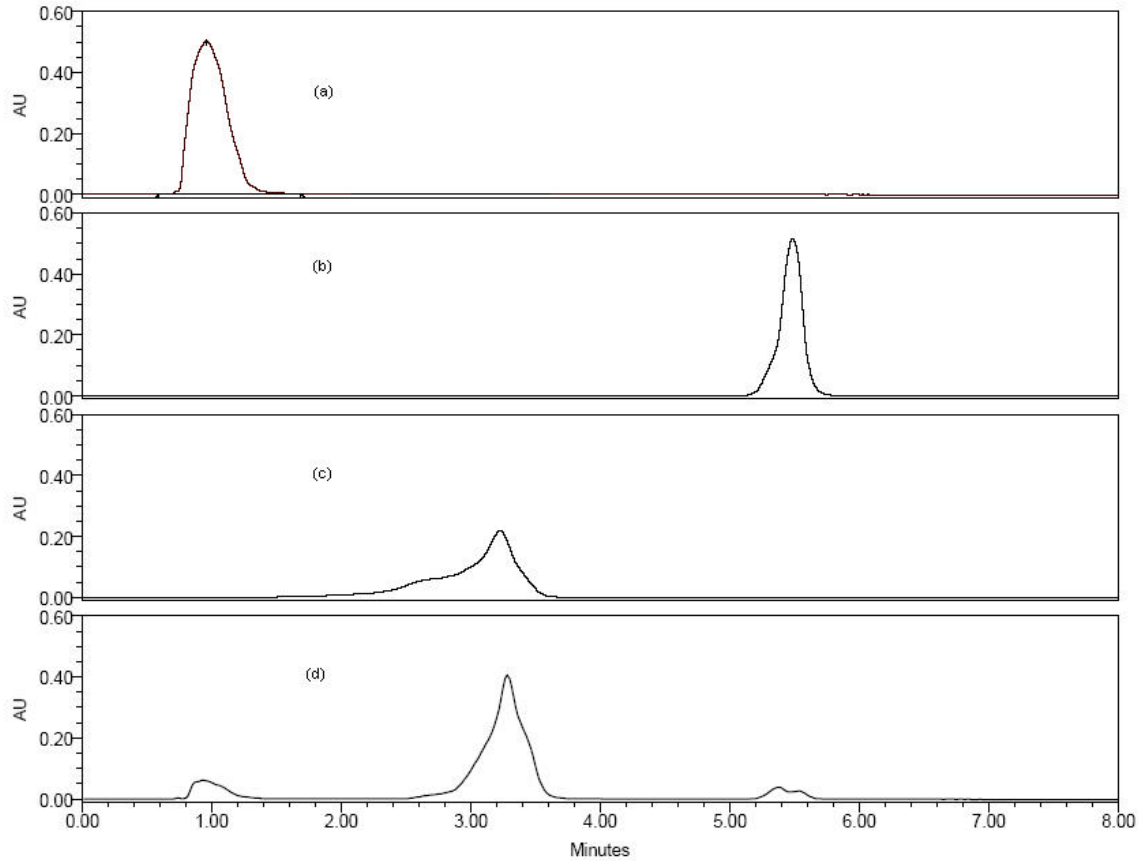


Figure S42. HPLC chromatogram for (a) pure **9** (b) pure **6** (c) pure ebselen (**1**) (d) reaction of **9** with 1 equiv of **6** to form ebselen (**1**).

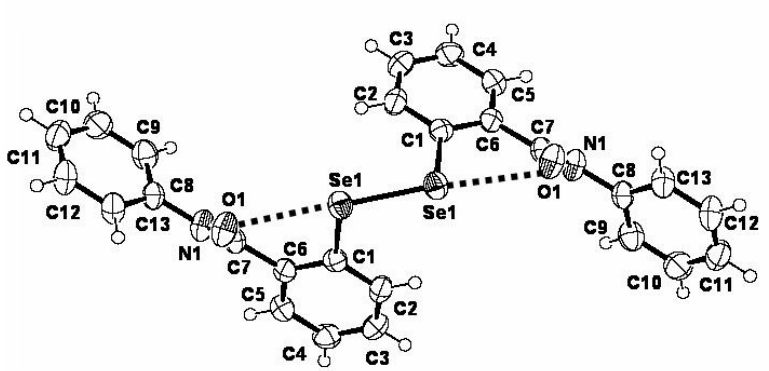


Figure S43. Molecular structure of diselenide **6**.

Table S1. Important Bond Length (Å), Bond Angles (°) and Torsion Angles (°) of diselenide **6**.

Se1-C1	1.938(2)	C8-C9	1.382(4)
Se1-Se1_a	2.3262(10)	C9-C10	1.386(4)
O1-C7	1.230(3)	C10-C11	1.368(4)
N1-C7	1.349(3)	C11-C12	1.373(4)
N1-C8	1.422(4)	C12-C13	1.379(4)
C1-C6	1.398(3)	Se1_a-Se1-C1	102.46(7)
C1-C2	1.393(4)	C7-N1-C8	124.7(2)
C2-C3	1.379(4)	C8-N1-H5	118(2)
Se1···O1	2.854(2)	C7-N1-H5	116(2)
C4-C5	1.381(4)	Se1-C1-C6	119.60(18)
C5-C6	1.393(3)	C2-C1-C6	118.9(2)
C6-C7	1.498(4)	Se1-C1-C2	121.55(18)
C8-C13	1.380(3)	C1-C2-C3	120.4(2)
C2-C3-C4	121.2(3)	N1-C8-C13	121.8(2)
C3-C4-C5	119.1(2)	C8-C9-C10	120.1(2)
C4-C5-C6	120.9(2)	C9-C10-C11	120.2(3)
C5-C6-C7	120.2(2)	Se1_a-Se1-C1-C2	18.7(2)
C1-C6-C7	120.19(19)	Se1_a-Se1-C1-C6	-161.47(16)
C1-C6-C5	119.6(2)	C1-Se1-Se1_a-C1_a	86.19(9)
C10-C11-C12	119.8(3)	C8-N1-C7-O1	0.6(4)
C11-C12-C13	120.7(3)	C8-N1-C7-C6	-178.4(2)
C8-C13-C12	119.8(2)	C7-N1-C8-C9	135.3(3)
O1-C7-N1	123.4(2)	C7-N1-C8-C13	-46.0(4)
O1-C7-C6	121.3(2)	Se1-C1-C2-C3	178.74(19)

N1-C7-C6	115.36(19)	C6-C1-C2-C3	-1.1(3)
N1-C8-C9	118.7(2)	Se1-C1-C6-C5	-179.01(17)
C9-C8-C13	119.5(2)	Se1-C1-C6-C7	-0.5(3)
C2-C1-C6-C5	0.8(3)	C5-C6-C7-O1	140.4(2)
C2-C1-C6-C7	179.3(2)	C5-C6-C7-N1	-40.7(3)
C1-C2-C3-C4	0.3(4)	N1-C8-C9-C10	-179.8(2)
C2-C3-C4-C5	0.7(4)	C13-C8-C9-C10	1.5(4)
C3-C4-C5-C6	-1.0(4)	N1-C8-C13-C12	179.9(3)
C4-C5-C6-C1	0.2(3)	C9-C8-C13-C12	-1.4(4)
C4-C5-C6-C7	-178.3(2)	C8-C9-C10-C11	-0.5(4)
C1-C6-C7-O1	-38.1(3)	C9-C10-C11-C12	-0.7(4)
C1-C6-C7-N1	140.8(2)		

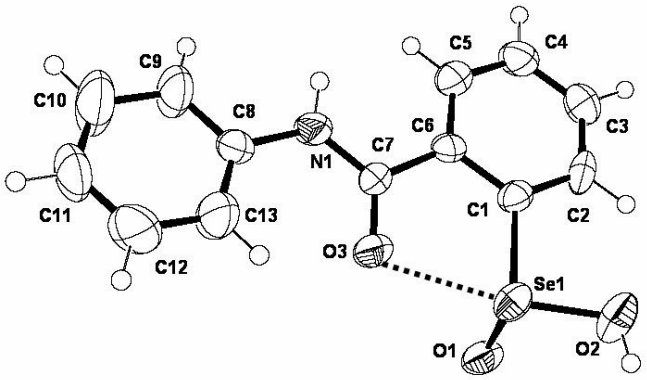


Figure S44. Molecular structure of seleninic acid **9**.

Table S2. Important Bond Length (Å), Bond Angles (°) and Torsion Angles (°) of seleninic acid **9**.

Se1-O1	1.658(3)	Se1-C1-C6	120.0(3)
Se1-O2	1.753(4)	C1-C2-C3	119.9(5)
Se1-C1	1.959(4)	C2-C3-C4	120.1(5)
O3-C7	1.229(5)	C3-C4-C5	120.4(5)
N1-C8	1.419(7)	C4-C5-C6	121.1(4)
N1-C7	1.335(6)	C5-C6-C7	125.2(4)
C1-C6	1.399(6)	C1-C6-C7	116.5(4)
C1-C2	1.384(6)	C1-C6-C5	118.3(4)
C2-C3	1.373(7)	O3-C7-N1	122.8(4)
C3-C4	1.374(7)	O3-C7-C6	118.4(4)

C4-C5	1.360(8)	N1-C7-C6	118.8(4)
C5-C6	1.382(7)	N1-C8-C9	117.6(5)
C6-C7	1.496(5)	N1-C8-C13	124.1(5)
C8-C13	1.370(8)	C9-C8-C13	118.3(5)
C8-C9	1.355(7)	C8-C9-C10	120.5(6)
C9-C10	1.370(8)	C9-C10-C11	121.4(6)
C10-C11	1.367(9)	C10-C11-C12	117.9(6)
C11-C12	1.333(9)	C11-C12-C13	121.9(6)
Se1···O3	2.460(3)	C8-C13-C12	120.1(6)
O1-Se1-O2	98.23(17)	O1-Se1-C1-C2	-89.0(4)
O1-Se1-C1	102.89(17)	O2-Se1-C1-C2	10.3(4)
O2-Se1-C1	93.53(17)	O1-Se1-C1-C6	90.2(4)
Se1-O2-H14	109.00	O2-Se1-C1-C6	-170.6(4)
C7-N1-C8	127.1(3)	C8-N1-C7-O3	3.1(8)
C8-N1-H1	116.00	C8-N1-C7-C6	-178.4(5)
C7-N1-H1	116.00	C7-N1-C8-C9	-167.6(5)
C2-C1-C6	120.2(4)	C7-N1-C8-C13	14.8(9)
Se1-C1-C2	119.8(3)	C2-C1-C6-C5	0.0(7)
C2-C1-C6-C7	178.8(4)	C5-C6-C7-O3	165.7(4)
C6-C1-C2-C3	-0.5(7)	C5-C6-C7-N1	-12.9(7)
Se1-C1-C6-C5	-179.2(3)	C1-C6-C7-O3	-12.9(6)
Se1-C1-C2-C3	178.7(4)	N1-C8-C9-C10	-178.5(6)
Se1-C1-C6-C7	-0.4(5)	C13-C8-C9-C10	-0.8(9)
C1-C2-C3-C4	-0.2(8)	N1-C8-C13-C12	178.9(6)
C2-C3-C4-C5	1.4(8)	C9-C8-C13-C12	1.4(10)
C3-C4-C5-C6	-1.9(8)	C8-C9-C10-C11	0.3(10)
C4-C5-C6-C1	1.2(7)	C9-C10-C11-C12	-0.4(10)
C4-C5-C6-C7	-177.5(4)	C10-C11-C12-C13	1.0(11)
C1-C6-C7-N1	168.5(4)	C11-C12-C13-C8	-1.6(11)

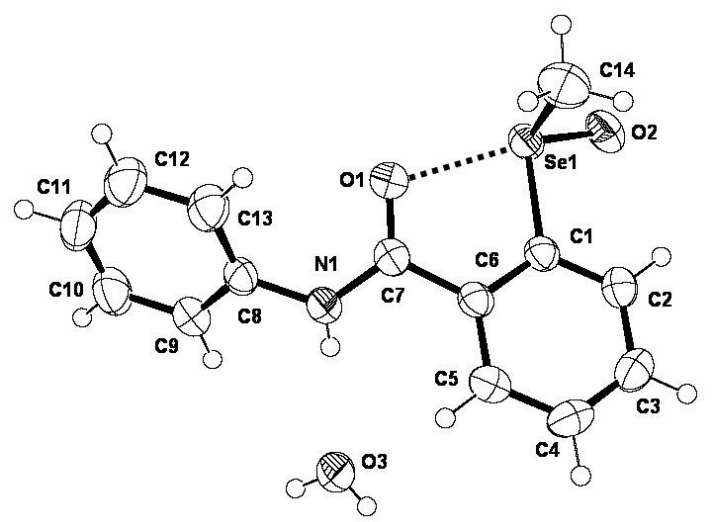


Figure S45. Molecular structure of selenoxide **19**.

Table S3. Important Bond Length (Å), Bond Angles (°) and Torsion Angles (°) of selenoxide **19**.

Se1-O2	1.6730(19)	Se1-C1-C2	117.18(17)
Se1-C1	1.949(2)	Se1-C1-C6	121.09(16)
Se1-C14	1.927(3)	C1-C2-C3	118.9(2)
O1-C7	1.224(3)	C2-C3-C4	120.2(2)
N1-C8	1.417(3)	C3-C4-C5	120.7(2)
N1-C7	1.345(3)	C4-C5-C6	119.9(2)
N1-H5	0.71(3)	C5-C6-C7	123.3(2)
C1-C2	1.377(3)	C1-C6-C7	118.1(2)
C1-C6	1.385(3)	C1-C6-C5	118.6(2)
C2-C3	1.390(3)	O1-C7-N1	124.1(2)
C3-C4	1.372(4)	O1-C7-C6	119.0(2)
C4-C5	1.379(3)	N1-C7-C6	116.9(2)
C5-C6	1.394(3)	N1-C8-C9	117.9(2)
C6-C7	1.499(3)	N1-C8-C13	122.2(2)
C8-C9	1.385(4)	C9-C8-C13	120.0(2)
C8-C13	1.386(4)	C8-C9-C10	119.6(3)
C9-C10	1.379(4)	C9-C10-C11	120.6(3)
C10-C11	1.372(5)	C10-C11-C12	119.8(3)
C11-C12	1.372(5)	O1-Se1-O2	172.28
C12-C13	1.384(4)	O2-Se1-C1-C2	17.0(2)
O1···Se1	2.6879(19)	O2-Se1-C1-C6	-160.28(19)

O2-Se1-C1	101.94(10)	C14-Se1-C1 -C2	-86.8(2)
O2-Se1-C14	102.45(11)	C14-Se1-C1-C6	96.0(2)
C1-Se1-C14	94.43(12)	C8-N1-C7-O1	2.1(4)
C7-N1-C8	125.5(2)	C8-N1-C7-C6	-175.0(2)
C11-C12-C13	120.7(3)	C7-N1-C8-C9	146.7(3)
C8-C13-C12	119.4(3)	C7-N1-C8-C13	-33.8(4)
C2-C1-C6	121.7(2)	Se1-C1-C2-C3	-179.11(18)
C6-C1-C2-C3	-1.9(4)	C1-C6-C7-N1	148.8(2)
Se1-C1-C6-C5	178.67(17)	C5-C6-C7-O1	149.8(2)
Se1-C1-C6-C7	-3.0(3)	C5-C6-C7-N1	-32.9(3)
C2-C1-C6-C5	1.6(4)	N1-C8-C9-C10	179.5(3)
C2-C1-C6-C7	179.9(2)	C13-C8-C9-C10	-0.1(4)
C1-C2-C3-C4	0.7(4)	N1-C8-C13-C12	179.9(3)
C2-C3-C4-C5	0.7(4)	C9-C8-C13-C12	-0.5(4)
C3-C4-C5-C6	-1.1(4)	C8-C9-C10-C11	0.0(5)
C4-C5-C6-C1	-0.1(4)	C9-C10-C11-C12	0.7(5)
C4-C5-C6-C7	-178.4(2)	C10-C11-C12-C13	-1.4(5)
C1-C6-C7-O1	-28.5(3)	C11-C12-C13-C8	1.3(5)

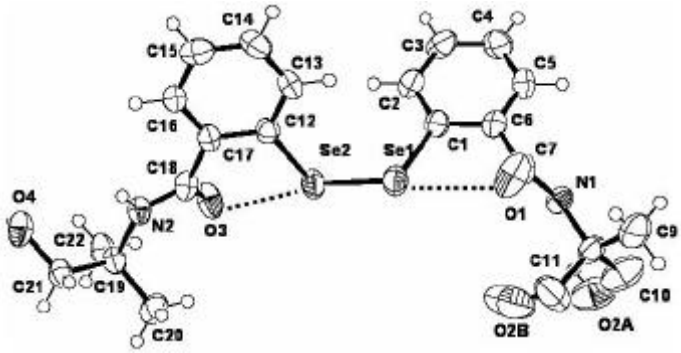


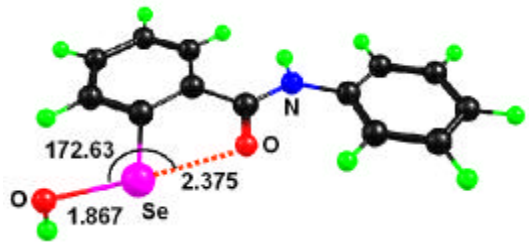
Figure S46. Molecular structure of diselenide **16**.

Table S4. Important Bond Length (Å), Bond Angles (°) and Torsion Angles (°) of diselenide **16**.

Se1-Se2	2.3266(16)	O3-C18-C17	119.3(4)
Se1-C1	1.935(5)	O3-C18-N2	122.4(5)
Se2-C12	1.940(5)	N2-C18-C17	118.4(4)
O1-C7	1.239(6)	N2-C19-C20	108.7(4)
O2A-C10	1.249(14)	N2-C19-C21	106.5(4)

O2B-C11	1.161(17)	N2-C19-C22	111.9(4)
O3-C18	1.244(6)	Se1-C1-C2 -C3	176.1(4)
O4-C21	1.420(6)	C6-C1-C2-C3	-1.3(8)
N1-C8	1.494(7)	Se1-C1-C6-C5	-177.1(4)
N1-C7	1.326(7)	Se1-C1-C6-C7	0.9(6)
N2-C18	1.336(6)	C8-N1-C7-O1	1.4(8)
N2-C19	1.474(6)	C8-N1-C7-C6	-176.0(4)
C17-C18	1.486(7)	C7-N1-C8-C9	-66.2(6)
Se1···O1	2.973(4)	C7-N1-C8-C10	176.1(5)
Se2···O3	2.720(4)	Se2-C12-C13-C14	179.0(4)
Se2-Se1-C1	103.43(16)	C17-C12-C13-C14	-2.1(8)
Se1-Se2-C12	100.59(16)	Se2-C12-C17-C16	179.6(4)
C7-N1-C8	125.3(4)	Se2-C12-C17-C18	-1.3(6)
N1-C8-C11	112.1(4)	C-Se1-Se2-C12	-91.3(2)
O2A-C10-C8	116.9(6)	Se2-Se1-C1-C2	24.7(5)
O2B-C11-C8	118.3(9)	Se2-Se1-C1-C6	-157.9(4)
Se2-C12-C17	119.4(4)	Se1-Se2-C12-C13	29.6(4)
Se1-C1-C6	117.8(4)	Se1-Se2-C12-C17	-149.3(4)
O1-C7-C6	119.3(4)		
O1-C7-N1	124.0(5)		
N1-C8-C9	109.4(4)		
C9-C8-C10	108.4(5)		

Table S5. B3LYP/6-31G(d) level optimized geometries of reactants, intermediates, transition states and products involved in the cyclization of the selenenic acid **4** to the cyclic selenenyl amide **1**.

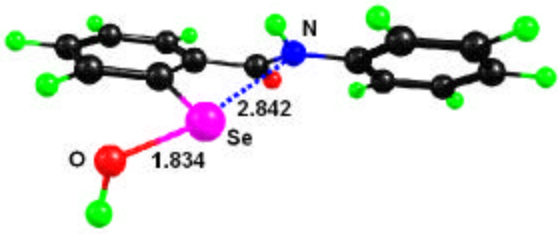


4

4TS1

6	2.081281	0.354938	-0.008451	6	2.048944	0.155424	-0.039156
6	3.294289	1.056502	-0.017829	6	3.337624	0.473182	-0.469710
6	3.302186	2.445560	-0.017096	6	3.718670	1.810623	-0.582275
6	2.101056	3.166703	-0.008904	6	2.821596	2.832692	-0.266833

6	0.895881	2.479560	-0.007133	6	1.530673	2.511168	0.153976
6	0.865249	1.073381	-0.007147	6	1.134631	1.175323	0.263962
34	2.059500	-1.557700	-0.01636	34	1.455800	-1.664228	0.144522
8	3.913809	-1.769460	0.008257	8	2.931534	-2.506694	-0.530852
1	4.136987	-1.8602547	0.949397	1	3.474278	-2.719057	0.247342
1	4.219692	0.492189	-0.039994	1	4.027234	-0.323724	-0.726848
1	4.251457	2.974909	-0.026740	1	4.723469	2.052293	-0.918626
1	2.109380	4.252397	-0.010051	1	3.122322	3.872869	-0.350825
1	-0.024641	3.058878	-0.011078	1	0.822618	3.298009	0.401046
6	-0.362626	0.251502	-0.011239	6	-0.254296	0.818280	0.750017
8	-0.245915	-0.988052	-0.038210	8	-0.506453	0.635673	1.933647
7	-1.576990	0.874708	0.016146	7	-1.161737	0.697091	-0.275979
1	-1.558308	1.883419	0.045654	1	-0.785786	0.850781	-1.203030
6	-2.875795	0.317172	0.010125	6	-2.533241	0.362051	-0.225115
6	-3.949745	1.221207	0.039989	6	-3.216549	0.270552	-1.447671
6	-5.261853	0.758269	0.036285	6	-4.570438	-0.050465	-1.474934
6	-5.523397	-0.613034	0.002674	6	-5.261587	-0.285603	-0.284727
6	-4.454345	-1.508805	-0.027045	6	-4.578777	-0.194875	0.928648
6	-3.132661	-1.061993	-0.023002	6	-3.221770	0.126002	0.974357
1	-3.754831	2.292213	0.065484	1	-2.682364	0.450805	-2.378634
1	-6.080426	1.473543	0.059611	1	-5.083696	-0.117413	-2.430343
1	-6.546659	-0.976979	0.165802	1	-6.318139	-0.536760	-0.304188
1	-4.643666	-2.578102	-0.053210	1	-5.105263	-0.376205	1.861970
1	-2.309048	-1.760755	-0.046363	1	-2.693236	0.194583	1.914661



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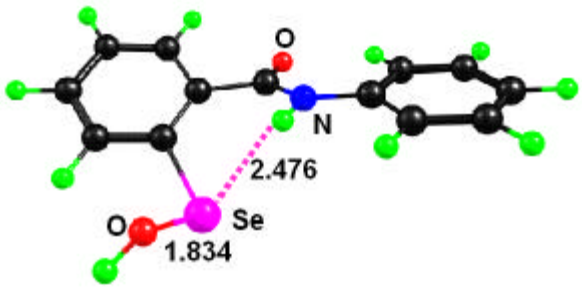
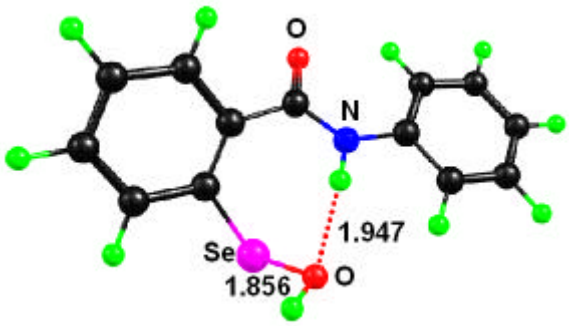


4TS2

6	-1.950205	-0.042841	0.068713
6	-3.321285	-0.192423	0.293048
6	-4.124447	0.931654	0.481001
6	-3.573760	2.215035	0.433244
6	-2.209132	2.364674	0.208958
6	-1.382431	1.245467	0.046200
34	-0.862684	-1.612539	-0.277677
8	-2.217814	-2.844242	-0.381056
1	-2.490178	-2.843551	-1.314904
1	-3.750237	-1.188452	0.311697
1	-5.188705	0.801071	0.658935
1	-4.203824	3.089096	0.568589
1	-1.753941	3.348618	0.151843
6	0.077313	1.485886	-0.197405
8	0.489665	2.431933	-0.852451
7	0.892320	0.523064	0.381545
1	0.469038	-0.011425	1.132252
6	2.291197	0.343232	0.254814
6	2.853378	-0.741826	0.945215
6	4.220547	-0.990108	0.867871
6	5.043208	-0.162669	0.100708
6	4.478749	0.912122	-0.586826
6	3.110564	1.178196	-0.517562
1	2.210036	-1.400913	1.524533
1	4.640736	-1.834933	1.406742
1	6.110530	-0.354810	0.039869
1	5.109017	1.563585	-1.186348
1	2.675551	2.016665	-1.042819

6	-2.033326	0.050142	-0.070202
6	-3.411790	0.116902	0.171387
6	-4.025816	1.323761	0.487759
6	-3.266904	2.495593	0.517782
6	-1.903346	2.439124	0.255581
6	-1.251873	1.222610	-0.012228
34	-1.316601	-1.678271	-0.559521
8	-2.085559	-2.678862	0.772039
1	-2.855686	-3.104642	0.360866
1	-4.005796	-0.789501	0.110891
1	-5.093904	1.351374	0.684973
1	-3.736809	3.449287	0.740122
1	-1.299544	3.339862	0.259923
6	0.247451	1.369197	-0.220538
8	0.694910	2.408297	-0.695759
7	1.027975	0.335375	0.225618
1	0.536384	-0.483518	0.566426
6	2.432494	0.202917	0.180145
6	2.965263	-1.011210	0.645047
6	4.340177	-1.224622	0.641531
6	5.205682	-0.231773	0.177521
6	4.673801	0.973154	-0.282724
6	3.297786	1.204217	-0.287358
1	2.293970	-1.789734	1.001394
1	4.733980	-2.170540	1.003708
1	6.279434	-0.396215	0.175644
1	5.336425	1.754208	-0.646506
1	2.887761	2.137438	-0.645516



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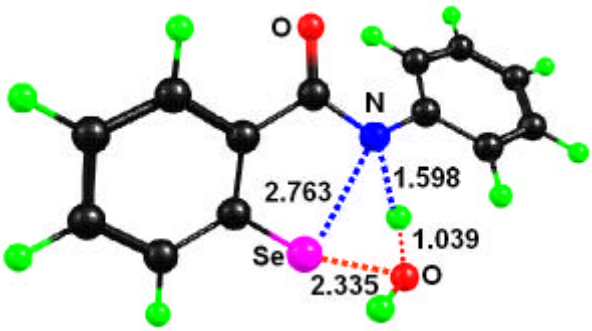
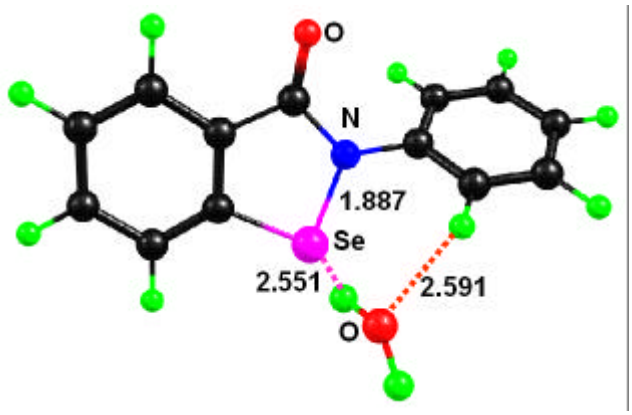


4TS3

6	-2.122704	-0.120773	-0.055067
6	-3.506928	-0.145260	0.174314
6	-4.203493	1.022209	0.480113
6	-3.512487	2.231430	0.558085
6	-2.138912	2.264789	0.328401
6	-1.417438	1.100424	0.031385
34	-1.325303	-1.781662	-0.601178
8	-0.361637	-2.160108	0.938858
1	-1.020871	-2.481673	1.576521
1	-4.031675	-1.092762	0.099980
1	-5.275127	0.985070	0.654385
1	-4.042058	3.150624	0.792594
1	-1.595318	3.203098	0.359045
6	0.062524	1.321705	-0.220523
8	0.425471	2.347661	-0.789960
7	0.908962	0.370461	0.278677
1	0.491530	-0.419098	0.764919
6	2.317191	0.315002	0.178436
6	2.937213	-0.850339	0.660865
6	4.321789	-0.979847	0.614994
6	5.109730	0.044899	0.085977
6	4.490536	1.198032	-0.396674
6	3.103626	1.347041	-0.356801
1	2.323494	-1.655727	1.056339
1	4.784584	-1.888739	0.990636
1	6.190733	-0.056574	0.048412
1	5.091561	2.002440	-0.813017
1	2.626165	2.240310	-0.732706

6	-2.039278	-0.270905	-0.173896
6	-3.430601	-0.519109	-0.203638
6	-4.329456	0.518255	-0.002169
6	-3.855993	1.808225	0.280167
6	-2.487914	2.050006	0.358502
6	-1.561670	1.020639	0.154226
34	-0.882663	-1.655479	-0.639004
8	0.106516	-2.025157	1.443467
1	-0.700473	-2.076148	1.985267
1	-3.782034	-1.526204	-0.406709
1	-5.397485	0.325151	-0.050371
1	-4.559579	2.616631	0.458470
1	-2.099361	3.038162	0.581291
6	-0.104529	1.361612	0.249508
8	0.249512	2.540716	0.154445
7	0.725448	0.285321	0.493344
1	0.349331	-1.020238	1.334301
6	2.082481	0.346462	0.212035
6	2.917501	-0.639398	0.795559
6	4.283598	-0.657197	0.550262
6	4.861709	0.295329	-0.295515
6	4.049957	1.265036	-0.892985
6	2.682382	1.299732	-0.651465
1	2.473947	-1.396984	1.433848
1	4.901436	-1.421817	1.013622
1	5.930222	0.277876	-0.491664
1	4.490539	2.007078	-1.553816
1	2.068527	2.068960	-1.098351



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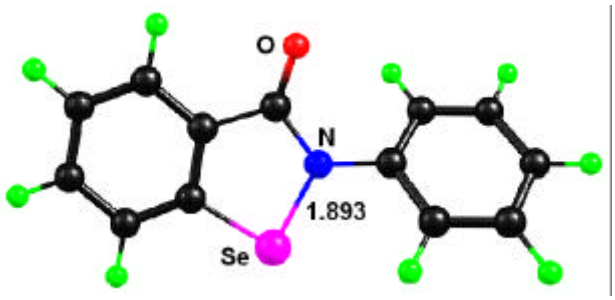


1

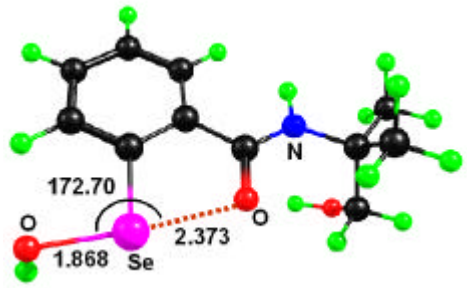
34	0.394497	1.092155	-0.881223
8	-0.033718	-2.404221	0.930789
7	-0.474906	-0.352631	-0.034383
6	2.020092	0.260557	-0.369014
6	1.782636	-0.961889	0.263353
6	2.858339	-1.736045	0.705622
1	2.651301	-2.682627	1.195976
6	4.156131	-1.274113	0.509506
1	5.000987	-1.865280	0.849939
6	4.378600	-0.043246	-0.125870
1	5.394897	0.311434	-0.273784
6	3.313211	0.738179	-0.572062
1	3.493904	1.690027	-1.063076
6	0.365406	-1.360478	0.434238
6	-1.897977	-0.395565	-0.037525
6	-2.573414	-1.522420	-0.519860
1	-2.007540	-2.373731	-0.879075
6	-3.967215	-1.540280	-0.511411
1	-4.491434	-2.417698	-0.880051
6	-4.687335	-0.439039	-0.043313
1	-5.773655	-0.457122	-0.046698
6	-4.006530	0.680204	0.439451
1	-4.559780	1.532814	0.823410
6	-2.612502	0.704097	0.454306
1	-2.075609	1.547772	0.881831
8	-0.241810	3.032782	1.953347
1	0.131299	2.483635	1.241213
1	-0.425361	3.877652	1.514961

6	-4.134735	1.244896	0.162864
6	-4.365137	-0.131178	0.013087
6	-3.305638	-1.030415	-0.097440
6	-2.005524	-0.526899	-0.057558
6	-1.763545	0.841069	0.090285
6	-2.833193	1.733620	0.201852
34	-0.390817	-1.501568	-0.186333
7	0.495473	0.159244	0.011007
6	-0.347296	1.266550	0.121963
8	0.045057	2.421559	0.236381
6	1.914558	0.191190	0.024028
6	2.623871	-0.880576	0.585135
6	4.017381	-0.879476	0.580302
6	4.718588	0.197855	0.038180
6	4.010254	1.271303	-0.505045
6	2.616750	1.276174	-0.522988
1	-4.975541	1.926816	0.248058
1	-5.384292	-0.506865	-0.016922
1	-3.496656	-2.093516	-0.211773
1	-2.617087	2.791532	0.317430
1	2.081407	-1.707223	1.036317
1	4.552553	-1.719538	1.014435
1	5.804842	0.201848	0.039970
1	4.545011	2.116889	-0.929197
1	2.070757	2.111493	-0.939084

Table S6. Relative Electronic ?(E + ZPE) and relative Gibbs Free Energy ?(G + ZPE) for the cyclization of selenenic acid **4** to the corresponding selenenyl amide **1** calculated at B3LYP/6-31G(d) level of theory.

4 ? 1 + H_2O		
Structure	?(E + ZPE) kcal/mol	?(G + ZPE) kcal/mol
4	0	0
4TS1	11.74	11.63
4a	7.35	7.12
4TS2	9.91	9.95
4b	6.56	6.44
4TS3	46.84	47.35
4c	2.29	1.33
1 + H_2O	7.79	-1.31

Table S7. B3LYP/6-31G(d) level optimized geometries of reactants, intermediates, transition states and products involved in the cyclization of the selenenic acid **23** to the cyclic selenenyl amide **17**.



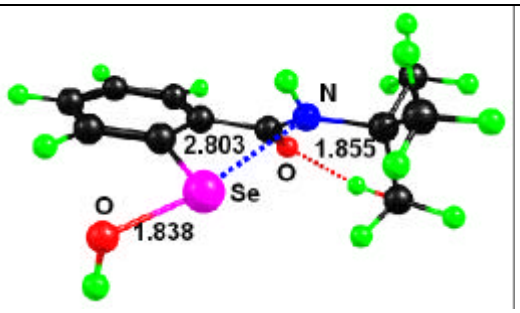
23

23TS1

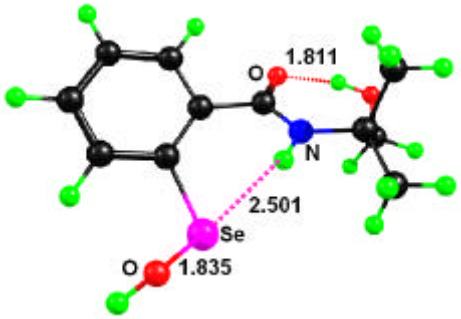
8	-0.464648	-1.052709	-0.214423	8	0.939775	0.503462	-1.707597
7	-1.908890	0.708210	-0.159458	7	1.382772	0.696344	0.541745
6	0.520449	1.068490	-0.058430	6	-0.825140	1.207633	-0.252675
6	-4.298717	1.014262	-0.321370	6	3.720113	1.405966	0.137752
6	2.941978	1.191700	0.072712	6	-3.099957	0.540086	0.259359
6	1.774102	0.421486	-0.007670	6	-1.772693	0.202953	-0.005565
6	-3.377064	-1.053287	0.783564	6	3.052682	-1.028675	-0.203894
6	-0.659509	0.180569	-0.156596	6	0.596323	0.793491	-0.557066
1	3.899141	0.682897	0.090549	1	-3.819219	-0.243629	0.472564
6	-3.179578	-0.034765	-0.366241	6	2.806937	0.270068	0.621651
6	1.626389	3.228609	0.067246	6	-2.549303	2.887788	0.004182
6	-3.167860	-0.765250	-1.718700	6	3.058239	-0.045241	2.104636
6	2.866613	2.578504	0.111213	6	-3.482856	1.882259	0.261638
6	0.465818	2.472666	-0.019544	6	-1.219792	2.547140	-0.250095
8	-3.384412	-0.446842	2.066909	8	3.310690	-0.835061	-1.570457
1	-2.613211	-1.835550	0.713416	1	2.197219	-1.704672	-0.029108
1	-4.360379	-1.519893	0.662962	1	3.944312	-1.515034	0.207583
1	3.781744	3.161974	0.171220	1	-4.518185	2.140695	0.467550
1	-4.151232	1.785345	-1.087881	1	3.580674	2.301491	0.753928
1	-4.344692	1.484916	0.665540	1	3.508330	1.653588	-0.904305
1	-0.488158	2.993203	-0.061702	1	-0.483713	3.321070	-0.451871
1	-3.064512	-0.048820	-2.541010	1	2.817543	0.816473	2.740147
1	-2.475337	-0.162361	2.249631	1	2.510248	-0.398110	-1.929649
1	-4.108828	-1.309464	-1.859096	1	4.112314	-0.288918	2.266010
1	1.570479	4.312597	0.095307	1	-2.852240	3.930701	0.003435
1	-5.265053	0.537449	-0.512064	1	4.769786	1.099393	0.199594
1	-2.341642	-1.477716	-1.771810	1	2.453149	-0.897529	2.436304

34	1.863062	-1.488901	-0.066620
8	3.723538	-1.596992	0.068460
1	3.893566	-1.699333	1.019487
1	-1.985330	1.714358	-0.137924

34	-1.163924	-1.622474	-0.030004
8	-2.729124	-2.443598	0.436932
1	-3.150987	-2.675390	-0.407933
1	0.946750	0.970333	1.413106



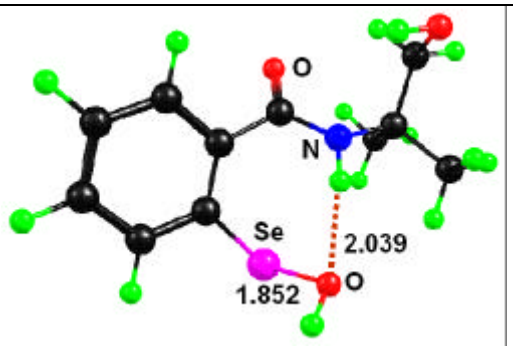
23a



23TS2

8	1.119385	2.017868	-0.880723
7	1.141421	0.222224	0.564037
6	-0.952961	1.277720	0.048327
6	3.419383	0.937704	1.257389
6	-3.097868	0.158539	0.205174
6	-1.708451	0.091199	0.074030
6	3.065073	-0.332253	-0.929664
6	0.532191	1.238763	-0.129111
1	-3.675254	-0.759631	0.220184
6	2.588038	-0.135448	0.539185
6	-2.984142	2.581931	0.255888
6	2.688521	-1.484176	1.270624
6	-3.727316	1.399018	0.303167
6	-1.601007	2.516397	0.117386
8	3.502471	0.831114	-1.586318
1	2.251930	-0.844411	-1.472755
1	3.926762	-1.008586	-0.911427
1	-4.808133	1.439653	0.410462
1	3.118314	1.017596	2.308507
1	3.296986	1.910484	0.778312
1	-1.000261	3.418763	0.056078
1	2.297019	-1.410960	2.293107
1	2.750194	1.455795	-1.563533
1	3.734413	-1.797538	1.338892
1	-3.480894	3.545321	0.321919
1	4.482401	0.677217	1.220227
1	2.124470	-2.264587	0.747888
34	-0.840518	-1.630760	-0.139558
8	-2.355440	-2.634875	-0.412019
1	-2.521842	-2.588038	-1.369254
1	0.631475	-0.110029	1.376207

8	1.383779	1.991205	-0.604857
7	1.262831	-0.081977	0.353351
6	-0.783438	1.226354	-0.009036
6	3.360362	0.377907	1.583970
6	-3.126475	0.576636	0.048588
6	-1.777407	0.230703	-0.104788
6	3.456211	-0.205388	-0.890373
6	0.722642	1.058094	-0.128735
1	-3.885624	-0.193399	-0.046402
6	2.705402	-0.432543	0.454965
6	-2.529746	2.884388	0.389516
6	2.732854	-1.936196	0.775083
6	-3.504565	1.887332	0.319529
6	-1.191752	2.553018	0.209665
8	3.903242	1.105821	-1.121964
1	2.812659	-0.580978	-1.705192
1	4.355672	-0.831977	-0.872162
1	-4.555336	2.131197	0.449234
1	2.866082	0.172823	2.540129
1	3.301767	1.447654	1.375072
1	-0.422644	3.316662	0.241490
1	2.175030	-2.154230	1.694007
1	3.102793	1.669611	-1.075100
1	3.762667	-2.273626	0.923381
1	-2.811509	3.916680	0.575904
1	4.419524	0.113144	1.673596
1	2.289088	-2.521356	-0.039204
34	-1.394752	-1.617520	-0.526584
8	-2.365287	-2.410199	0.814333
1	-3.200901	-2.682378	0.400780
1	0.614060	-0.776773	0.704473



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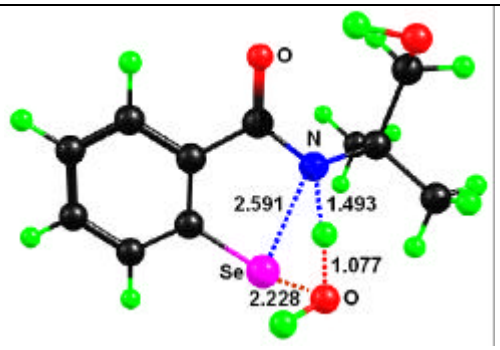
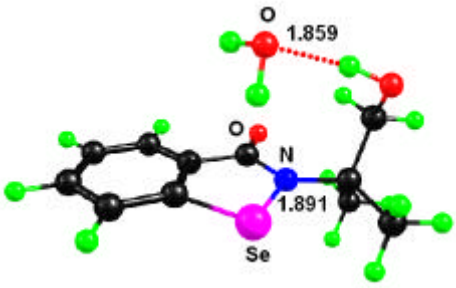


23TS3

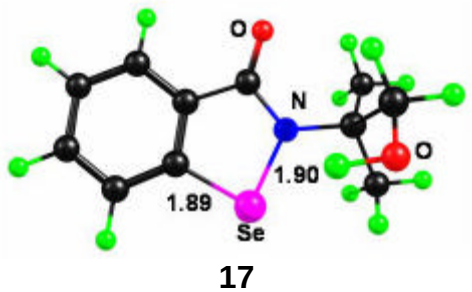
8	-0.855676	1.871527	1.326356
7	-1.215596	0.256693	-0.262587
6	1.044114	1.116867	0.120943
6	-3.032508	-1.210058	-0.904036
6	3.234113	0.120024	-0.247723
6	1.864403	-0.025661	0.016638
6	-3.534319	1.082547	0.015336
6	-0.432101	1.100464	0.466926
1	3.853528	-0.768988	-0.317497
6	-2.599088	-0.144960	0.113110
6	2.990397	2.517783	-0.290672
6	-2.608661	-0.718340	1.540290
6	3.797626	1.385053	-0.405729
6	1.630510	2.380412	-0.018810
8	-3.538566	1.667798	-1.279442
1	-3.254672	1.814141	0.781766
1	-4.562532	0.755427	0.203688
1	4.859672	1.483750	-0.611926
1	-2.342256	-2.060371	-0.903982
1	-3.073984	-0.782626	-1.910371
1	1.000687	3.255431	0.106725
1	-1.876300	-1.529577	1.613077
1	-2.624206	1.946273	-1.450161
1	-3.600107	-1.113638	1.788892
1	3.420644	3.508939	-0.404418
1	-4.032642	-1.577099	-0.651558
1	-2.342979	0.048758	2.272358
34	1.214712	-1.807315	0.335851
8	0.318009	-2.074992	-1.262143
1	1.012367	-2.296699	-1.904944
1	-0.745310	-0.371324	-0.908290

8	-0.708598	2.409290	0.085662
7	-0.994106	0.123441	-0.205260
6	1.225396	1.039212	-0.026229
6	-3.009989	-1.248851	-0.189449
6	3.189906	-0.410626	0.065099
6	1.788940	-0.250104	0.069778
6	-3.249393	1.240604	0.153897
6	-0.253434	1.256621	-0.043729
1	3.615921	-1.409662	0.077520
6	-2.335347	-0.007955	0.414952
6	3.455646	1.993104	-0.003163
6	-2.164149	-0.172947	1.938289
6	4.013341	0.707281	0.060014
6	2.075256	2.151812	-0.055618
8	-3.145520	1.764590	-1.149498
1	-3.026866	2.006917	0.904512
1	-4.288584	0.917338	0.292412
1	5.092044	0.580296	0.083879
1	-2.383244	-2.140503	-0.080240
1	-3.213595	-1.093638	-1.253970
1	1.616315	3.133016	-0.119960
1	-1.541401	-1.044766	2.159714
1	-2.319551	2.284272	-1.116707
1	-3.138136	-0.301828	2.425197
1	4.104131	2.863948	-0.036176
1	-3.962428	-1.441600	0.315672
1	-1.682486	0.711530	2.369348
34	0.716349	-1.779284	0.205795
8	-0.422592	-1.771457	-1.709574
1	0.291820	-1.623797	-2.356014
1	-0.764434	-0.818256	-1.341151



23c

8	0.265642	2.472792	-0.019352
7	0.758353	0.244832	-0.398367
6	-1.509591	0.854081	-0.110690
6	2.827190	-0.996003	-0.913646
6	-3.012092	-1.058385	-0.223960
6	-1.727582	-0.515964	-0.268531
6	2.856778	0.841260	0.805993
6	-0.098112	1.306595	-0.167076
1	-3.180356	-2.124913	-0.342581
6	2.245224	0.373735	-0.544573
6	-3.879819	1.190420	0.127639
6	2.553680	1.390211	-1.658449
6	-4.084615	-0.189804	-0.027926
6	-2.592392	1.716073	0.088220
8	2.843106	-0.149046	1.809007
1	2.355820	1.765003	1.119512
1	3.910043	1.082135	0.614003
1	-5.093639	-0.591444	0.004889
1	2.419003	-1.363283	-1.861750
1	2.641095	-1.722862	-0.117552
1	-2.397571	2.778007	0.205508
1	2.087452	1.075730	-2.598628
1	1.962462	-0.169881	2.239165
1	3.636723	1.442362	-1.815680
1	-4.731190	1.847294	0.279149
1	3.912621	-0.908375	-1.023586
1	2.183744	2.383945	-1.401473
34	-0.091340	-1.442157	-0.491848
8	0.257537	-0.645858	2.808392
1	-0.380897	0.083702	2.786659
1	0.069481	-1.154338	1.997395



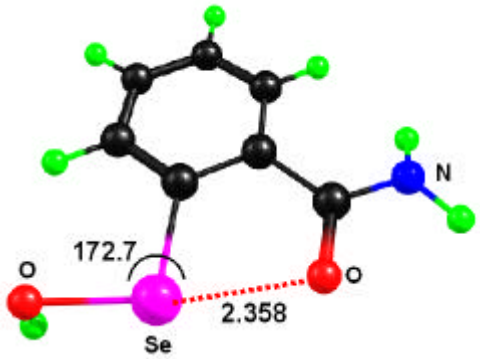
17

8	0.240432	2.483129	0.001461
7	0.792596	0.258465	-0.351244
6	-1.487823	0.816515	-0.040580
6	2.914469	-0.925937	-0.785754
6	-2.932321	-1.138961	0.020056
6	-1.662274	-0.568208	-0.070607
6	2.668246	0.611273	1.210760
6	-0.092381	1.305839	-0.119654
1	-3.070971	-2.215982	-0.005158
6	2.283654	0.376754	-0.269664
6	-3.865717	1.105186	0.178790
6	2.766931	1.546782	-1.145849
6	-4.029510	-0.288590	0.144019
6	-2.594088	1.661053	0.089029
8	2.354583	-0.488967	2.053605
1	2.187877	1.536092	1.557525
1	3.753155	0.742734	1.283262
1	-5.026152	-0.715599	0.215482
1	2.559502	-1.161250	-1.794184
1	2.706633	-1.768634	-0.118917
1	-2.428925	2.733927	0.118593
1	2.444668	1.399856	-2.182092
1	1.400132	-0.656899	1.980558
1	3.862431	1.572986	-1.130243
1	-4.735552	1.747983	0.276515
1	4.002218	-0.808361	-0.822756
1	2.375659	2.500739	-0.795067
34	-0.004532	-1.461187	-0.230253

Table S8. Relative Electronic ?(E + ZPE) and relative Gibbs Free Energy ?(G + ZPE) for the cyclization of selenenic acid **23** to the corresponding selenenyl amide **17** calculated at B3LYP/6-31G(d) level.

23 ? 17 + H_2O		
Structure	?(E + ZPE) kcal/mol	?(G + ZPE) kcal/mol
23	0	0
23TS1	8.70	9.39
23a	3.76	4.56
23TS2	7.87	8.63
23b	6.82	7.10
23TS3	49.48	51.01
23c	-2.91	-2.29
17 + H_2O	6.77	-1.57

Table S9. B3LYP/6-31G(d) level optimized geometries of reactants, intermediates, transition states and products involved in the cyclization of the selenenic acid **35** to the cyclic selenenyl amide **41**.

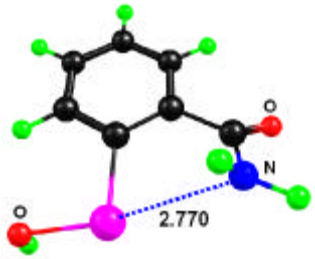


35

6	-0.022215	0.548549	-0.007352
6	-0.040300	1.949479	-0.012468
6	-1.254	2.633891	-0.010977
6	-2.467596	1.939975	-0.012077
6	-2.457953	0.552252	-0.011858
6	-1.244583	-0.156210	-0.003139
1	0.903765	2.482079	-0.032769
1	-1.247720	3.720904	-0.018159
1	-3.409502	2.480101	-0.021595
1	-3.405578	0.019774	-0.037417
34	1.627078	-0.419521	-0.030980
8	2.731815	1.086062	0.019940
1	2.911902	1.224199	0.964575
6	-1.139356	-1.625907	0.002070
8	-0.013410	-2.150804	-0.058837
7	-2.259911	-2.397981	0.049795
1	-3.150970	-2.019824	0.330964
1	-2.118373	-3.391885	0.165151

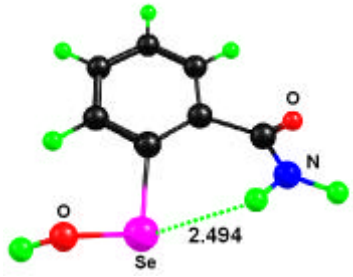
35TS1

6	-0.099898	-0.571679	-0.015628
6	-0.261460	-1.956736	0.033095
6	-1.545175	-2.503381	0.037830
6	-2.667885	-1.675082	-0.005724
6	-2.501871	-0.290218	-0.044634
6	-1.221752	0.269791	-0.044216
1	0.613784	-2.595937	0.080321
1	-1.665067	-3.582897	0.076209
1	-3.666235	-2.102721	-0.006110
1	-3.368107	0.365426	-0.076672
34	1.642437	0.245762	-0.032301
8	2.661306	-1.259658	0.167061
1	2.884288	-1.529887	-0.739854
6	-1.034633	1.770321	-0.119347
8	-0.939064	2.376225	-1.176382
7	-0.962055	2.382508	1.100022
1	-0.935778	1.850324	1.957126
1	-0.753245	3.371591	1.133360



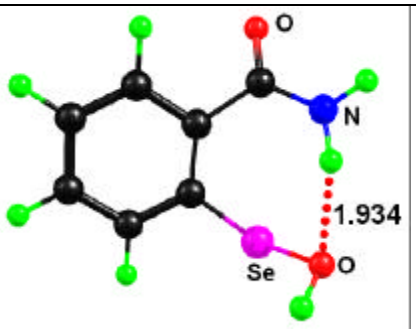
35a

6	0.063562	0.528386	0.063904
6	0.114878	1.924694	0.118922
6	1.343956	2.582057	0.118203
6	2.538485	1.859846	0.047413
6	2.490916	0.471753	-0.009661
6	1.264642	-0.206554	0.016776
1	-0.811905	2.486428	0.159057
1	1.365675	3.667695	0.168229
1	3.494067	2.375647	0.036369
1	3.398004	-0.120828	-0.077586
34	-1.667820	-0.344699	-0.019524
8	-2.697137	1.170439	-0.182427
1	-2.747264	1.339020	-1.138873
6	1.298797	-1.697932	-0.038420
8	2.181180	-2.336575	-0.587660
7	0.193434	-2.316685	0.545816
1	-0.152660	-1.925429	1.416274
1	0.242160	-3.330382	0.537491



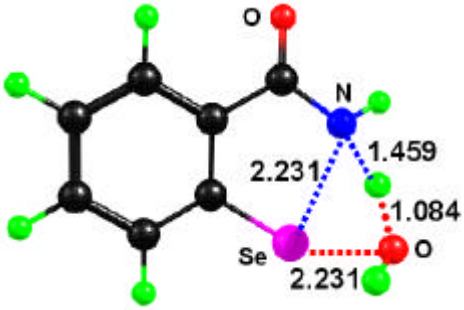
35TS2

6	0.010842	0.548448	-0.094194
6	0.024661	1.949649	-0.094545
6	1.216672	2.654061	0.035389
6	2.423951	1.956867	0.115704
6	2.418247	0.567307	0.090236
6	1.221436	-0.165112	0.017394
1	-0.911112	2.490353	-0.195644
1	1.203439	3.740464	0.048711
1	3.364827	2.494205	0.192730
1	3.344150	0.004647	0.136762
34	-1.706123	-0.303949	-0.349431
8	-2.670390	0.629145	0.902015
1	-3.148146	1.310529	0.401181
6	1.423945	-1.671246	0.061973
8	2.464857	-2.165141	-0.357789
7	0.459151	-2.425873	0.656976
1	-0.445116	-2.049029	0.908609
1	0.591826	-3.427652	0.643922



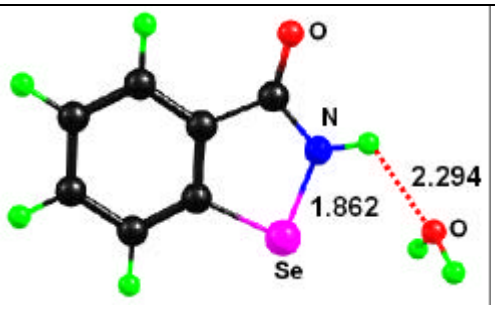
35b

6	-0.229117	-0.646146	-0.057404
6	-0.793675	-1.927909	0.033128
6	-2.168925	-2.095383	0.184536
6	-2.993600	-0.972135	0.246269
6	-2.440460	0.303534	0.155541
6	-1.059708	0.493230	0.015854
1	-0.139872	-2.792665	-0.026639
1	-2.589342	-3.094845	0.252678
1	-4.068038	-1.087441	0.359383
1	-3.071902	1.185541	0.175104
34	1.654128	-0.582769	-0.436606
8	2.286710	0.086435	1.172333
1	2.240787	-0.661614	1.790828
6	-0.623240	1.942367	-0.086305
8	-1.333440	2.754577	-0.671165
7	0.522061	2.294622	0.552790
1	1.138155	1.635284	1.018142
1	0.821611	3.254067	0.446503



35TS3

6	-0.431233	-0.611538	-0.065568
6	-1.220651	-1.768281	0.081253
6	-2.599792	-1.645104	0.209314
6	-3.194443	-0.376080	0.250170
6	-2.406602	0.769165	0.161427
6	-1.021562	0.664541	0.017075
1	-0.749776	-2.747185	0.079956
1	-3.212834	-2.537793	0.296713
1	-4.270021	-0.286930	0.374184
1	-2.838523	1.764284	0.202975
34	1.400828	-0.826782	-0.434434
8	2.618518	0.023991	1.230400
1	2.281611	-0.479841	1.992964
6	-0.176611	1.891914	-0.091701
8	-0.655410	2.993983	-0.366533
7	1.153446	1.637117	0.114066
1	1.967174	0.872586	1.053287
1	1.720603	2.374168	-0.310547

			
35c			
6	-0.780137	-0.639738	-0.001374
6	-1.770660	-1.622150	0.003608
6	-3.104945	-1.218450	0.009649
6	-3.449420	0.141803	0.010644
6	-2.453218	1.113005	0.005539
6	-1.113169	0.719695	-0.000622
1	-1.517088	-2.678644	0.002888
1	-3.887508	-1.972540	0.013670
1	-4.495592	0.433641	0.015354
1	-2.682683	2.174715	0.006231
34	1.103583	-0.895502	-0.009741
8	4.026189	0.125801	0.027230
1	4.285025	-0.423778	-0.728034
6	0.026137	1.672784	-0.005547
8	-0.042595	2.896645	-0.002454
7	1.204459	0.963968	-0.014882
1	4.229651	-0.414918	0.805516
1	2.118883	1.399546	-0.009854

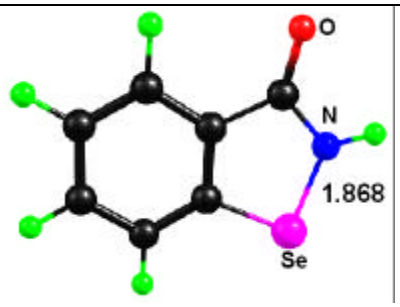
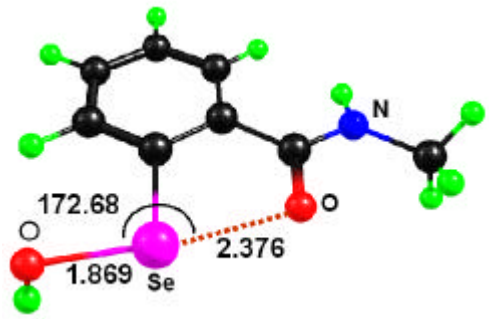
			
41			
6	0.338375	-0.918683	-0.248520
6	-0.897723	-1.523300	-0.476691
6	-2.048027	-0.754628	-0.306616
6	-1.969370	0.591138	0.083413
6	-0.729861	1.181320	0.307329
6	0.430520	0.421672	0.139962
1	-0.970143	-2.564070	-0.779043
1	-3.019471	-1.209477	-0.480339
1	-2.879344	1.170182	0.209620
1	-0.632354	2.219935	0.609768
34	2.051119	-1.724500	-0.404066
6	1.799169	0.951170	0.351062
8	2.108244	2.085501	0.692121
7	2.713867	-0.052476	0.102328
1	3.705001	0.126214	0.199672

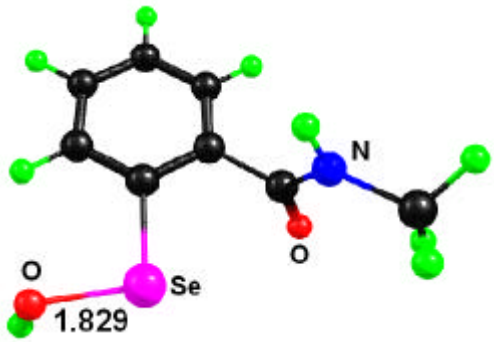
Table S10. Relative Electronic ?(E + ZPE) and relative Gibbs Free Energy ?(G + ZPE) for the cyclization of selenenic acid **35** to the corresponding selenenyl amide **41** calculated at B3LYP/6-31G(d) level of theory.

35 ? 41 + H_2O		
Structure	?(E + ZPE) kcal/mol	?(G + ZPE) kcal/mol
35	0	0
35TS1	12.69	12.10
35a	7.33	7.15
35TS2	10.74	10.57
35b	7.60	7.13
35TS3	50.84	51.04
35c	3.20	0.32
41 + H_2O	9.52	-0.23

Table S11. B3LYP/6-31G(d) level optimized geometries of reactants, intermediates, transition states and products involved in the cyclization of the selenenic acid **37** to the cyclic selenenyl amide **43**.

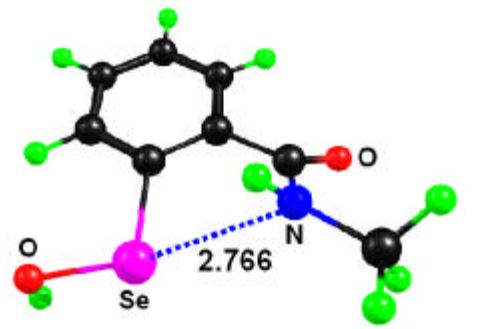


37

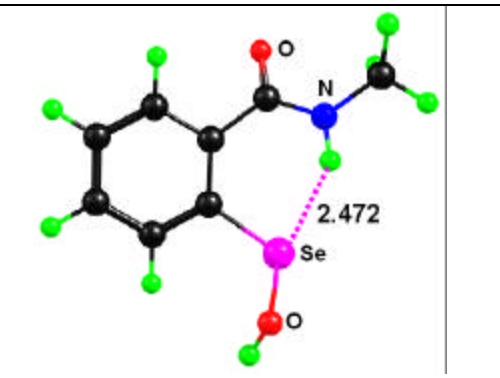


37TS1

6	0.667191	0.510516	-0.007524	6	0.790989	0.340035	0.007255
6	1.624476	1.533621	-0.005048	6	2.025907	0.955088	-0.200187
6	1.227305	2.865373	-0.000021	6	2.104095	2.347483	-0.247569
6	-0.131383	3.206984	-0.003586	6	0.957190	3.127383	-0.089289
6	-1.085284	2.198625	-0.011607	6	-0.277172	2.506976	0.107880
6	-0.703187	0.846529	-0.009403	6	-0.370072	1.113554	0.151956
34	1.192231	-1.329563	-0.031424	34	0.607032	-1.572722	0.092085
8	3.031690	-0.999451	0.021066	8	2.332035	-2.038265	-0.298819
1	3.256895	-1.027506	0.965641	1	2.763977	-2.137277	0.566497
1	2.674149	1.262905	-0.021577	1	2.912189	0.344437	-0.336218
1	1.981864	3.647848	-0.000768	1	3.068117	2.822515	-0.409644
1	-0.438050	4.248648	-0.007203	1	1.021497	4.211105	-0.122341
1	-2.136412	2.477105	-0.032597	1	-1.177449	3.103452	0.230857
6	-1.643943	-0.292602	-0.017585	6	-1.697199	0.428111	0.396112
8	-1.180493	-1.449451	-0.068106	8	-2.097339	0.146996	1.519941
7	-2.982700	-0.076265	0.017483	7	-2.378390	0.127679	-0.748821
1	-3.318588	0.861620	0.172801	1	-1.936886	0.347783	-1.630644
6	-3.943243	-1.166976	0.062694	6	-3.639136	-0.593979	-0.750193
1	-3.504665	-2.033049	-0.434023	1	-3.976845	-0.663431	0.284693
1	-4.196372	-1.448676	1.093039	1	-4.390554	-0.060820	-1.342620
1	-4.856940	-0.871094	-0.460483	1	-3.519595	-1.606709	-1.154487



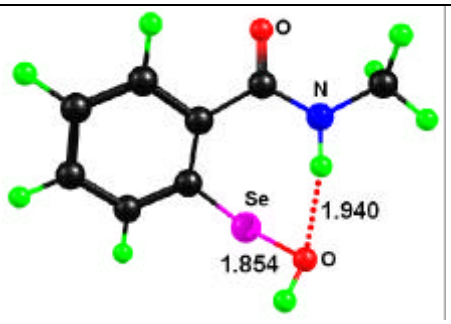
37a



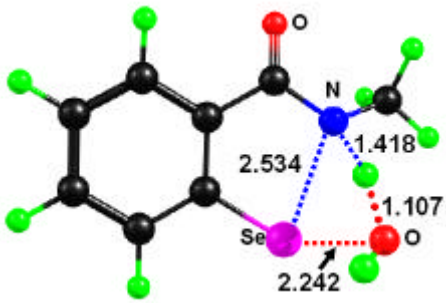
37TS2

6	0.809824	0.062381	-0.068407	6	-0.717593	0.440484	-0.102029
6	2.200962	0.113986	-0.195253	6	-1.870154	1.233820	-0.022148
6	2.854349	1.345185	-0.225143	6	-1.782999	2.611193	0.148840
6	2.133288	2.537473	-0.114801	6	-0.527386	3.220109	0.192220
6	0.749273	2.487730	0.013468	6	0.618813	2.441103	0.086408
6	0.074817	1.260014	0.018567	6	0.555933	1.042535	-0.034780
34	-0.070739	-1.661255	0.056393	34	-0.994809	-1.452706	-0.386954
8	1.443970	-2.699434	0.187813	8	-2.201568	-1.761985	0.961208
1	1.645328	-2.729955	1.138741	1	-3.072928	-1.755542	0.532351
1	2.761079	-0.812331	-0.263287	1	-2.845280	0.762168	-0.094027

1	3.936055	1.370409	-0.329391	1	-2.689647	3.205443	0.222917
1	2.647213	3.494111	-0.127560	1	-0.442384	4.297496	0.302062
1	0.160356	3.394025	0.116461	1	1.604193	2.893488	0.100971
6	-1.413035	1.273751	0.158850	6	1.923145	0.376516	-0.082829
8	-2.026619	2.114636	0.799406	8	2.900520	1.006954	-0.482884
7	-2.047192	0.204097	-0.459700	7	2.038902	-0.893636	0.383047
1	-1.617997	-0.125188	-1.318244	1	1.218104	-1.383807	0.713509
6	-3.498139	0.084875	-0.381046	6	3.331864	-1.555959	0.415157
1	-3.804813	0.220411	0.657149	1	3.989726	-1.113959	1.172970
1	-4.009395	0.841224	-0.989496	1	3.178579	-2.612528	0.647156
1	-3.789185	-0.912700	-0.718991	1	3.829478	-1.463875	-0.554422



37b



37TS3

6	-0.883334	-0.398430	-0.057296	6	-0.819242	-0.562879	-0.092277
6	-2.206018	-0.844850	0.089690	6	-1.965215	-1.379232	-0.022778
6	-3.251942	0.059250	0.263867	6	-3.219102	-0.793810	0.103310
6	-2.977615	1.426718	0.293546	6	-3.340868	0.599399	0.215348
6	-1.667545	1.877236	0.147124	6	-2.205422	1.403837	0.197024
6	-0.600199	0.984778	-0.018811	6	-0.936418	0.833620	0.059672
34	0.423765	-1.753949	-0.442198	34	0.847214	-1.363962	-0.423970
8	1.381259	-1.725365	1.145266	8	2.128246	-1.024396	1.385334
1	0.815057	-2.187033	1.786003	1	1.560766	-1.411169	2.075460
1	-2.404064	-1.911826	0.056602	1	-1.861905	-2.458885	-0.082183
1	-4.269926	-0.303524	0.375416	1	-4.105016	-1.422166	0.131400
1	-3.783146	2.143835	0.425696	1	-4.322622	1.048266	0.337214
1	-1.442239	2.938480	0.140232	1	-2.270065	2.483700	0.287251
6	0.756172	1.641939	-0.184091	6	0.276266	1.698659	0.005805
8	0.849707	2.715609	-0.778488	8	0.214523	2.900239	-0.266624
7	1.822511	1.038537	0.395518	7	1.442725	1.009699	0.233744
1	1.714146	0.172206	0.912828	1	1.795951	0.010784	1.175958
6	3.145276	1.628736	0.279940	6	2.651850	1.638359	-0.279217
1	3.180767	2.613491	0.759748	1	2.850433	2.573361	0.261203
1	3.865610	0.964904	0.762819	1	3.495886	0.958208	-0.136550
1	3.421699	1.759782	-0.771280	1	2.558967	1.890239	-1.341976

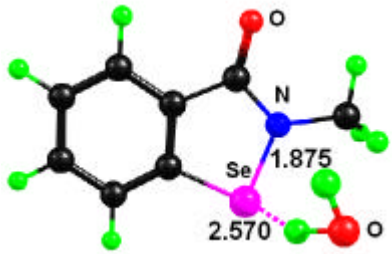
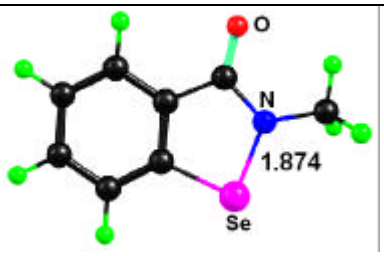
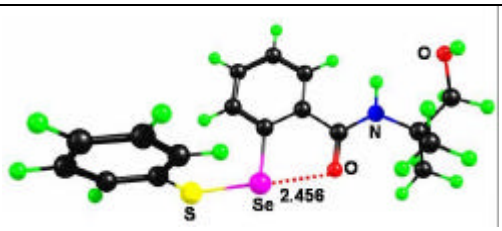
 **37c**				 **43**			
6	-0.942989	-0.607456	-0.163648	6	-0.518705	-0.917049	-0.324657
6	-2.055457	-1.431945	-0.005708	6	-1.800440	-1.453172	-0.444807
6	-3.277974	-0.833631	0.298697	6	-2.883542	-0.665422	-0.057105
6	-3.387281	0.557954	0.439864	6	-2.693673	0.632512	0.440922
6	-2.267098	1.367684	0.277958	6	-1.409248	1.154762	0.555475
6	-1.037350	0.779754	-0.027864	6	-0.316378	0.374513	0.170620
34	0.833042	-1.132630	-0.581064	34	1.125989	-1.747496	-0.768680
8	2.548688	-0.694780	2.406608	1	-1.959437	-2.456541	-0.829237
1	1.892858	-1.002660	1.757078	1	-3.889301	-1.067606	-0.143981
1	-1.980668	-2.510011	-0.114251	1	-3.552376	1.227970	0.736602
1	-4.156765	-1.459331	0.428306	1	-1.225017	2.154917	0.936605
1	-4.349745	1.001732	0.676475	6	1.089422	0.834252	0.252596
1	-2.315767	2.447485	0.383501	8	1.474197	1.927868	0.654858
6	0.222148	1.544901	-0.194524	7	1.940693	-0.159901	-0.196173
8	0.356228	2.755529	-0.053000	6	3.381841	-0.001641	-0.241997
7	1.259716	0.693064	-0.532619	1	3.599490	0.994577	0.149023
1	2.104624	0.043192	2.851454	1	3.881010	-0.753976	0.379859
6	2.653635	1.114203	-0.561632	1	3.755475	-0.078567	-1.269923
1	2.651114	2.204796	-0.509113				
1	3.195326	0.701464	0.297247				
1	3.132476	0.796508	-1.493904				

Table S12. Relative Electronic ?(E + ZPE) and relative Gibbs Free Energy ?(G + ZPE) for the cyclization of selenenic acid **37** to the corresponding selenenyl amide **43** calculated at B3LYP/6-31G(d) level of theory.

37 ? 43 + H_2O		
Structure	?(E + ZPE) kcal/mol	?(G + ZPE) kcal/mol
37	0	0
37TS1	12.20	12.25
37a	6.97	7.39
37TS2	10.57	10.91
37b	7.42	7.45
37TS3	49.03	49.89
37c	1.07	0.48
43 + H_2O	6.79	-1.64

Table S13. B3LYP/6-31G(d) level optimized geometry of the selenenyl sulfide **14**.



16	-2.983670000	0.026935000	-1.569645000
34	-0.785590000	-0.419625000	-1.341586000
8	5.322524000	0.092060000	2.046108000
1	5.112501000	-0.616151000	2.674622000
8	1.616521000	-0.822144000	-1.027140000
7	3.309974000	0.096611000	0.193853000
1	3.513430000	0.728595000	0.959375000
6	5.554537000	-0.500476000	0.769893000
1	6.288178000	-1.316269000	0.831556000
1	5.983453000	0.297925000	0.156636000
6	-1.025722000	2.268662000	-0.176267000
1	-2.067884000	2.210219000	-0.470181000
6	-5.144415000	-0.354245000	0.062491000
6	1.181333000	1.278059000	-0.051411000
6	-3.750636000	-0.484986000	-0.018589000
6	-0.173898000	1.192712000	-0.442304000
6	4.263734000	-1.025804000	0.101835000
1	-5.702198000	0.038189000	-0.784082000
6	1.648994000	2.451779000	0.563183000
1	2.699320000	2.549208000	0.822685000
6	-3.038768000	-0.990607000	1.072947000
1	-1.961259000	-1.098947000	1.000364000
6	2.056560000	0.106727000	-0.325115000
6	-0.548150000	3.416275000	0.449966000
1	-1.230009000	4.240319000	0.642545000
6	-3.718379000	-1.361855000	2.233966000
1	-3.154290000	-1.755044000	3.076194000
6	-5.814093000	-0.728282000	1.226802000
1	-6.894937000	-0.623732000	1.278030000
6	-5.105199000	-1.233090000	2.319195000
1	-5.628928000	-1.523101000	3.225874000
6	3.721434000	-2.258218000	0.852128000
1	3.527095000	-2.028157000	1.907312000
1	4.438399000	-3.086213000	0.803748000
1	2.780865000	-2.586108000	0.403917000
6	0.795944000	3.517748000	0.817362000
1	1.174406000	4.419116000	1.290052000
6	4.579821000	-1.372843000	-1.361090000
1	4.929582000	-0.485949000	-1.900512000
1	3.693350000	-1.757582000	-1.867140000
1	5.366956000	-2.134964000	-1.401427000