

Supporting Information

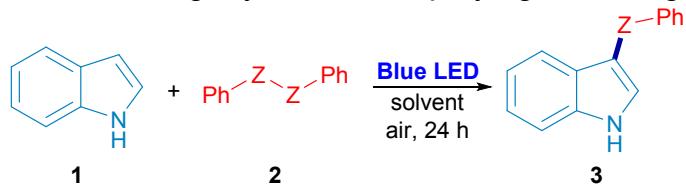
**Metal- and Photocatalyst-free Synthesis of
3-Selenylindoles and Asymmetric Diarylselenides
Promoted by Visible Light**

Ignacio D. Lemir, Willber D. Castro-Godoy, Adrián A. Heredia, Luciana C. Schmidt and Juan E. Argüello

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Table S1. Obtention of 3-chalcogenylindoles employing visible light.^a



Entry	Z	Solvent	Obtention of 3 ^b
1	S	MeCN	✗
2	S	Toluene	✗
3	S	EtOH	✗
4	S	Acetone	✗
5	Se	MeCN	✓
6	Se	EtOH	✓
7	Se	Acetone	✓
8	Te	MeCN	✗
9	Te	EtOH	✗
10	Te	Acetone	✗

^aReaction conditions: **1** (0.15 mmol), **2** (0.75 equiv.), solvent (2 mL) at room temperature irradiated with 3 W blue LED (467 nm) for 24 h. ^bDetection of **3** by GC, where a red cross and a green thick means not detected and observed, respectively.

Laser flash photolysis experiments

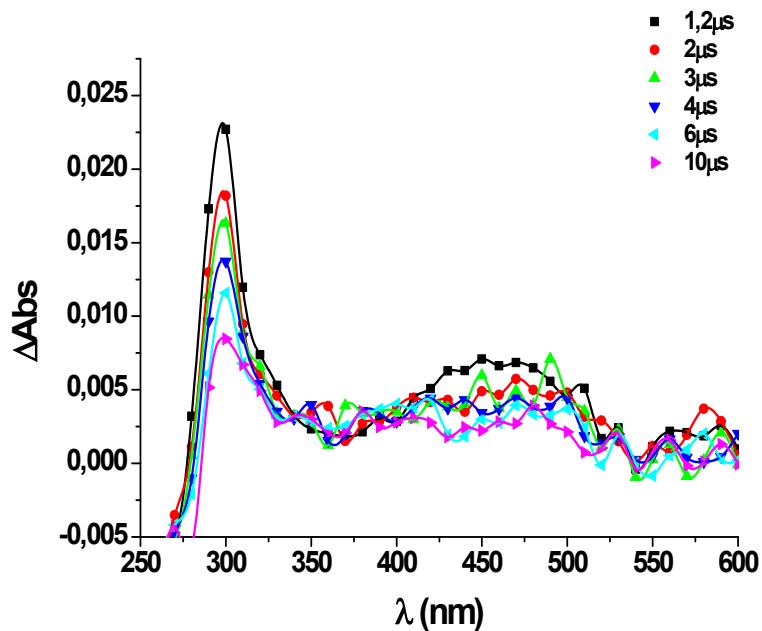


Figure S1. Transient absorption spectrum of Ph_2Se_2 (0.1 mM) excitation at 266 nm in MeCN. Spectrum taken at 1.2, 2, 3, 4, 6, 10 μs after the laser pulse.

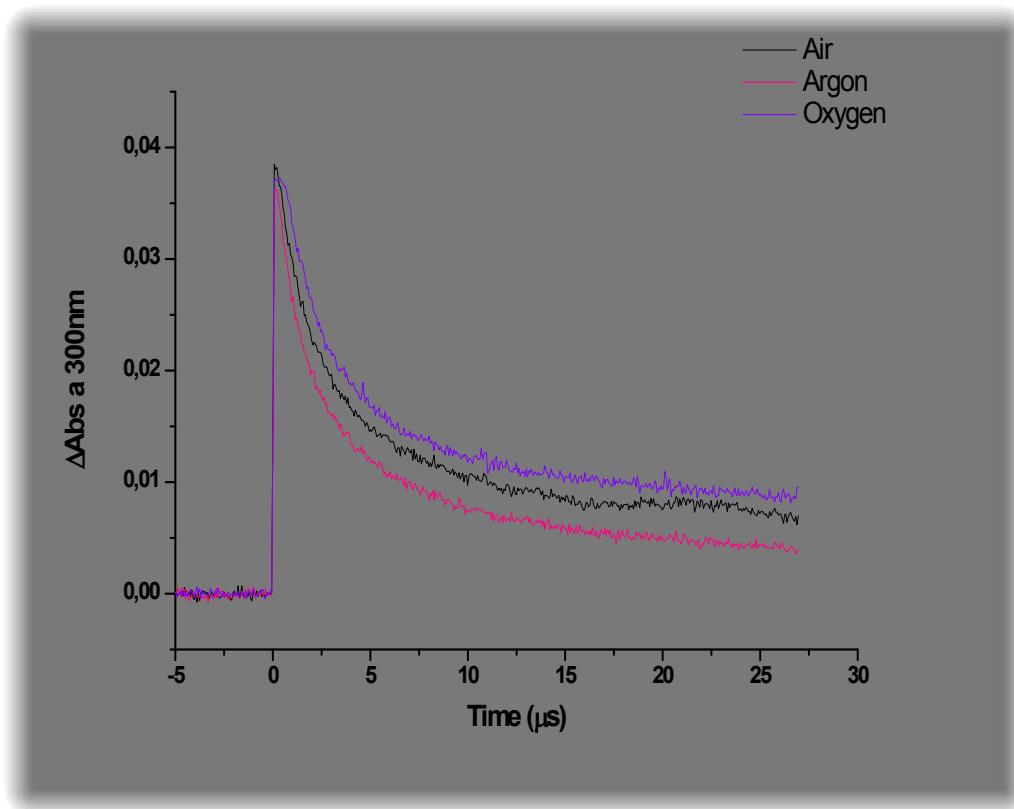


Figure S2. Decay trace monitored at 300 nm under air (), argon (), oxygen () atmosphere excitation at 266nm in MeCN

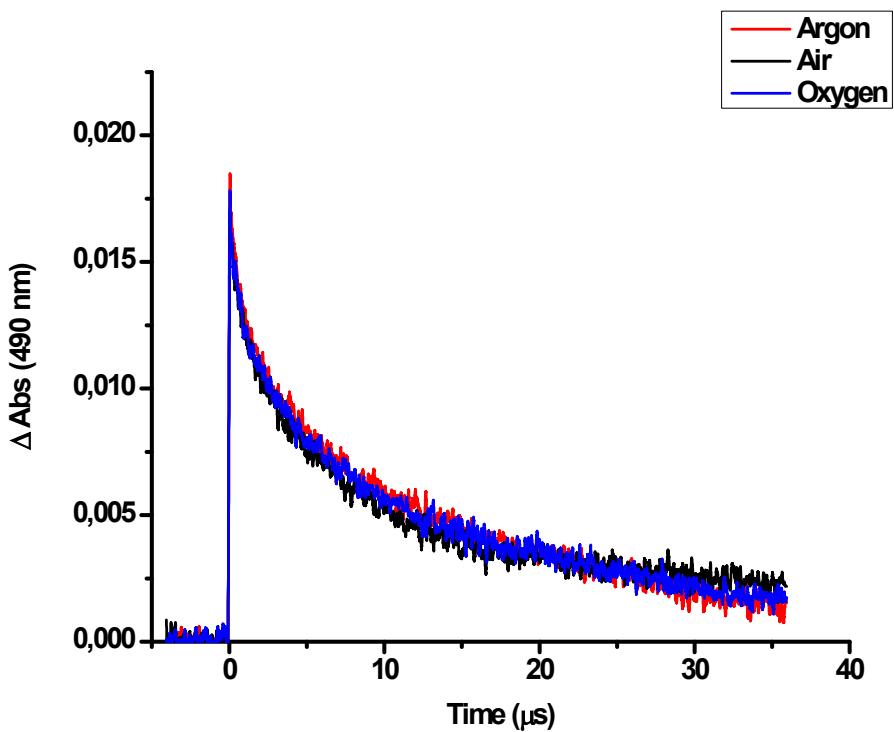


Figure S3. Decay trace monitored at 490 nm under air (), argon (), oxygen () atmosphere excitation at 355nm in MeOH.

Table S2. Decay profile of photogenerated PhSe[·] radical monitored at 490 nm.

Conditions	τ_1 (μs)	Error (τ_1)	A_1	Error (A_1)	y_0	Error (y_0)
Argon	9.79	0.09	0.01217	0.0004	0.00154	0.00003
Air	6.69	0.06	0.01126	0.0005	0.00256	0.00002
Oxygen	8.74	0.09	8.74575	0.0004	0.00196	0.00002

According to literature,¹ quenching of phenyl selenyl radical in presences of oxygen was not observed, since selenyl radical life time (τ_1) did not significantly change at different atmospheres.

1. Alam, M. M., Ito, O., Koga, Y. & Ouchi, A. *Int. J. Chem. Kinet.* 1998, **30**, 193–200.

Steady-state Fluorescence Study

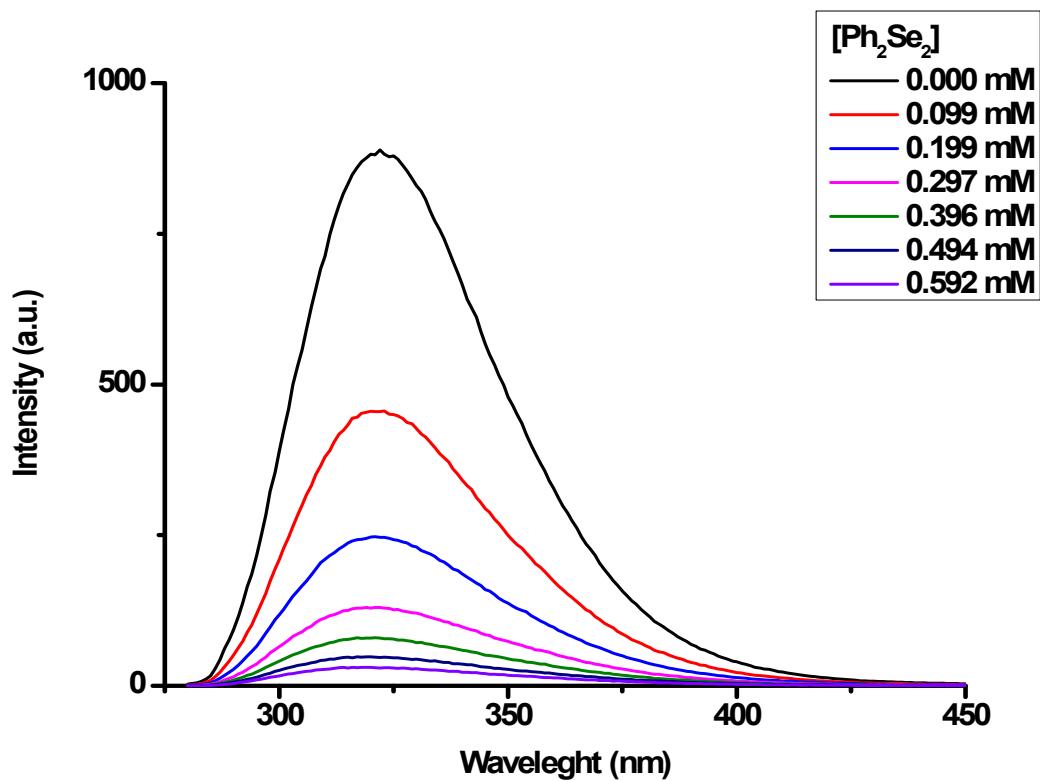


Figure S4. Indole fluorescence quenching with different concentrations of Ph_2Se_2 in MeCN. $[\text{Indole}] = 0.01 \text{ mM}$.

Time-Resolving Fluorescence Study

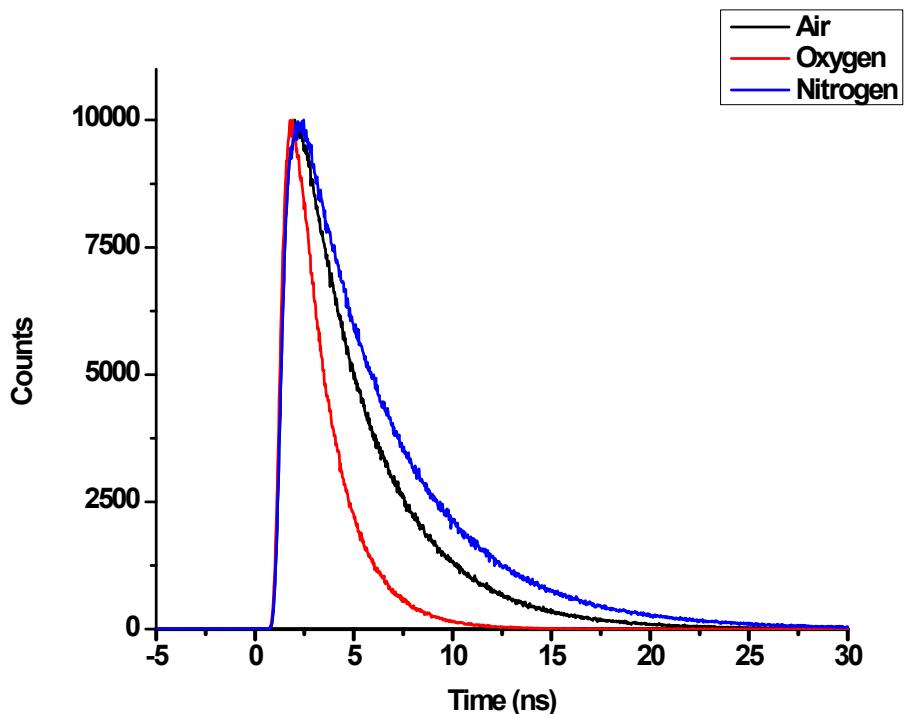


Figure S5. Time-resolved fluorescence of indole under different atmospheres: air (-), oxygen (-) and nitrogen (-).

Table S3. Decay profile of fluorescence lifetime of indole under different atmospheres.

$y = A_1 e^{(-x/\tau_1)} + y_0$						
Conditions	τ_1 (ns)	Error (τ_1)	A_1	Error (A_1)	y_0	Error (y_0)
Nitrogen	3.85	0.01	18279	40	-14	4
Air	3.78	0.01	18806	31	-5	3
Oxygen	2.03	0.01	27573	165	-38	7

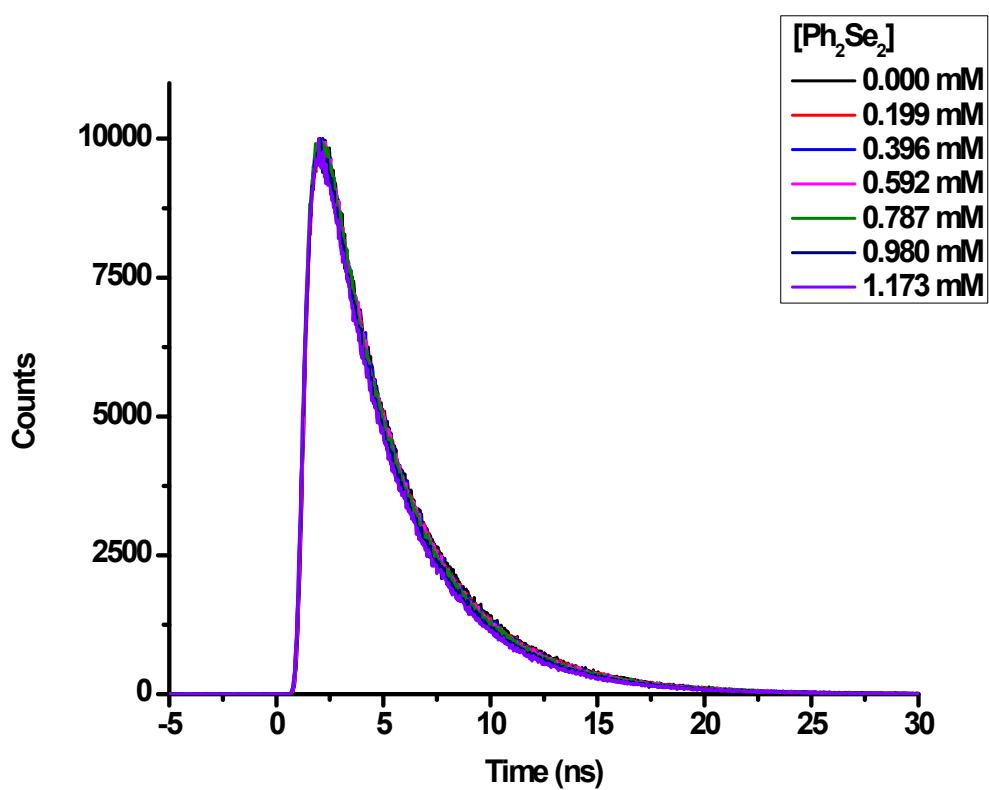
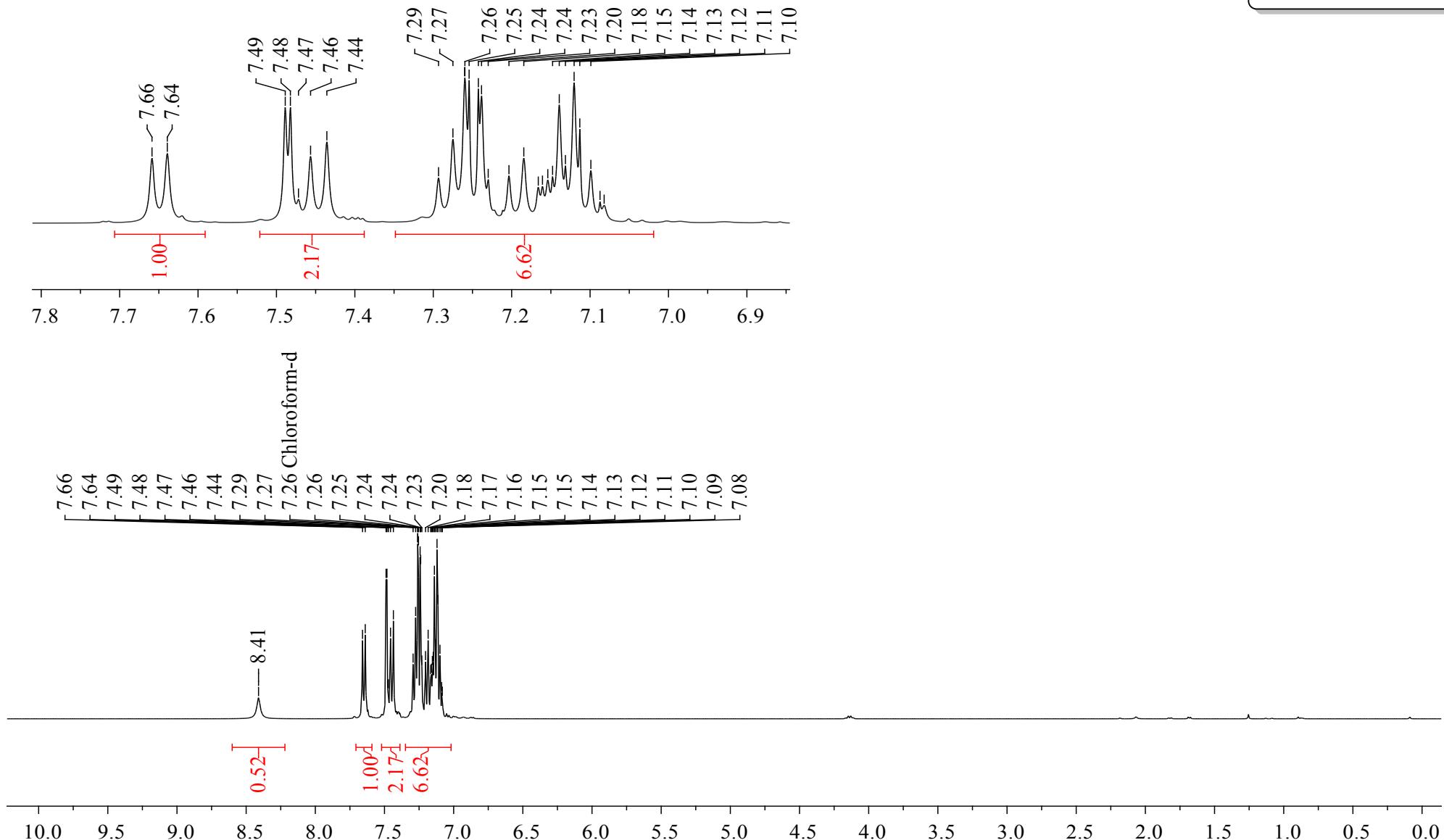
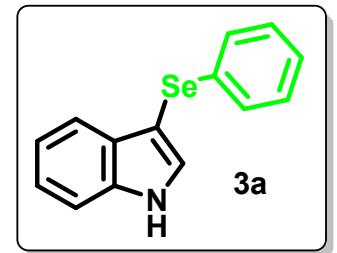


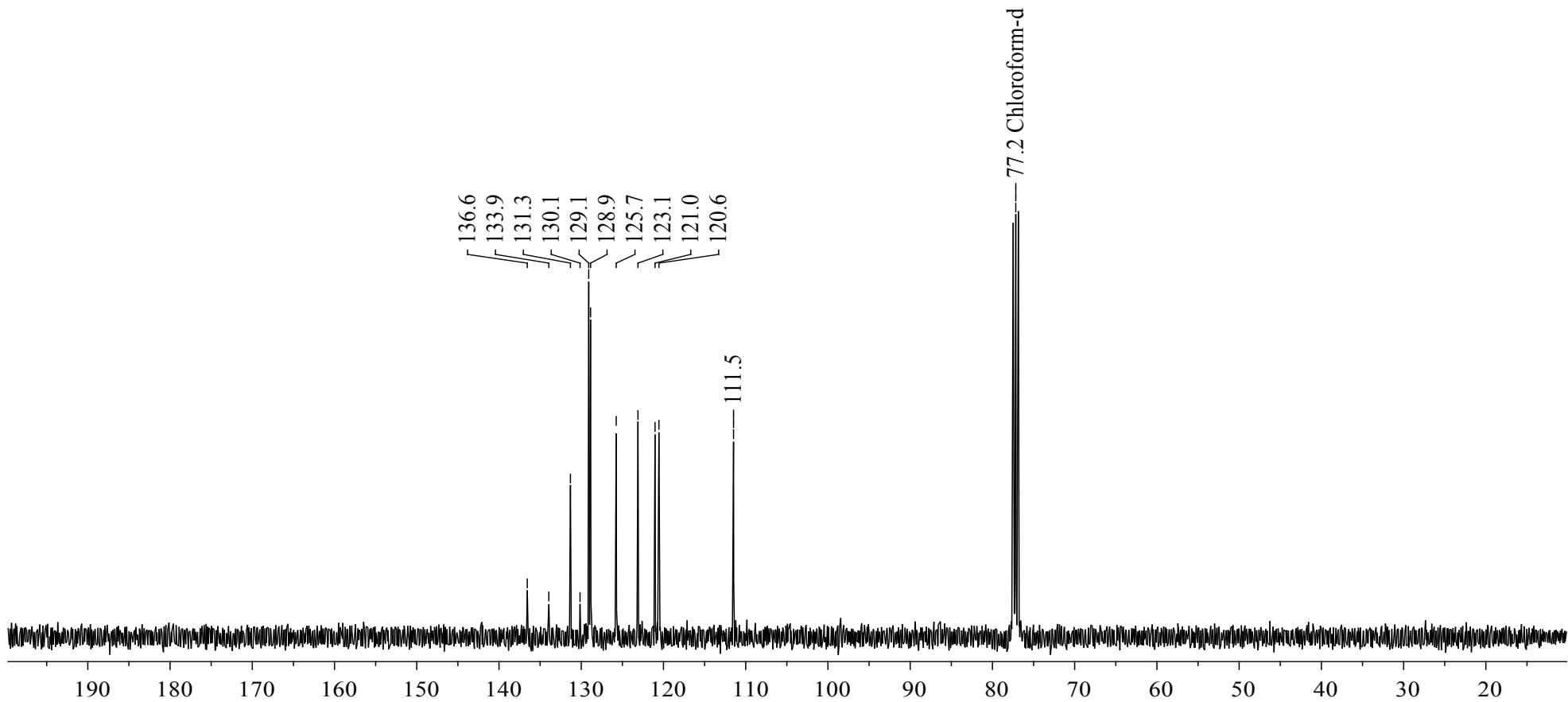
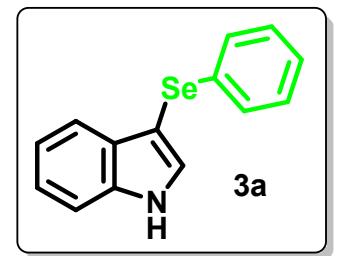
Figure S6. Time-resolved fluorescence of indole with different concentrations of Ph_2Se_2 in MeCN. $[\text{Indole}] = 0.01 \text{ mM}$.

^1H , ^{13}C , ^{19}F , ^{77}Se Spectra of Synthesized Products

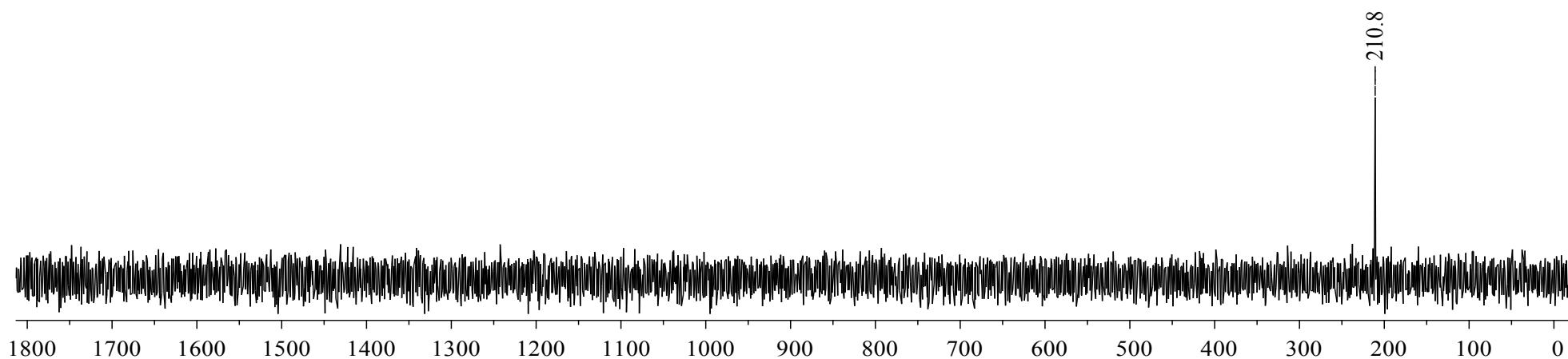
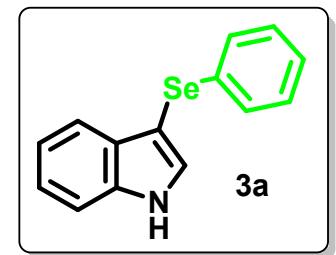
¹H NMR - 3-(phenylselanyl)-1H-indole (3a)



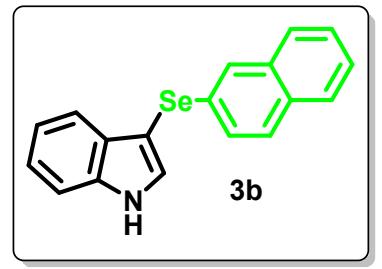
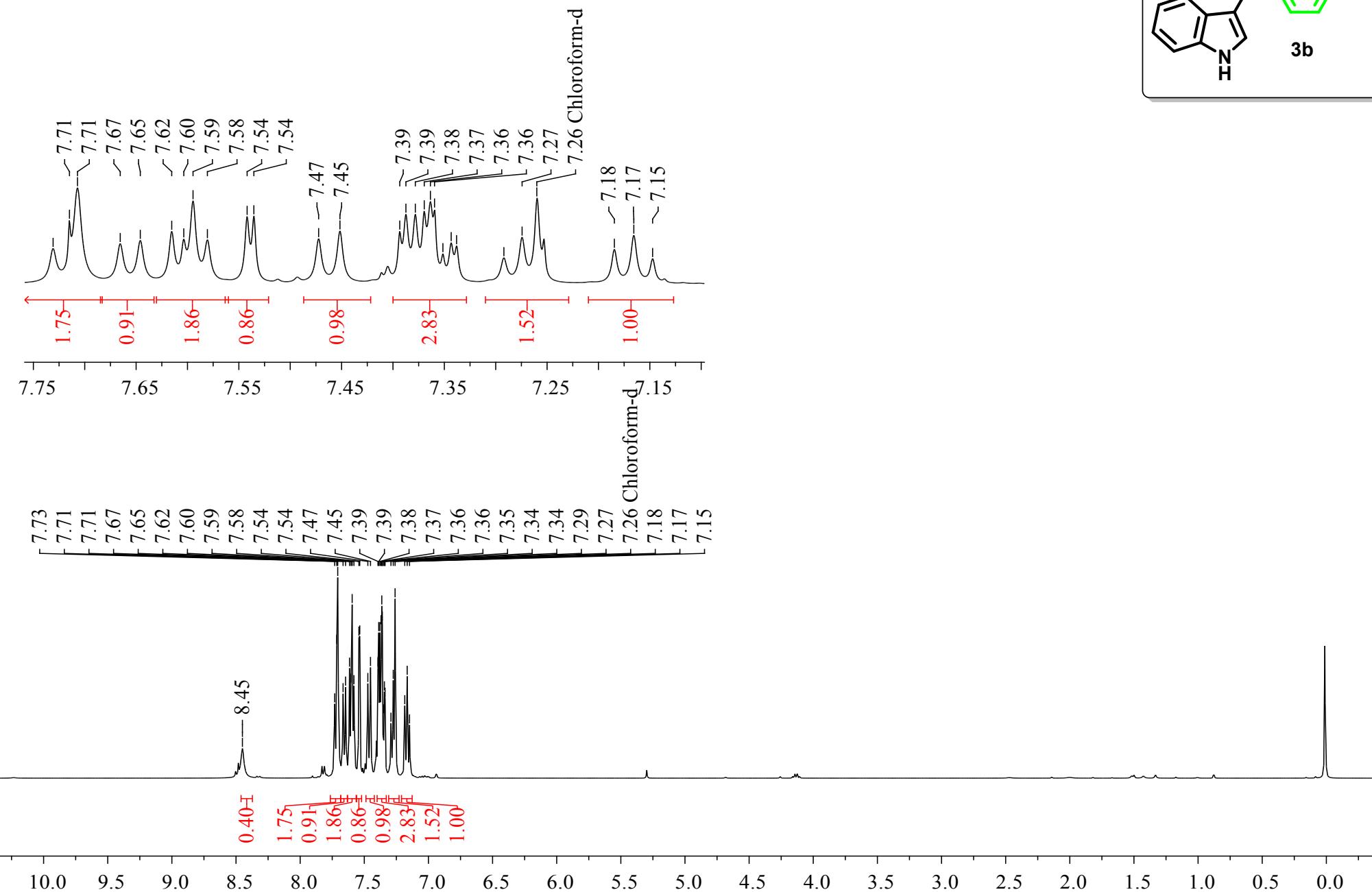
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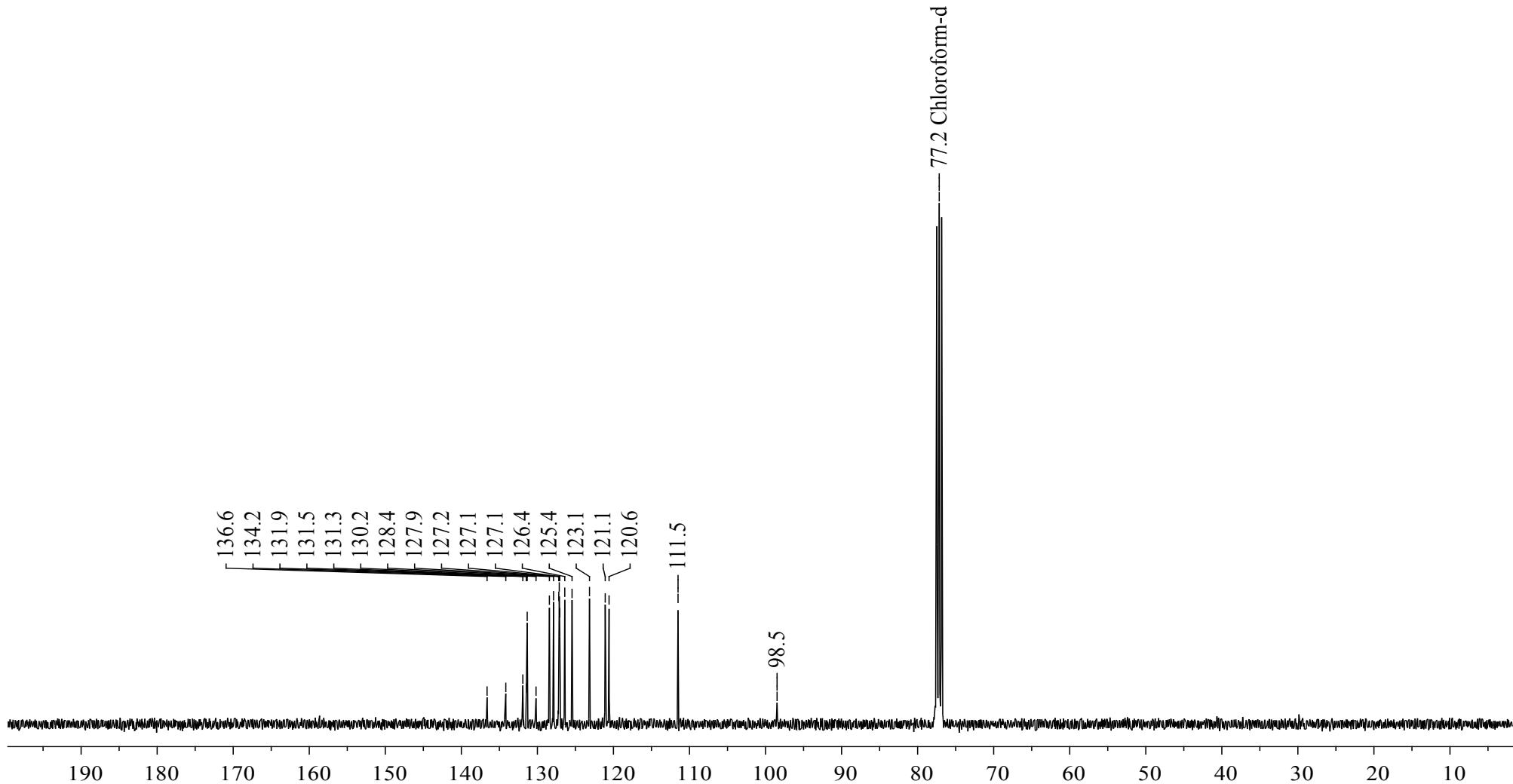
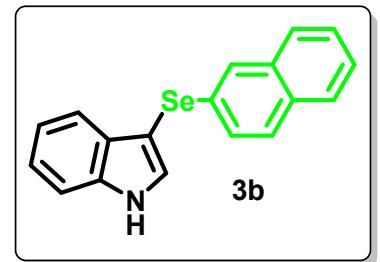
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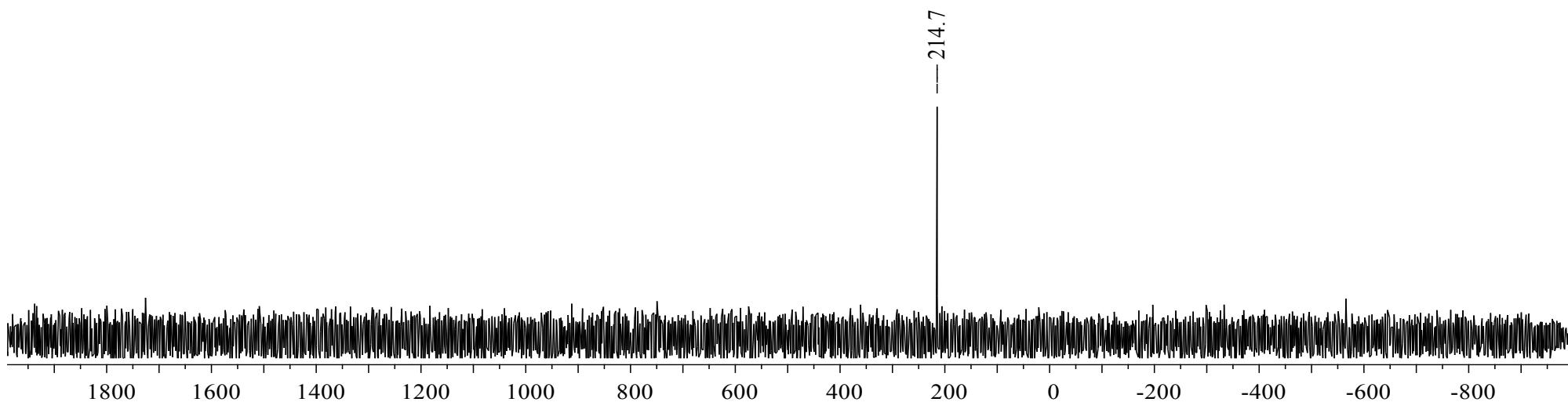
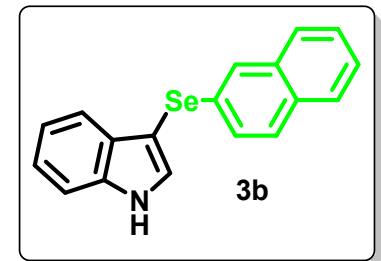
¹H NMR - 3-(naphthalen-2-ylselanyl)-1H-indole (3b)



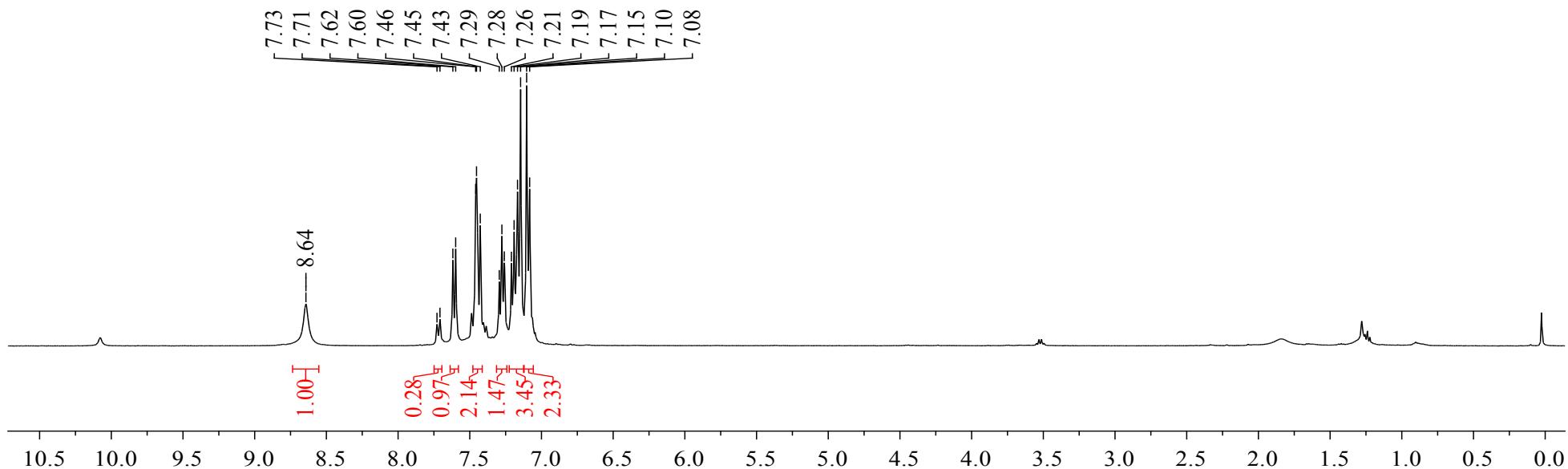
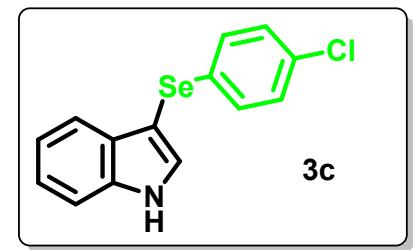
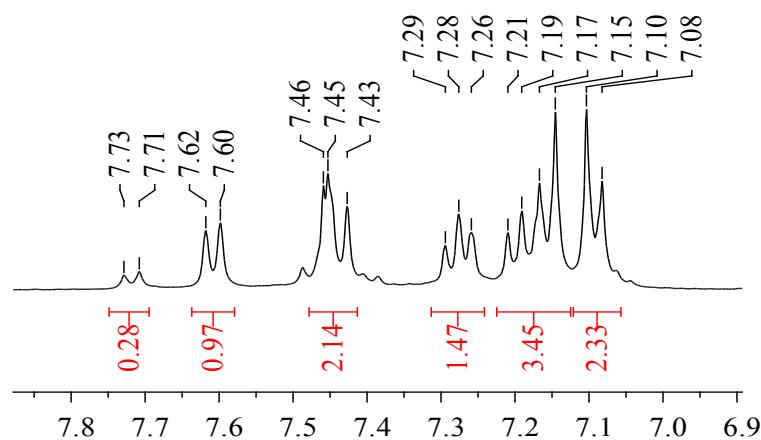
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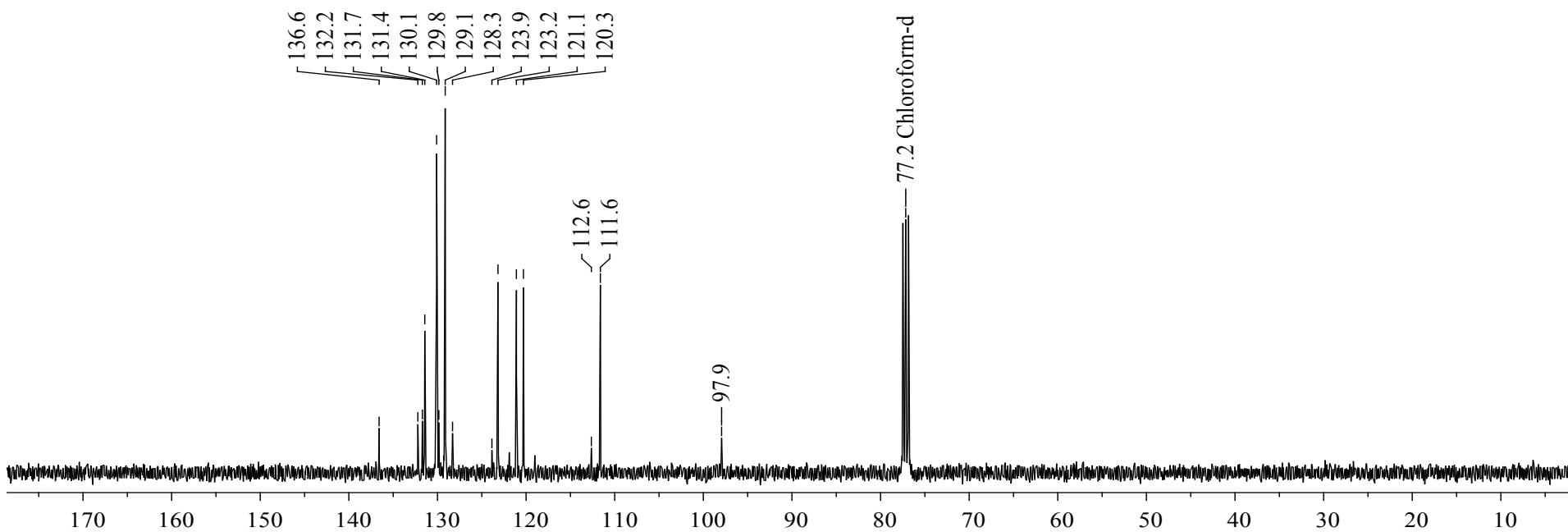
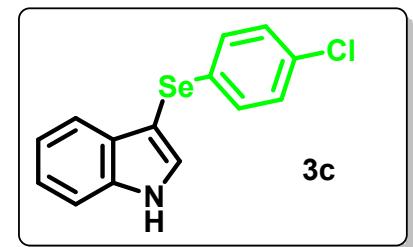
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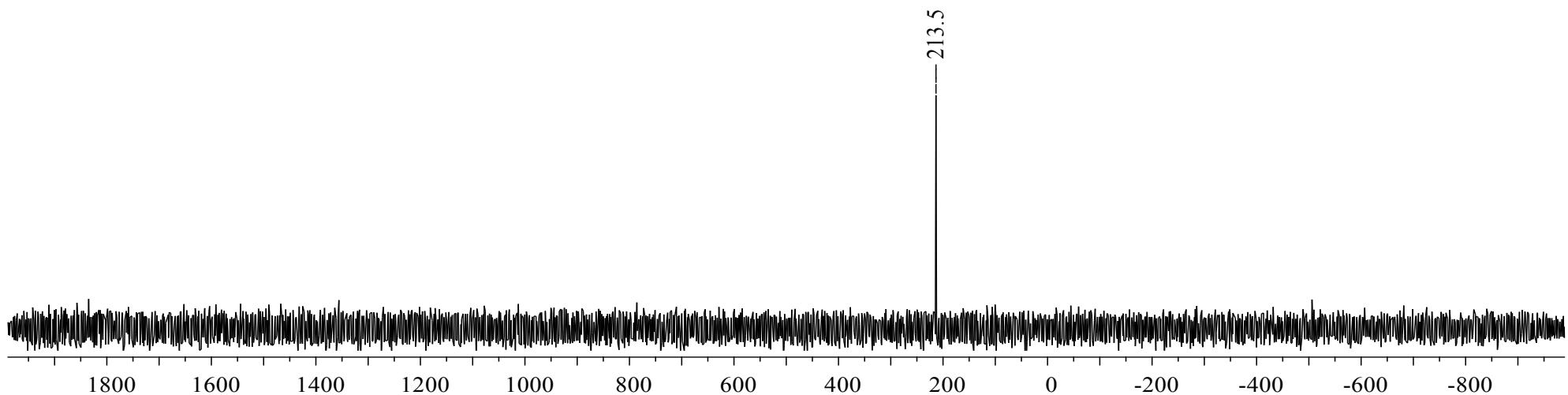
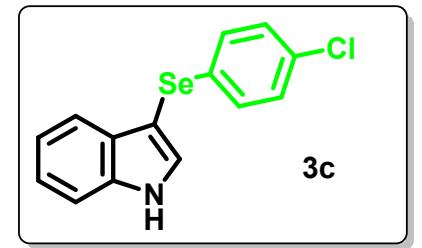
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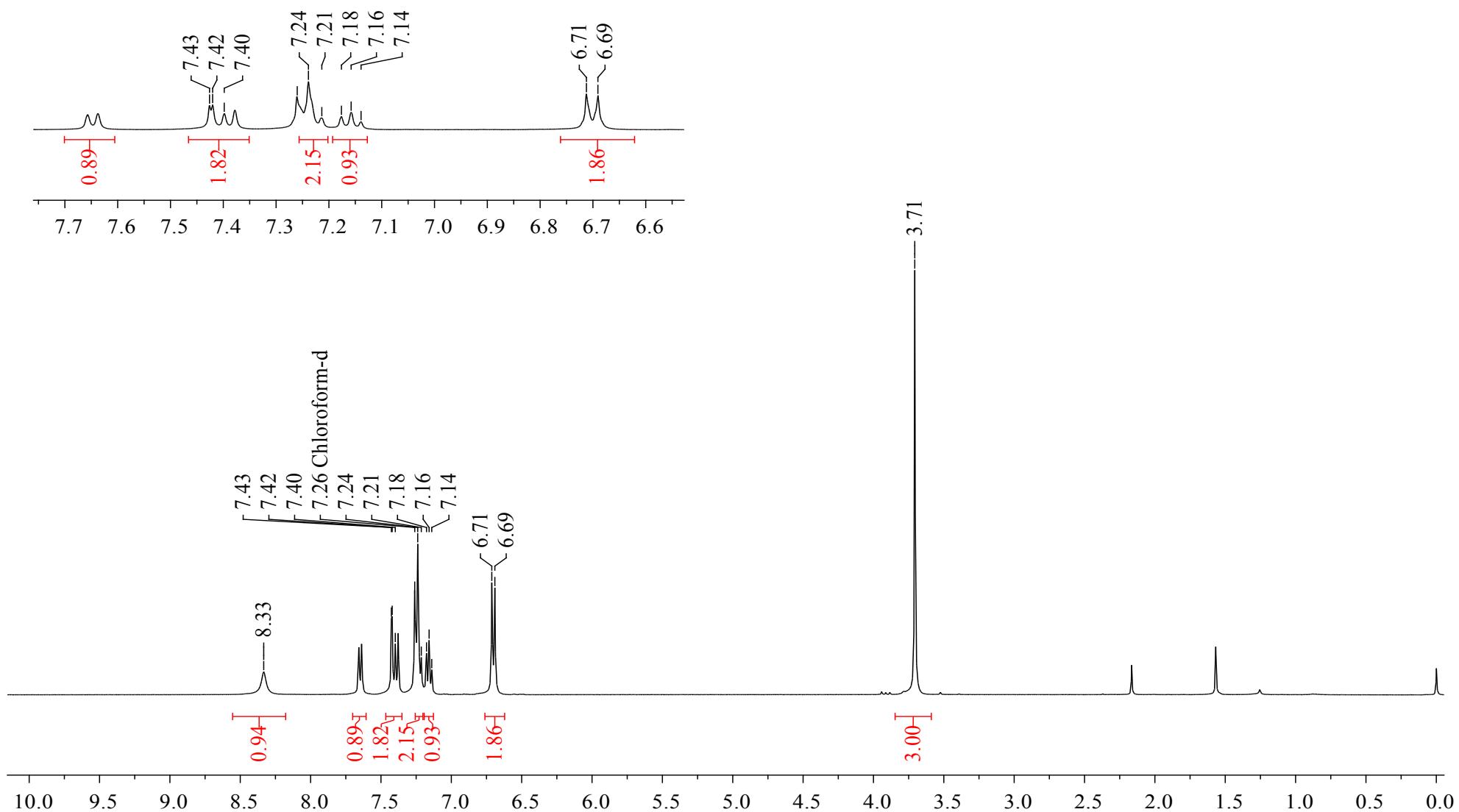
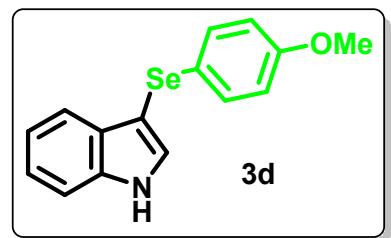
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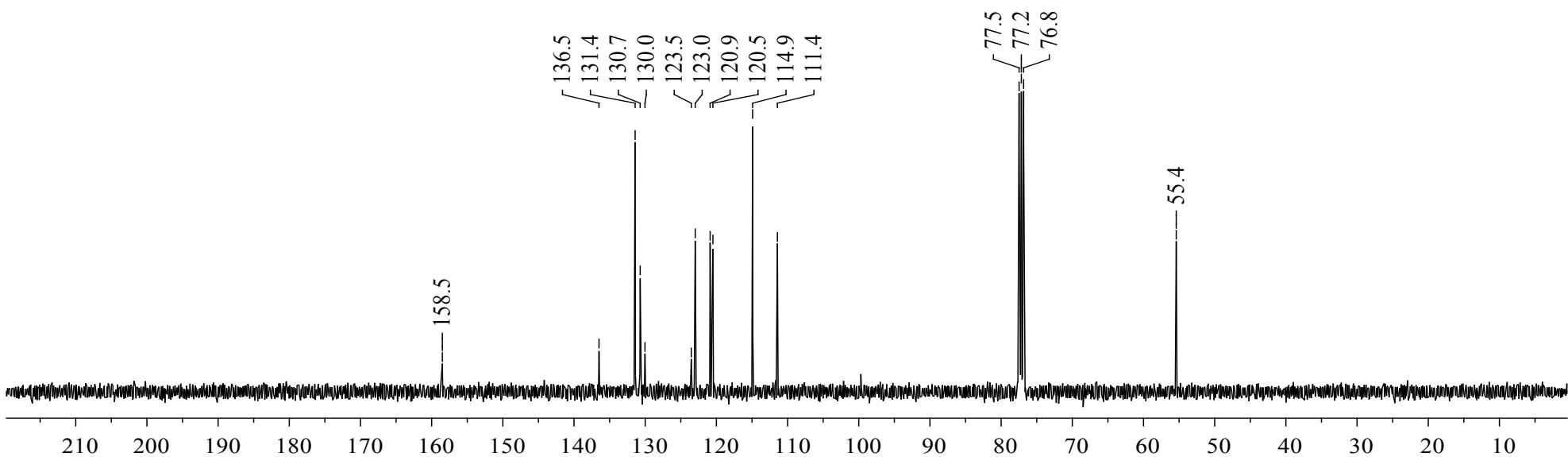
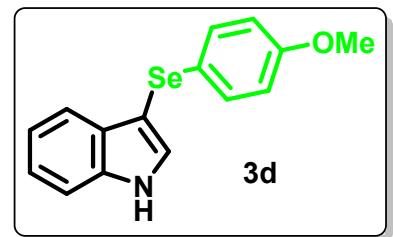
⁷⁷Se NMR - 3-((4-chlorophenyl)selanyl)-1H-indole (3c)



¹H NMR - 3-((4-methoxyphenyl)selanyl)-1H-indole (3d)

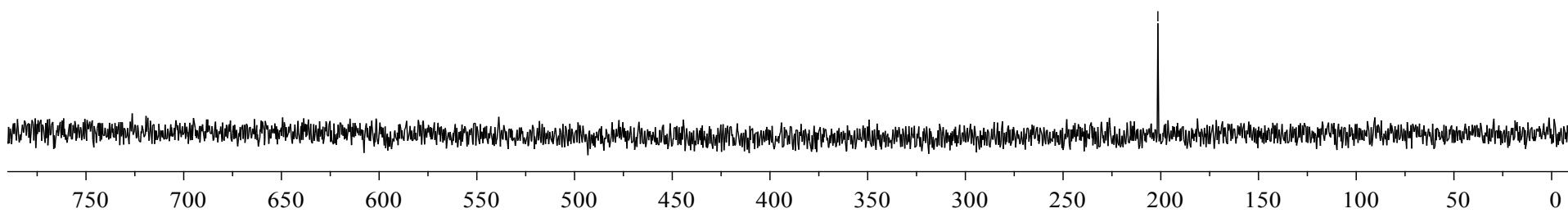
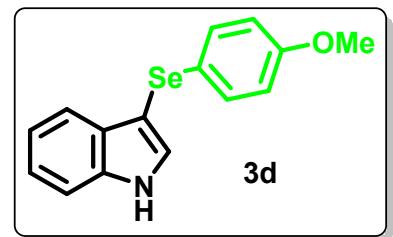


¹³C NMR - 3-((4-methoxyphenyl)selanyl)-1H-indole (3d)

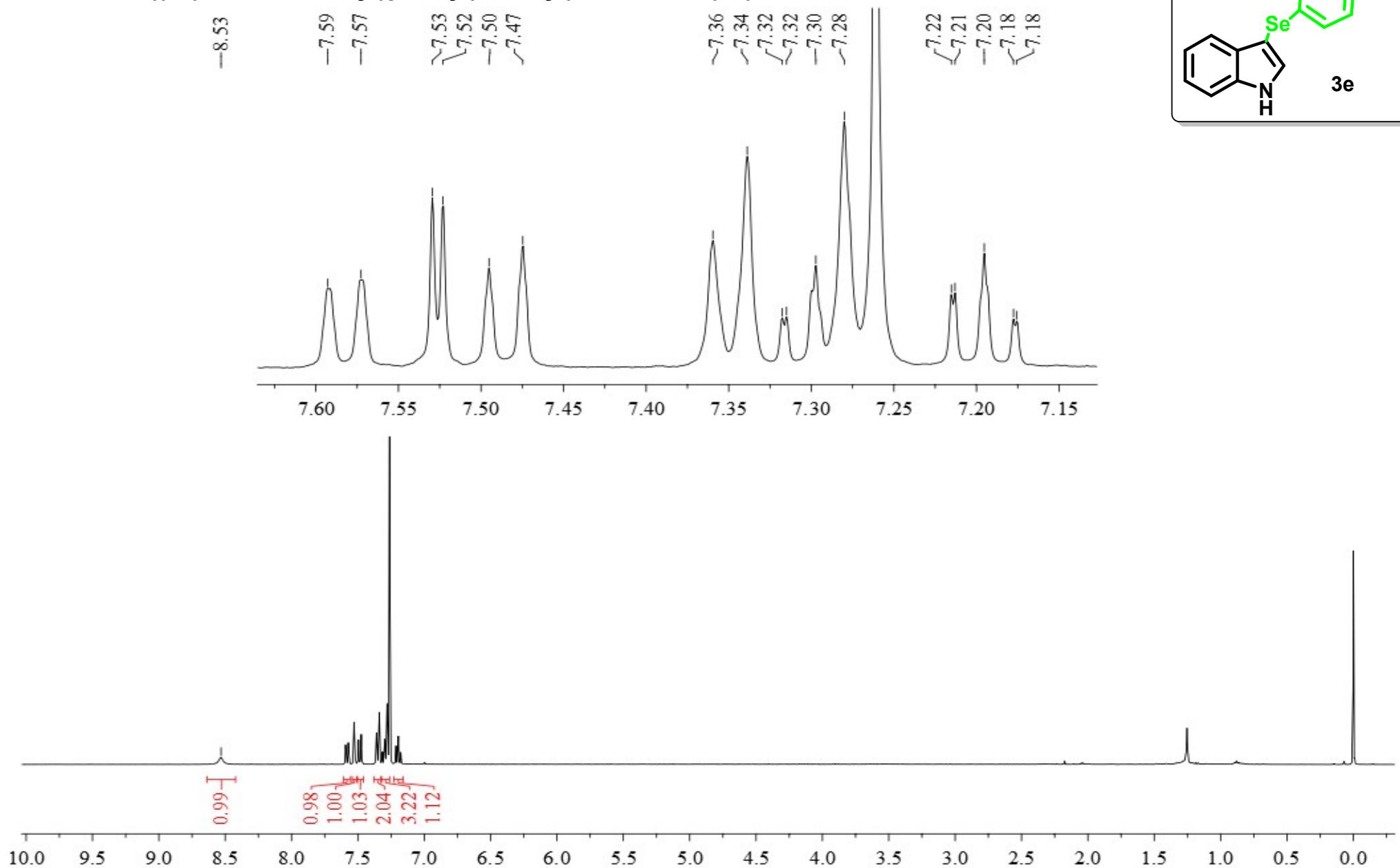


⁷⁷Se NMR - 3-((4-methoxyphenyl)selanyl)-1H-indole (3d)

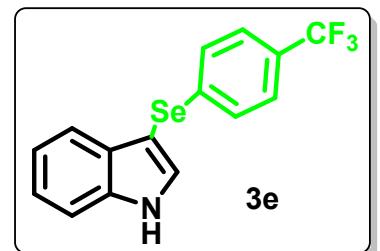
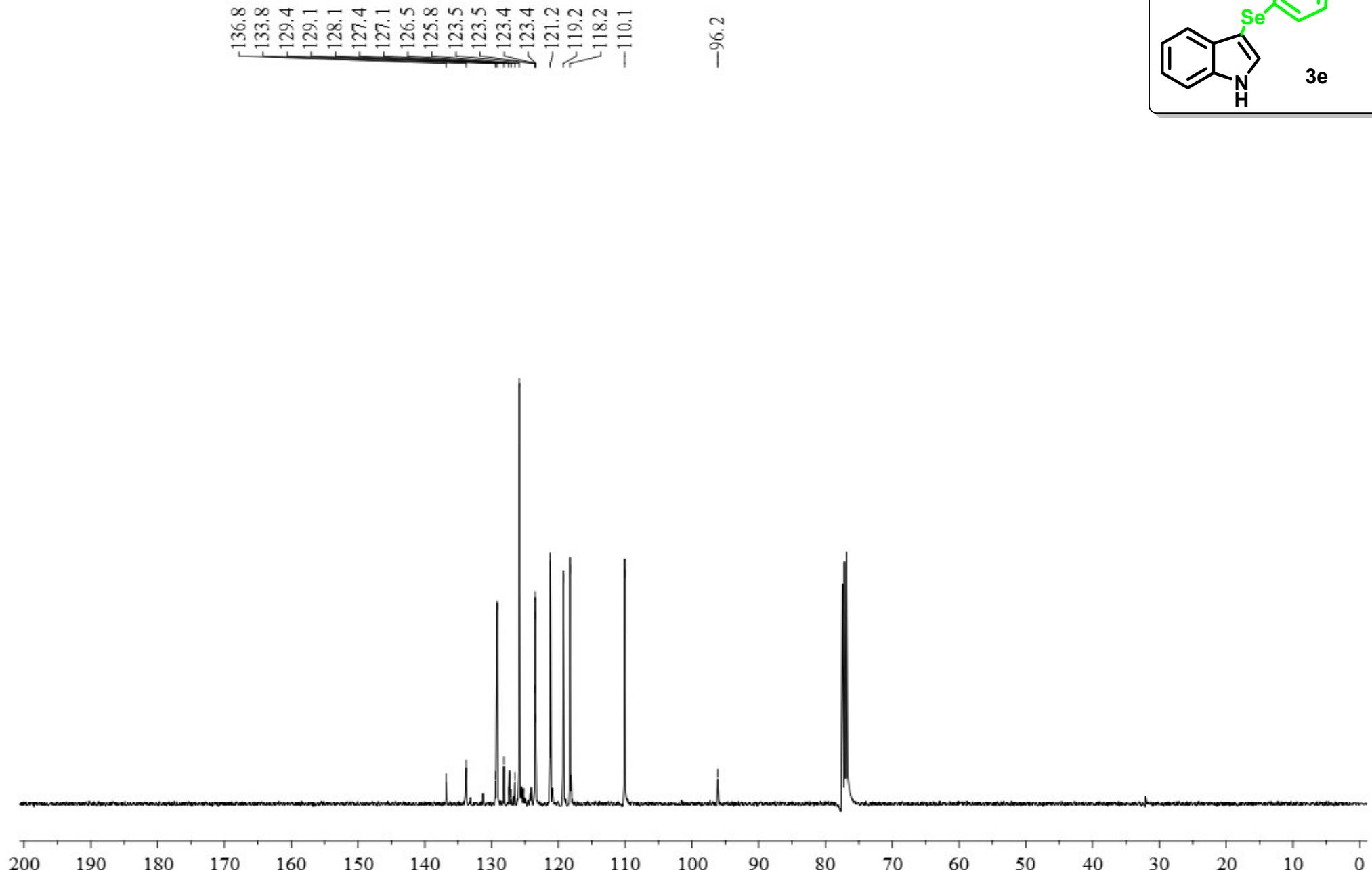
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¹H NMR - 3-((4-(trifluoromethyl)phenyl)selanyl)-1H-indole (3e)

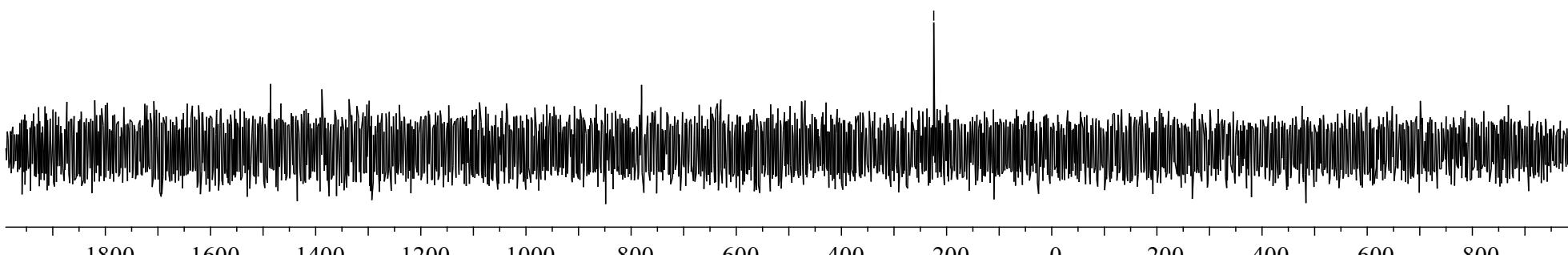
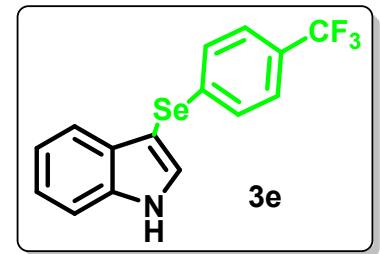


¹³C NMR - 3-((4-(trifluoromethyl)phenyl)selanyl)-1H-indole (3e)



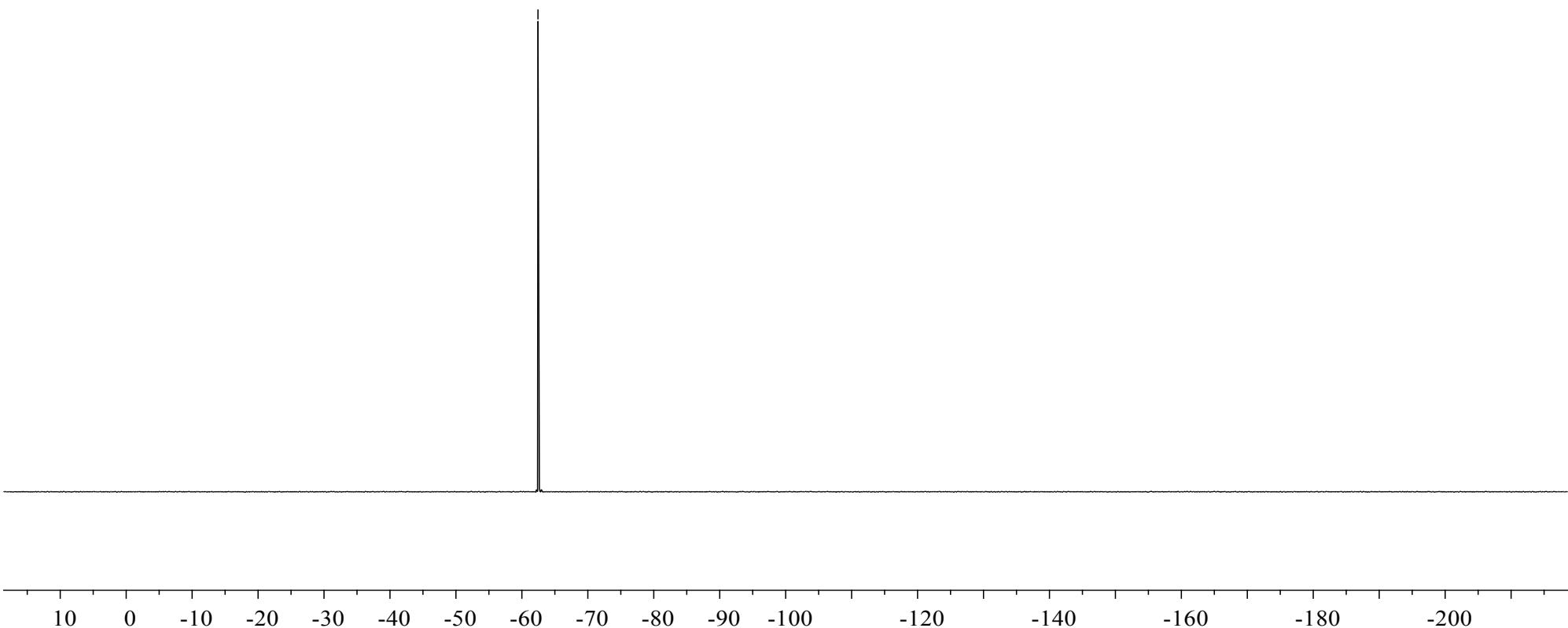
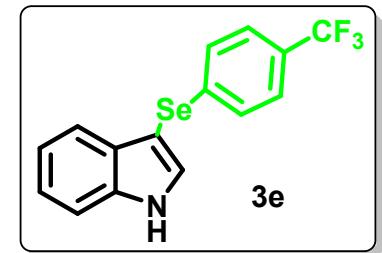
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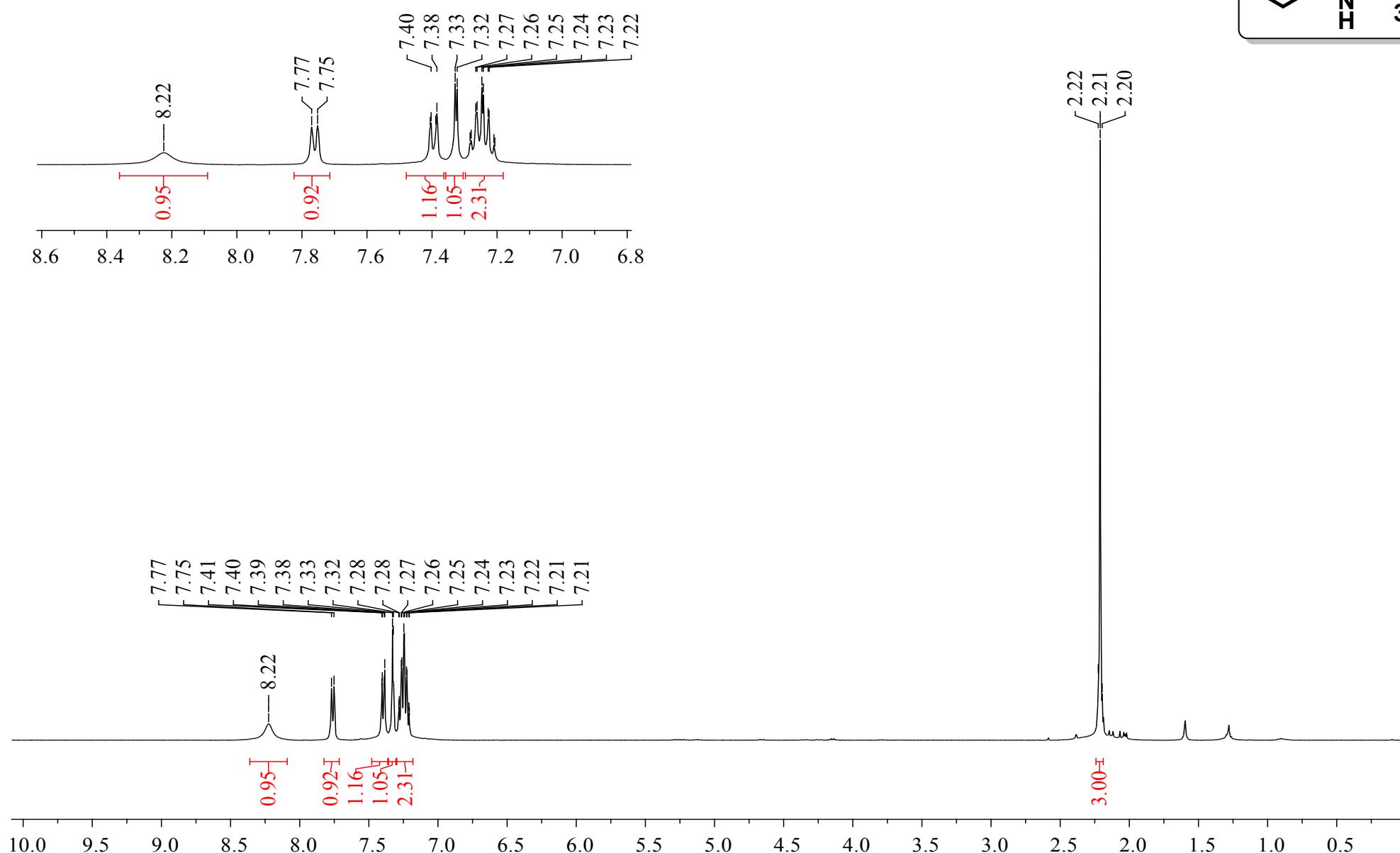
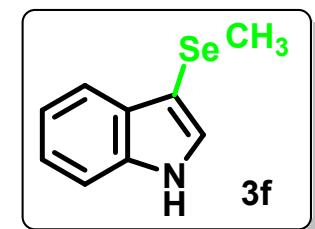


¹⁹F NMR - 3-((4-(trifluoromethyl)phenyl)selanyl)-1H-indole (3e)

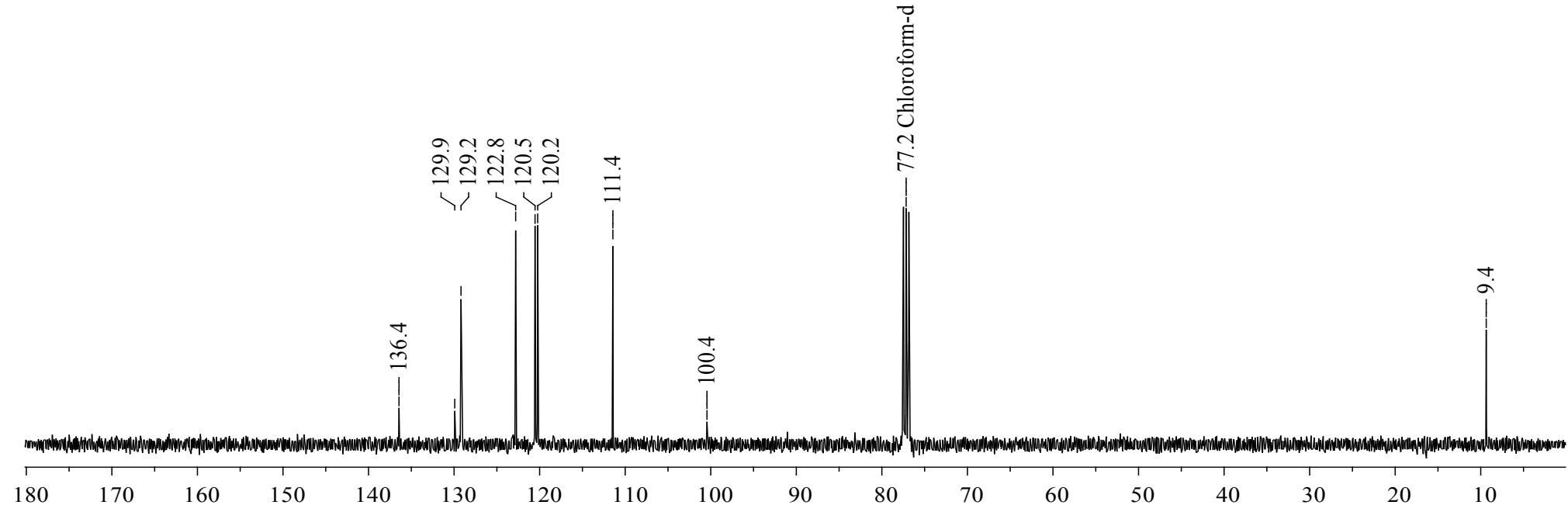
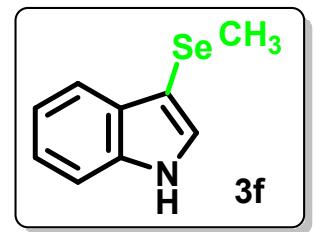
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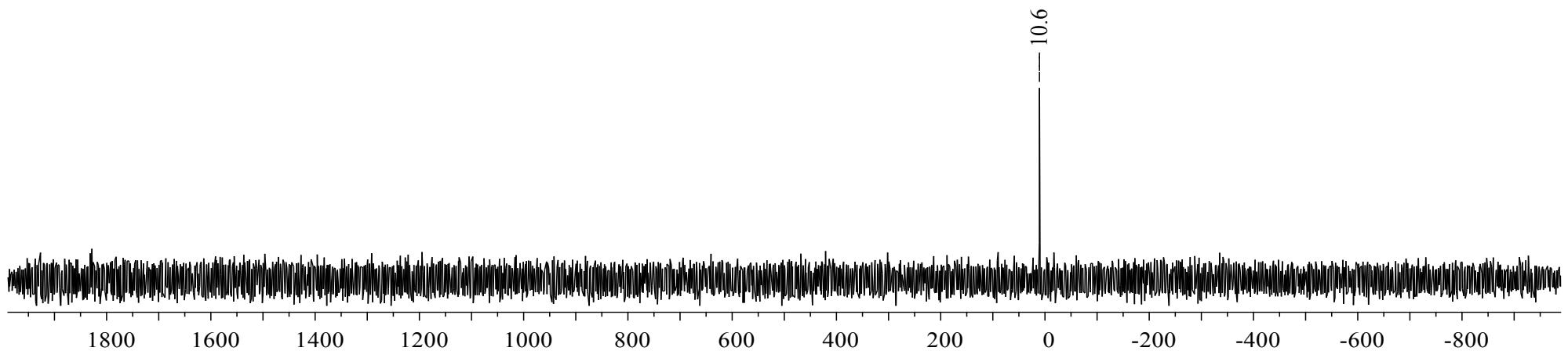
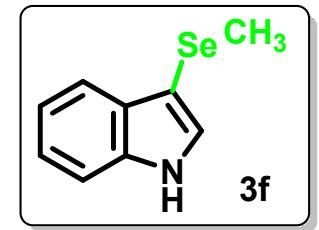
¹H NMR - 3-((4-methylselanyl)-1H-indole (3f)



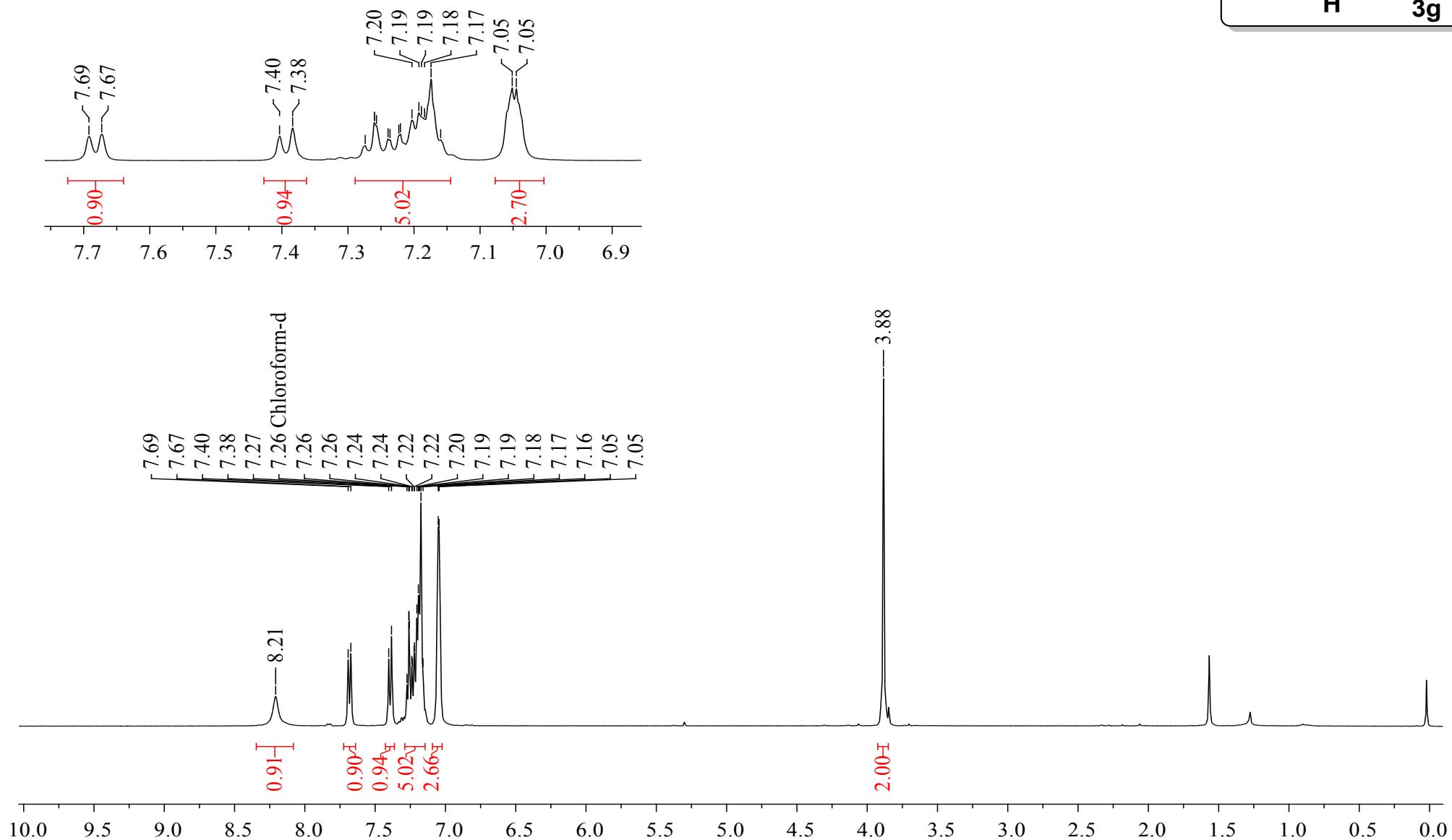
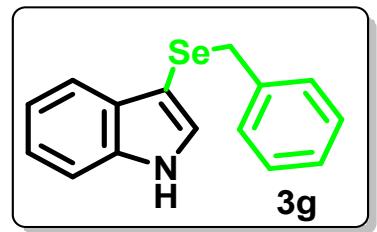
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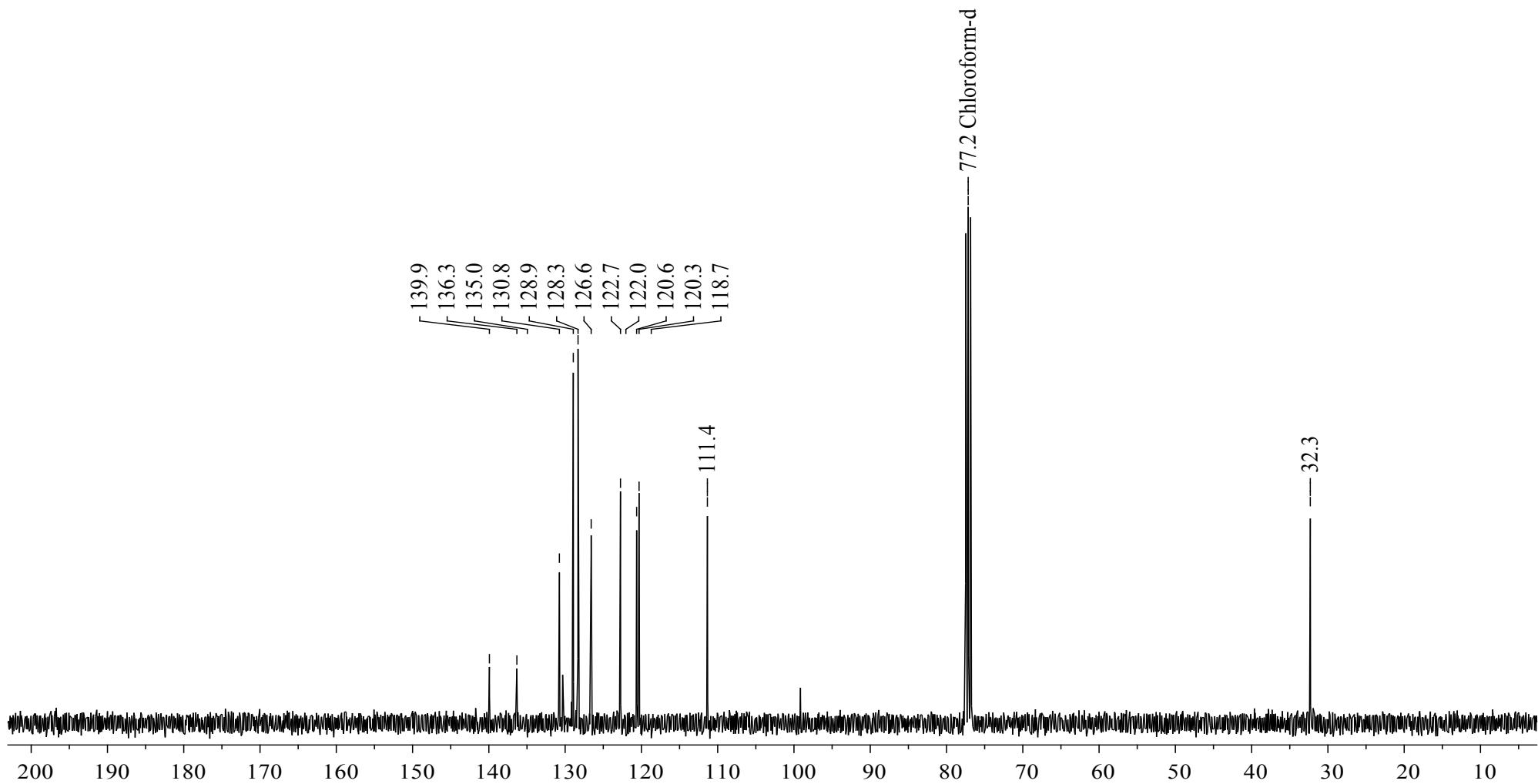
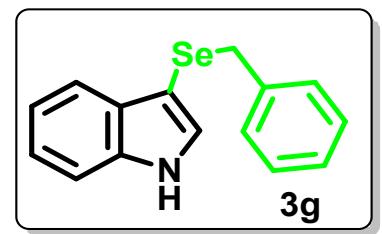
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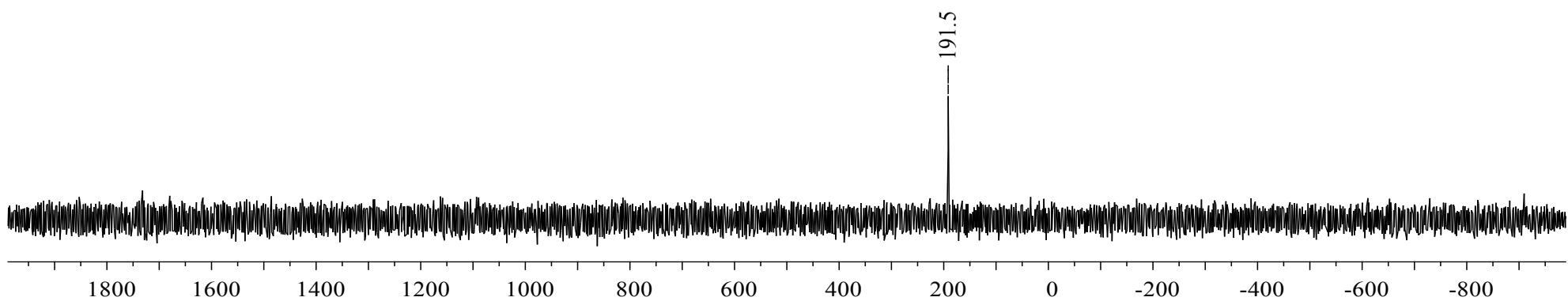
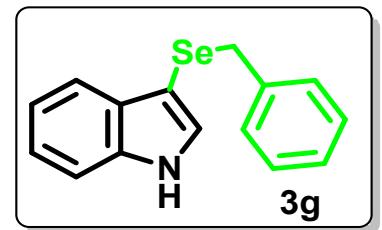
¹H NMR - 3-(benzylselanyl)-1H-indole (3g)



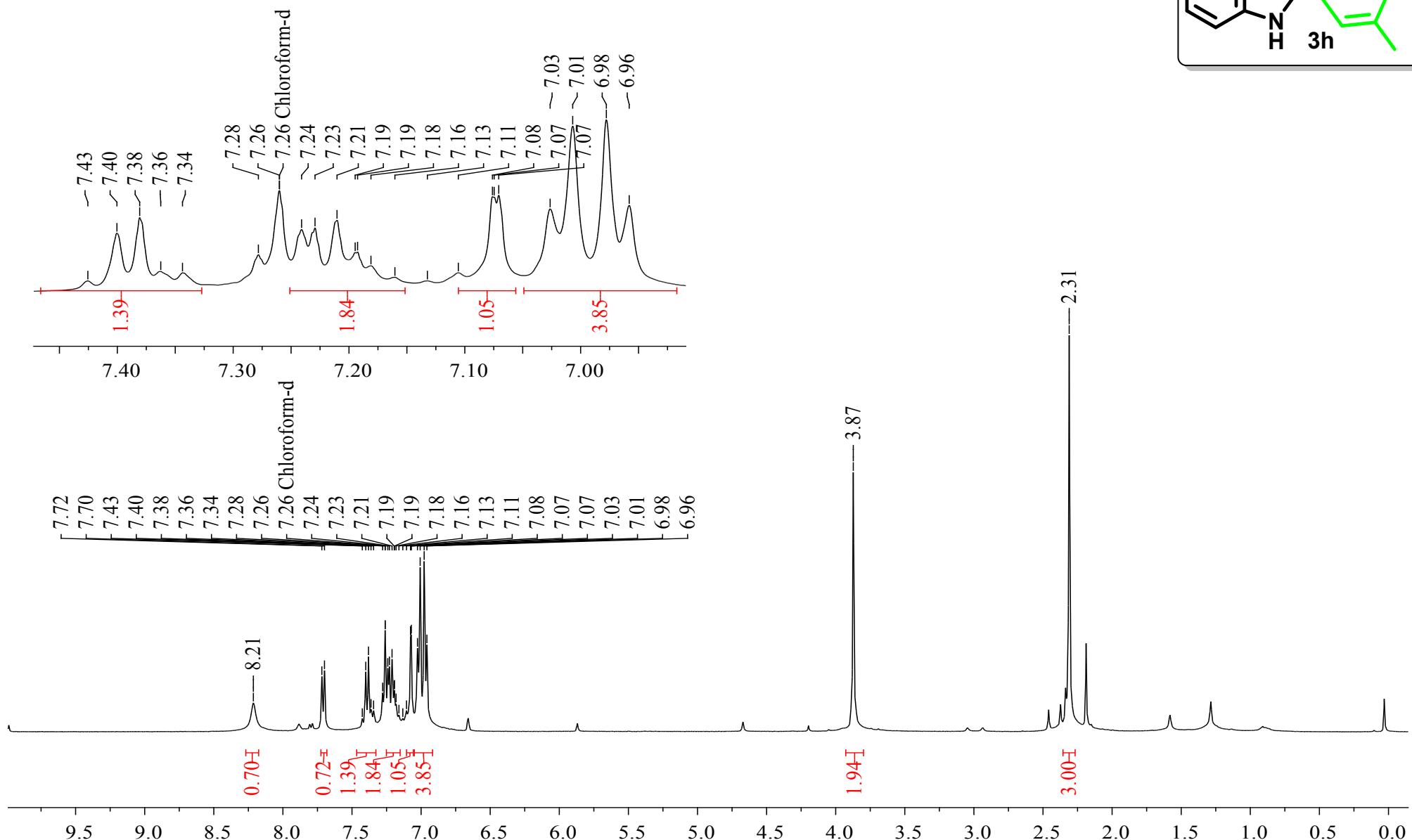
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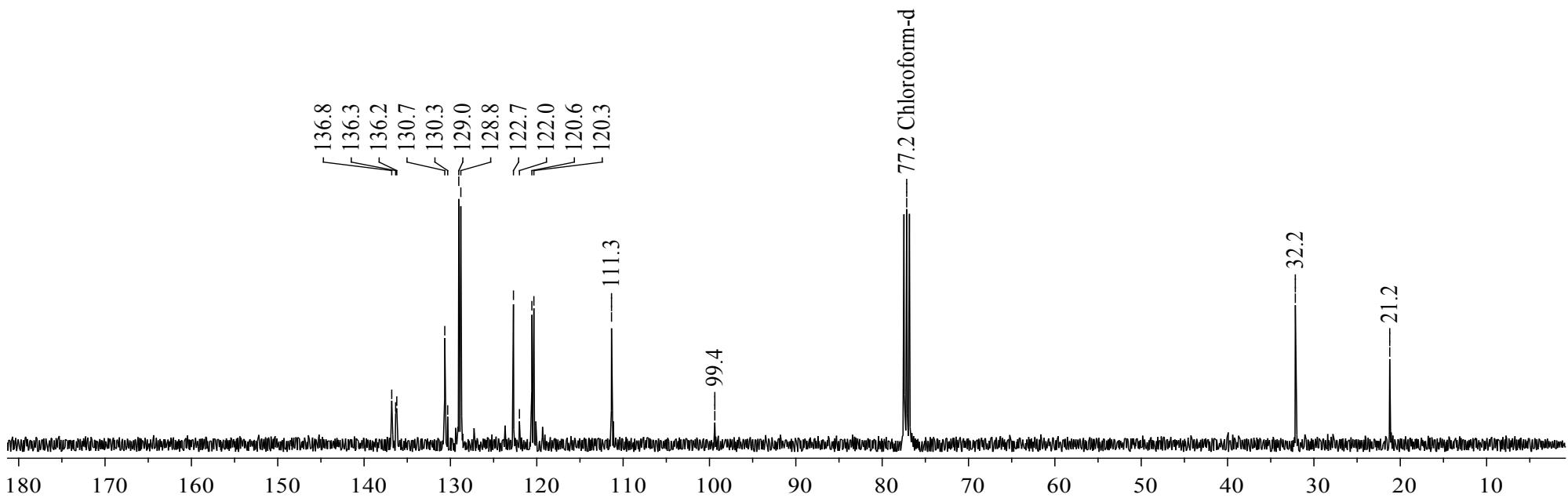
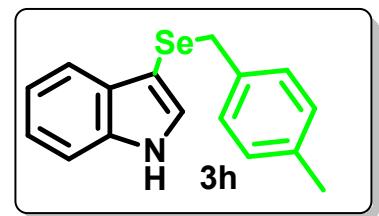
⁷⁷Se NMR - 3-(benzylselanyl)-1H-indole (3g)



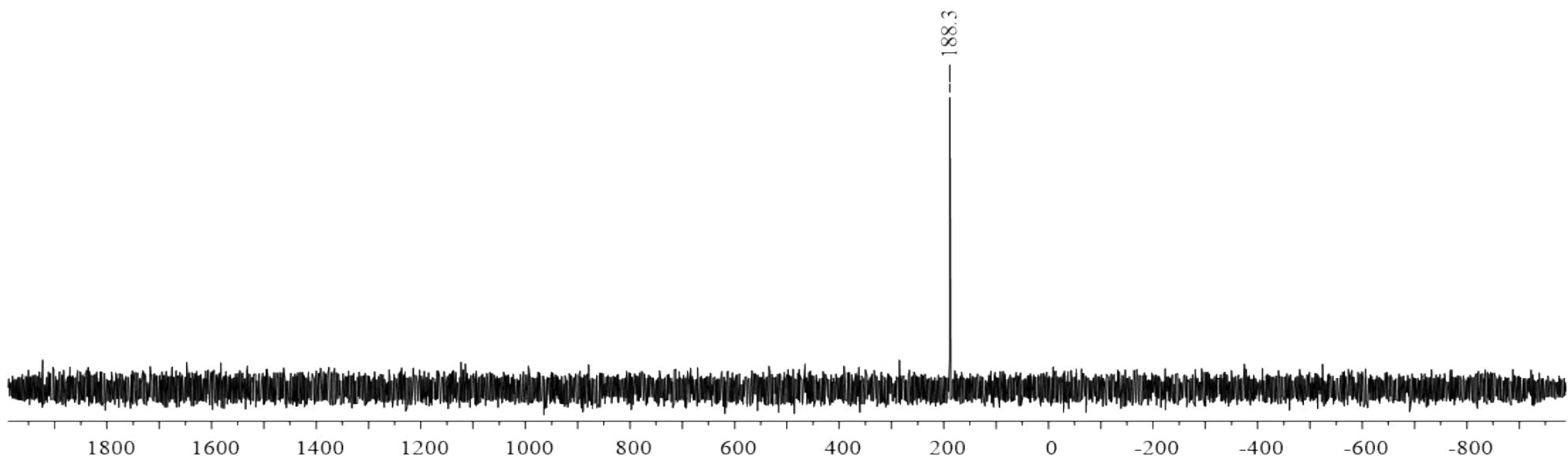
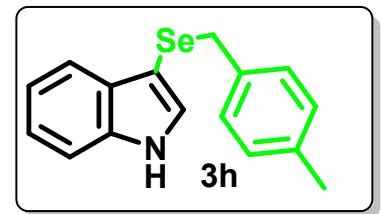
¹H NMR - 3-((4-methylbenzyl)selanyl)-1H-indole (3h)



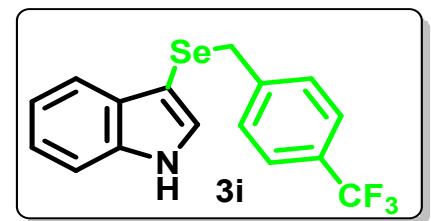
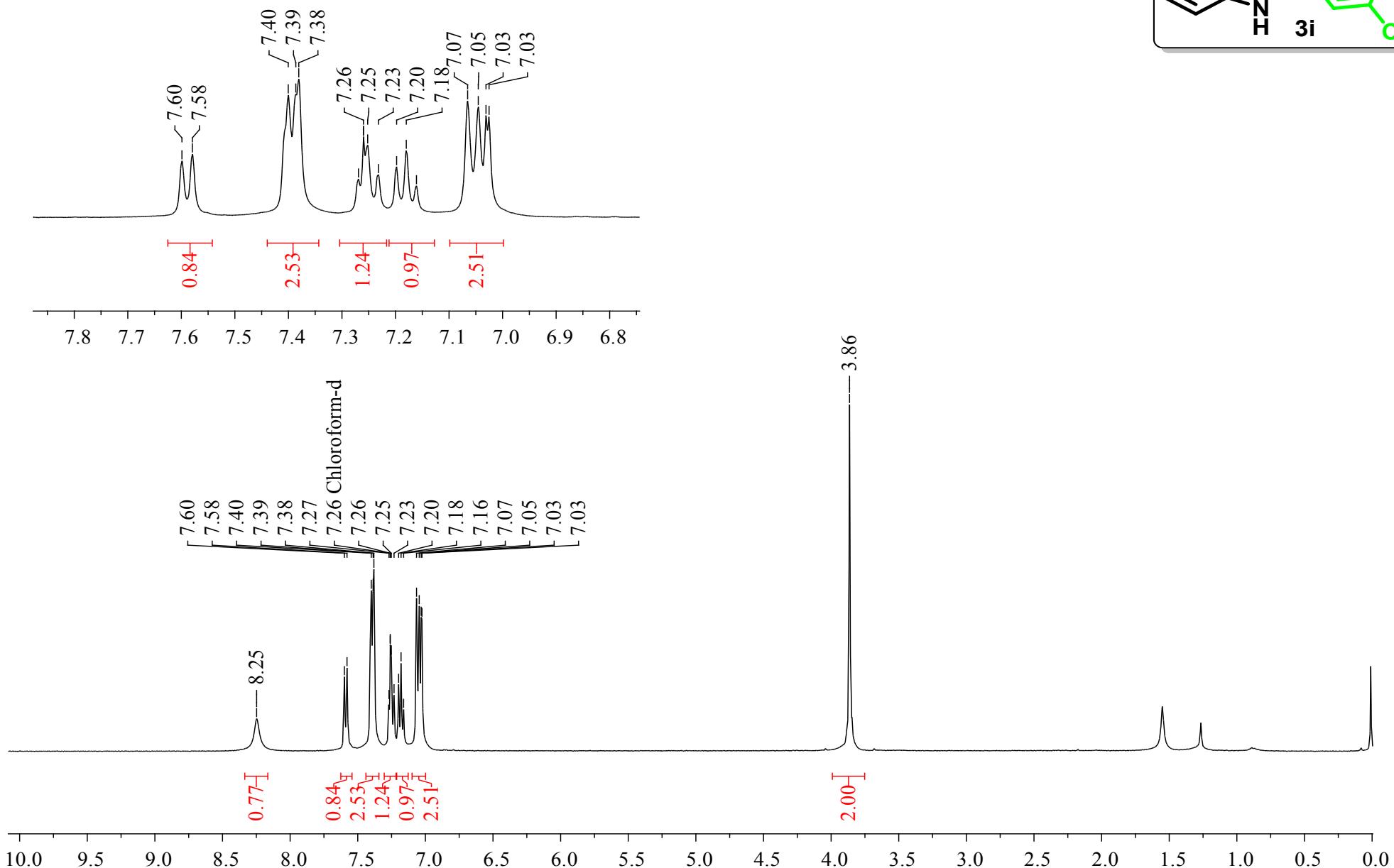
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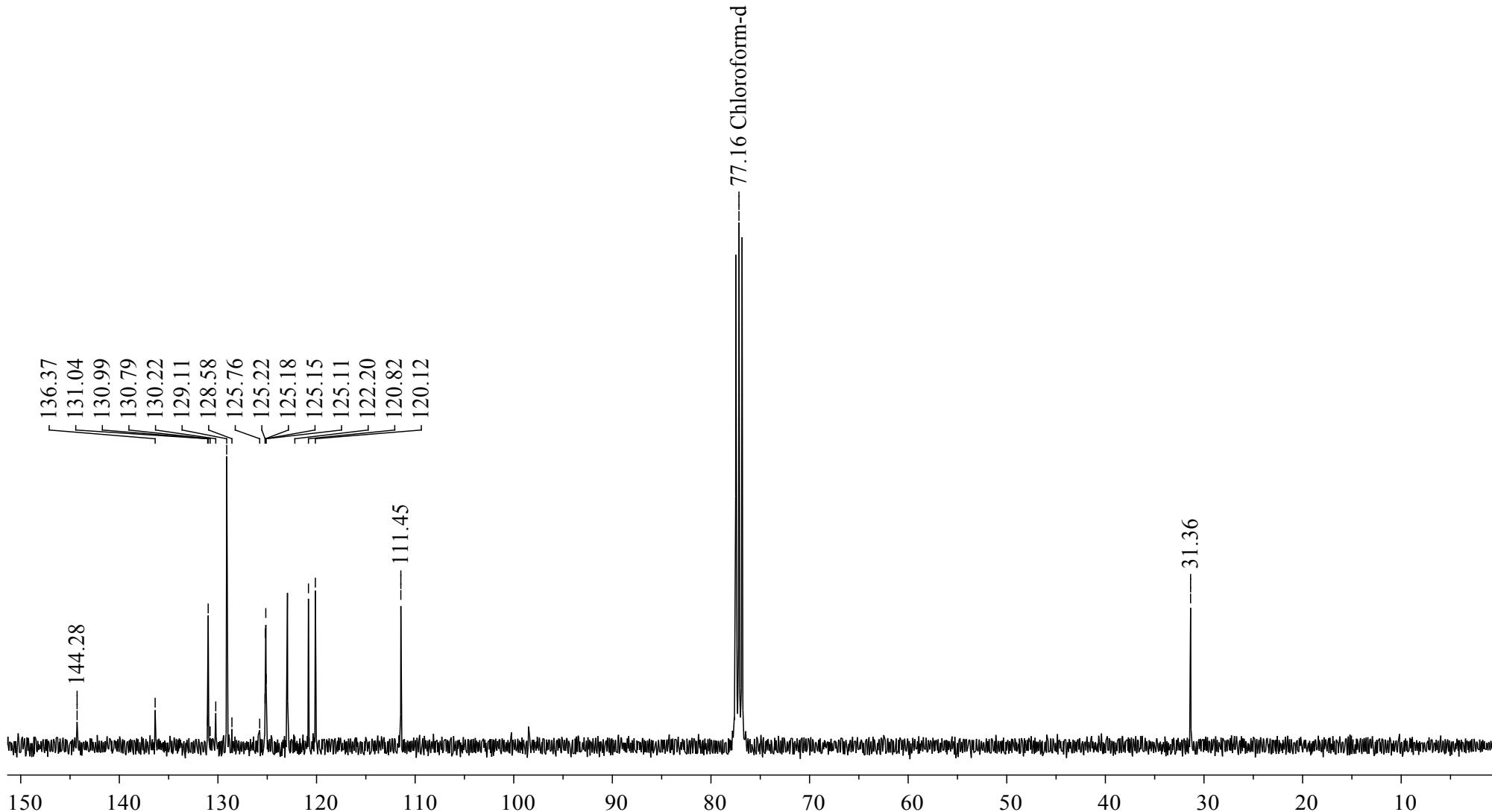
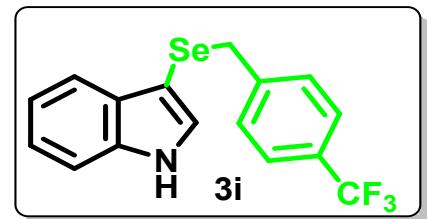
⁷⁷Se NMR - 3-((4-methylbenzyl)selanyl)-1H-indole (3h)



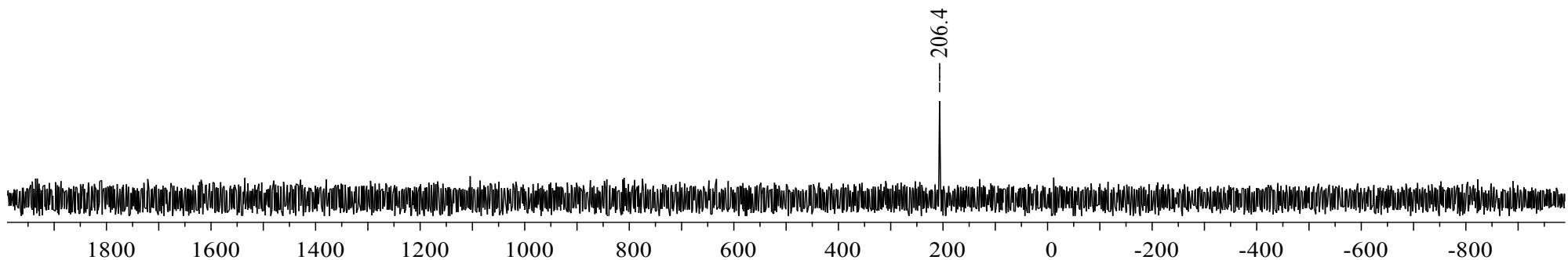
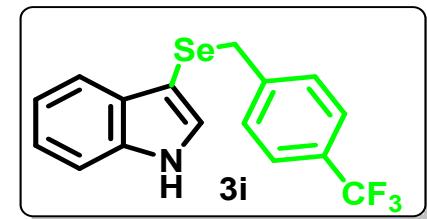
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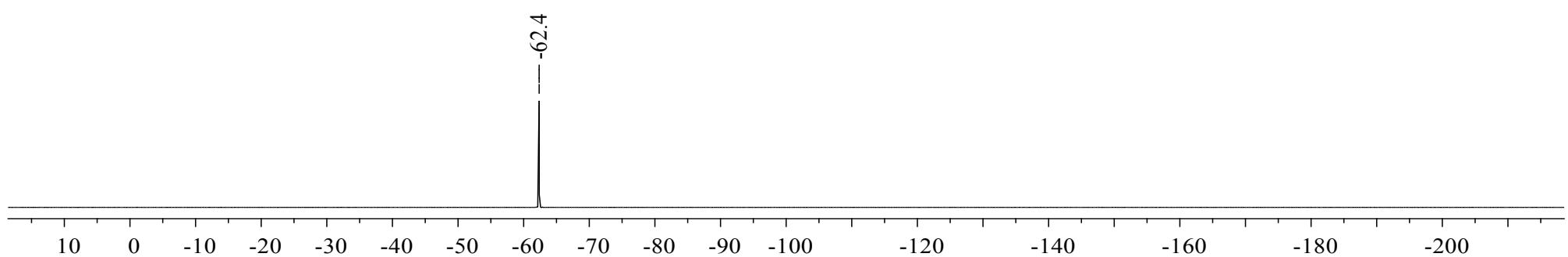
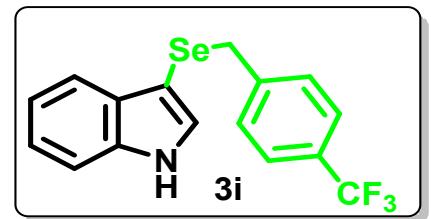
¹³C NMR - 3-((4-(trifluoromethyl)benzyl)selanyl)-1H-indole (3i)



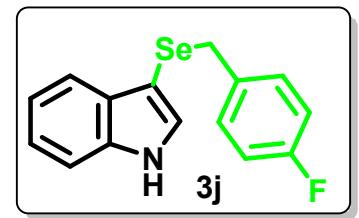
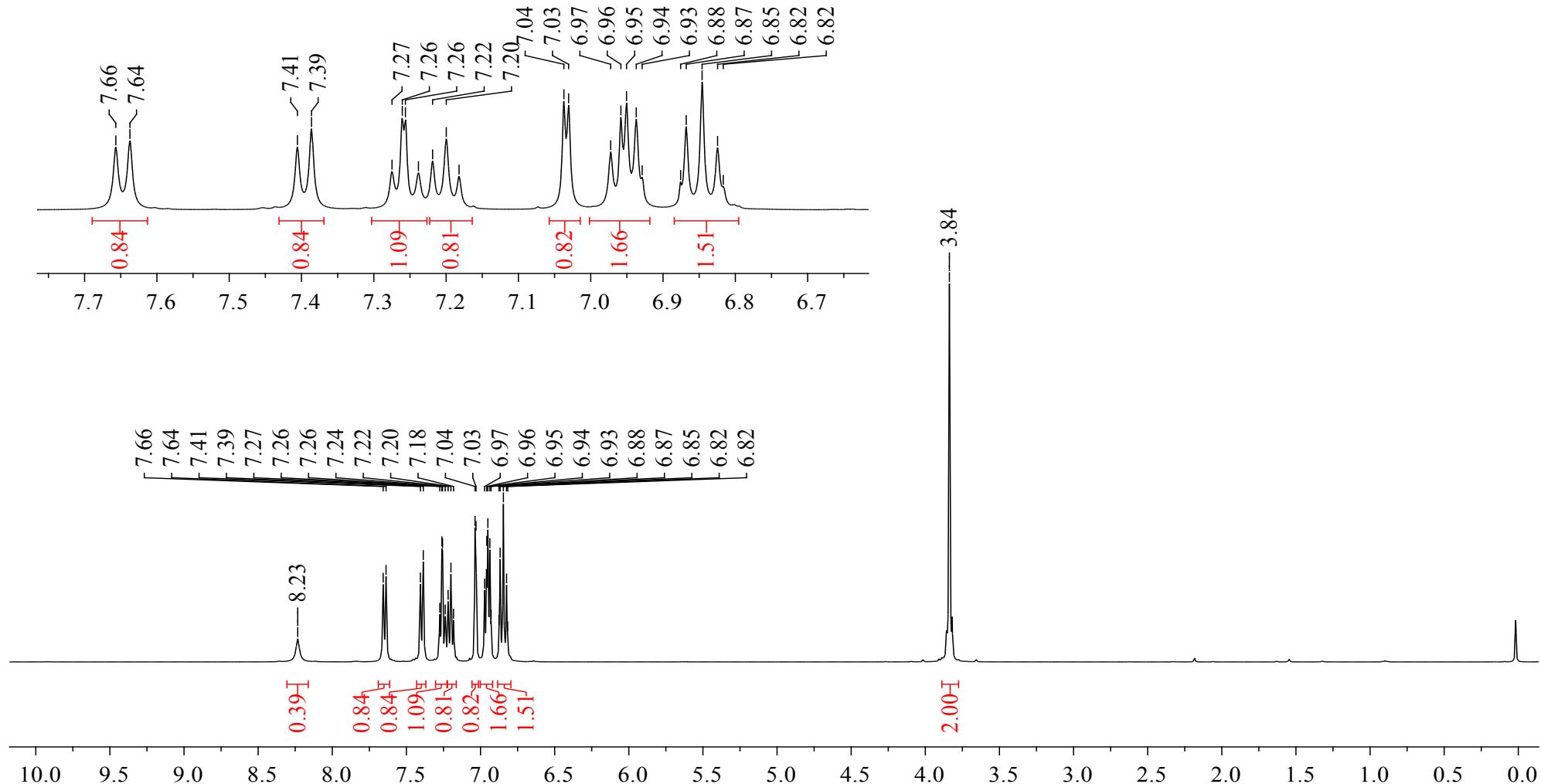
⁷⁷Se NMR - 3-((4-(trifluoromethyl)benzyl)selanyl)-1H-indole (3i)



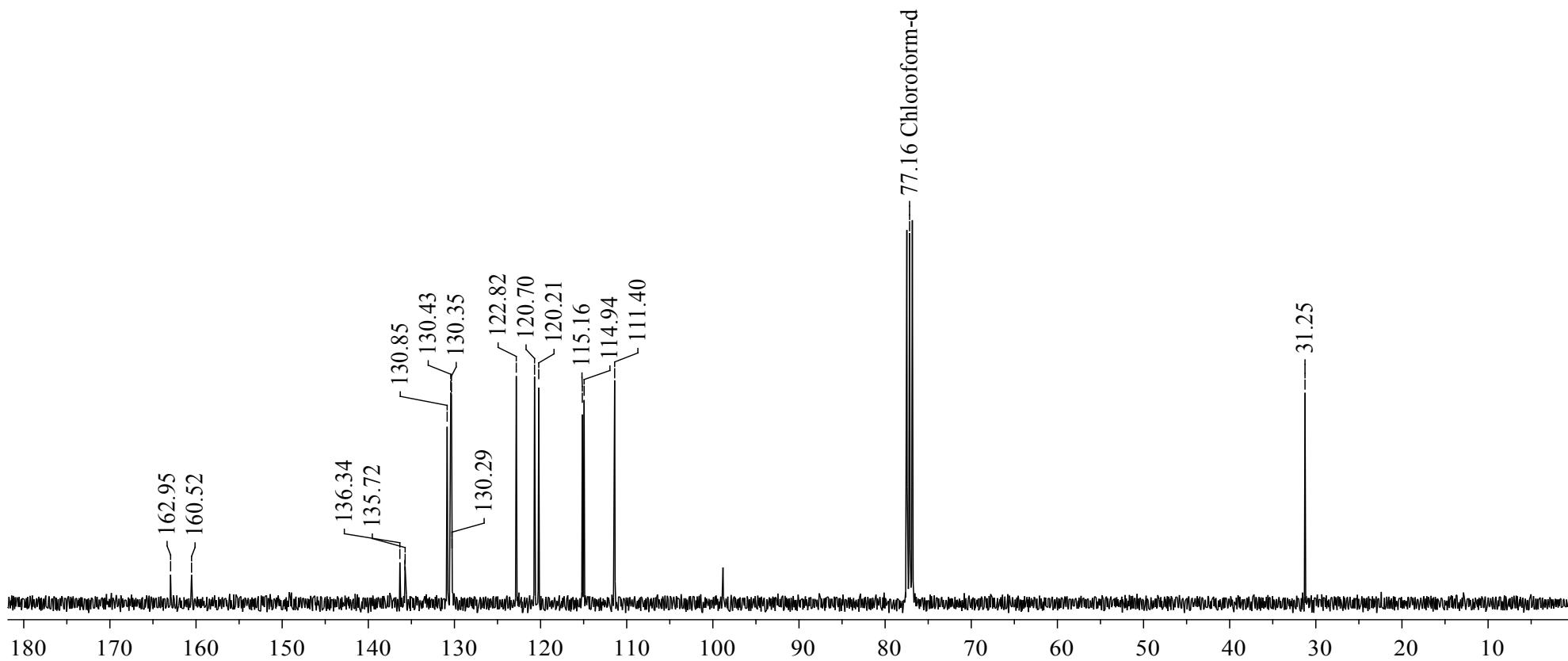
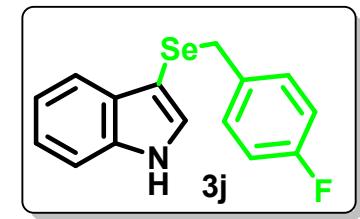
¹⁹F NMR - 3-((4-(trifluoromethyl)benzyl)selanyl)-1H-indole (3i)



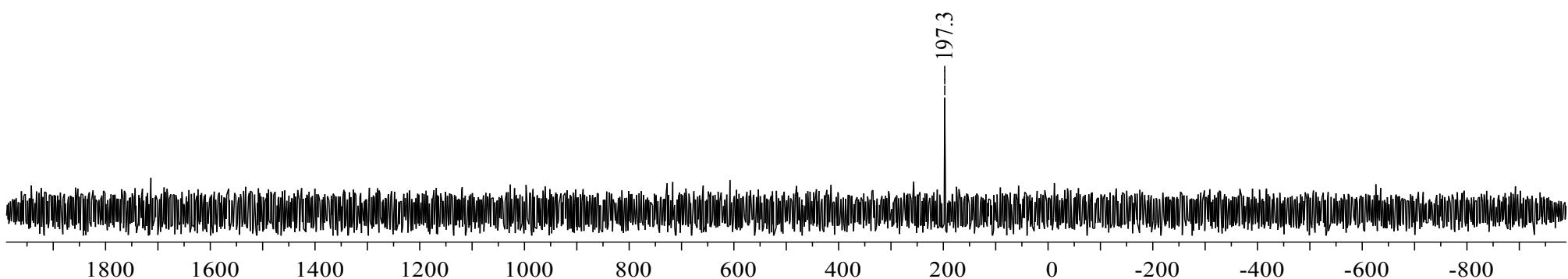
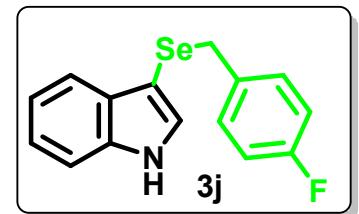
¹H NMR - 3-((4-fluorobenzyl)selanyl)-1H-indole (3j)



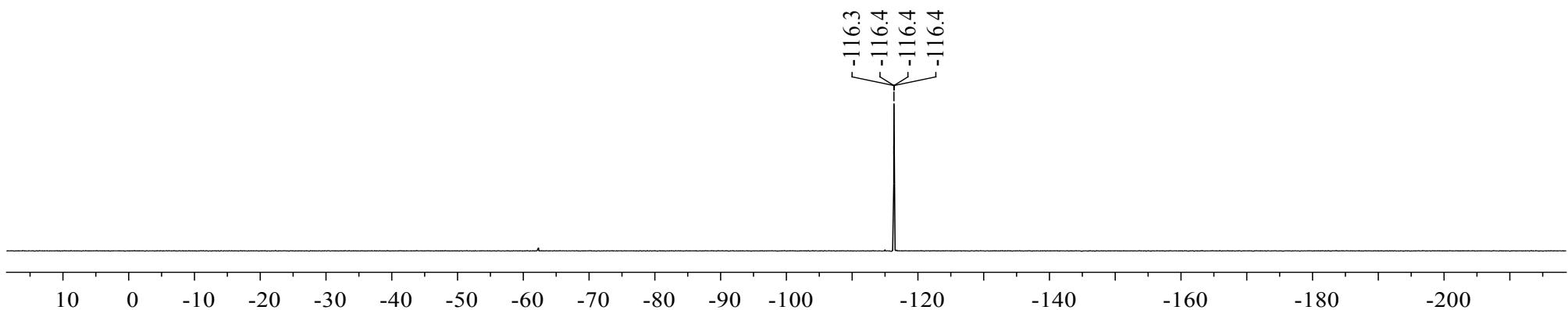
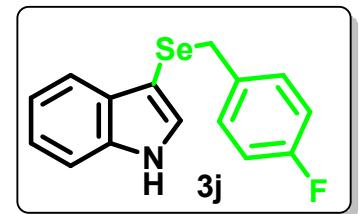
¹³C NMR - 3-((4-fluorobenzyl)selanyl)-1H-indole (3j)



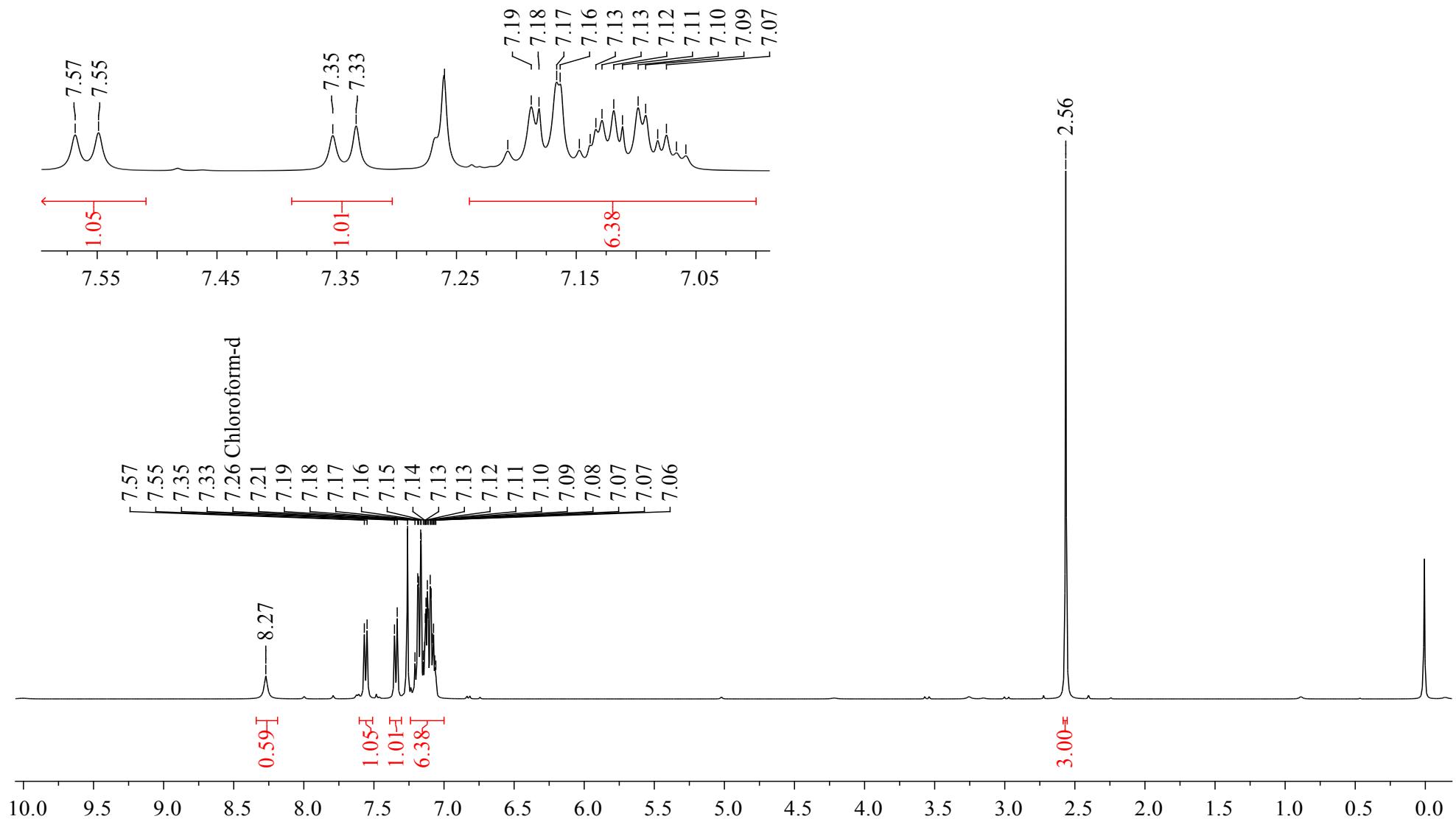
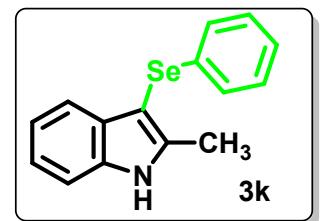
⁷⁷Se NMR - 3-((4-fluorobenzyl)selanyl)-1H-indole (3j)



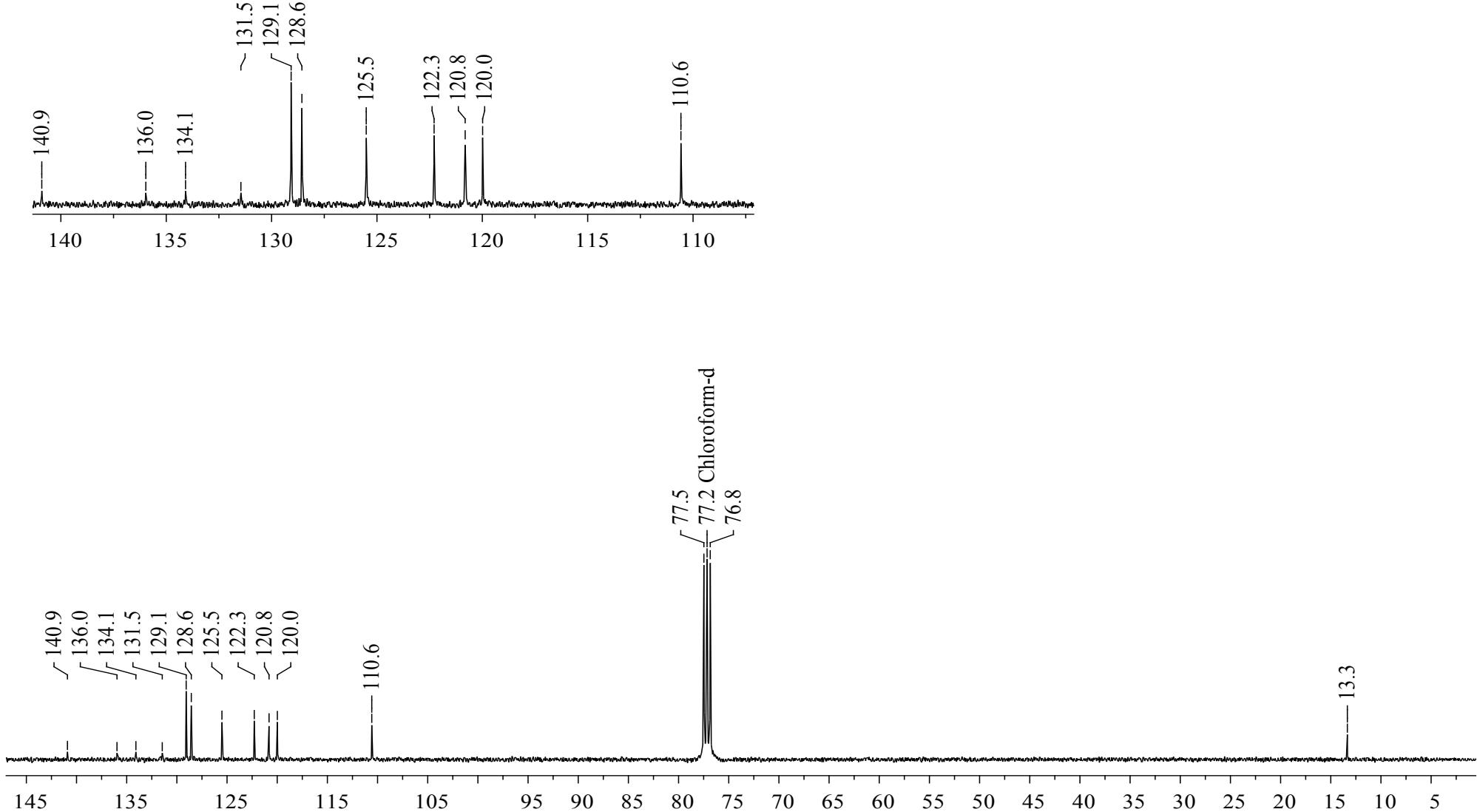
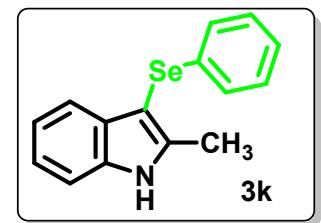
¹⁹F NMR - 3-((4-fluorobenzyl)selanyl)-1H-indole (3j)



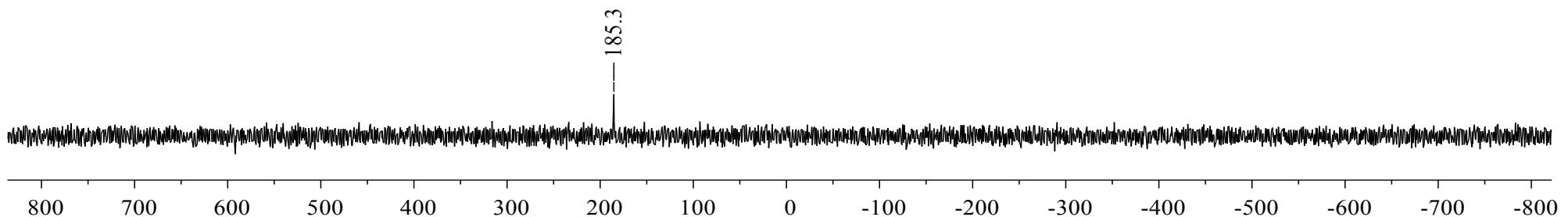
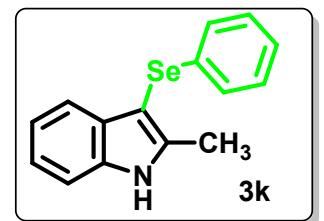
¹H NMR - 2-methyl-3-(phenylselanyl)-1H-indole (3k).



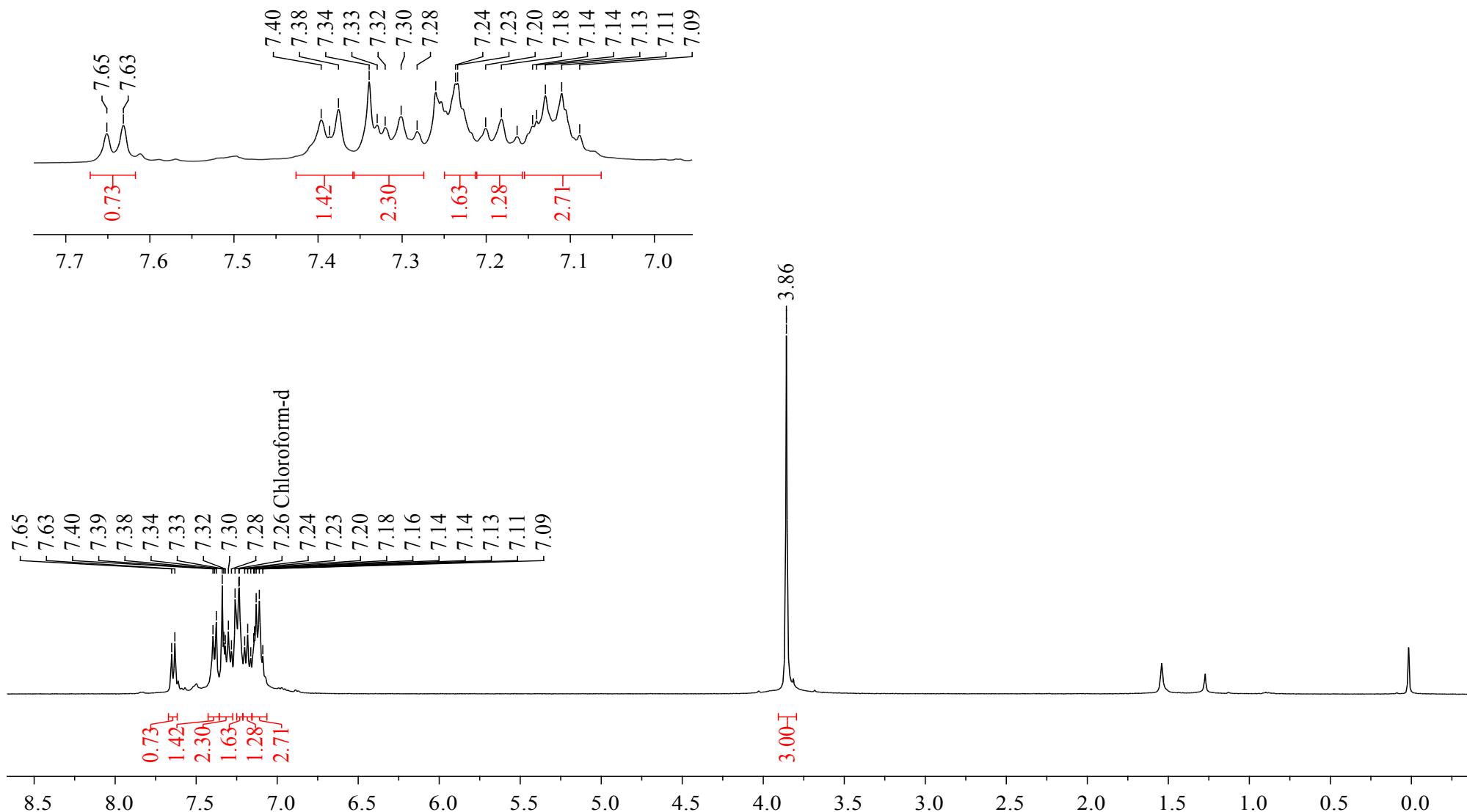
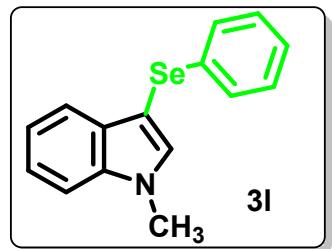
¹³C NMR - 2-methyl-3-(phenylselanyl)-1H-indole (3k).



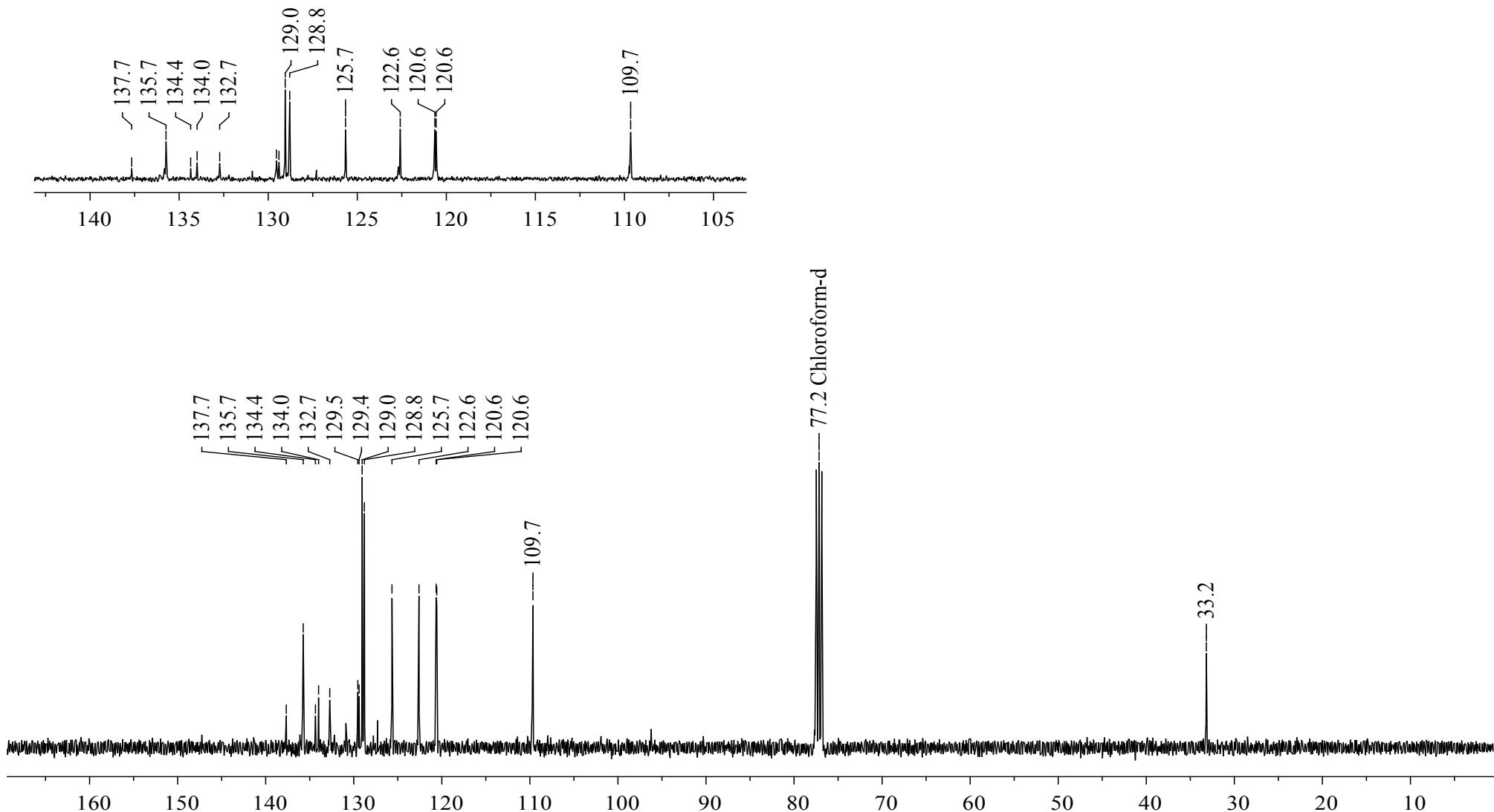
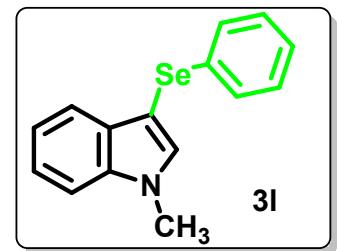
⁷⁷Se NMR - 2-methyl-3-(phenylselanyl)-1H-indole (3k).



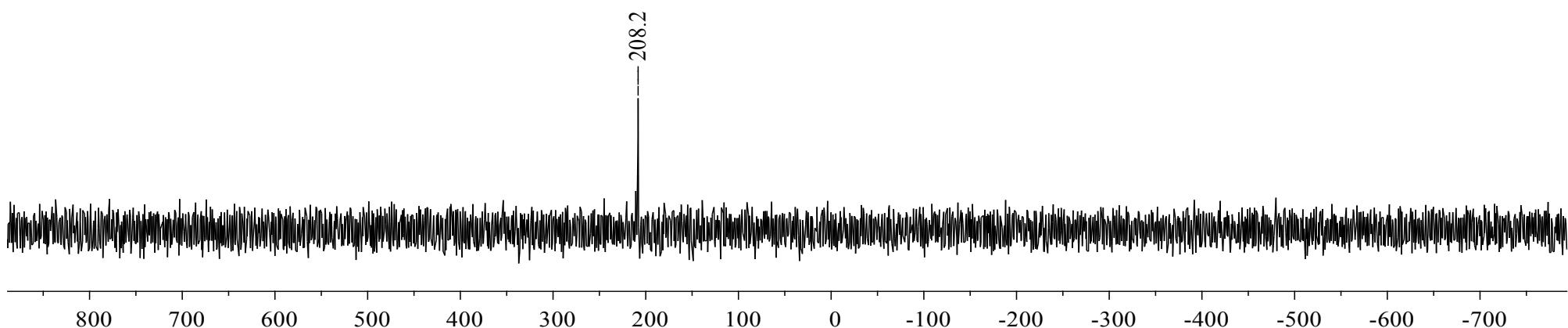
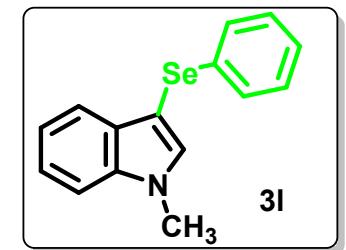
¹H NMR - 1-methyl-3-(phenylselanyl)-1H-indole (3l).



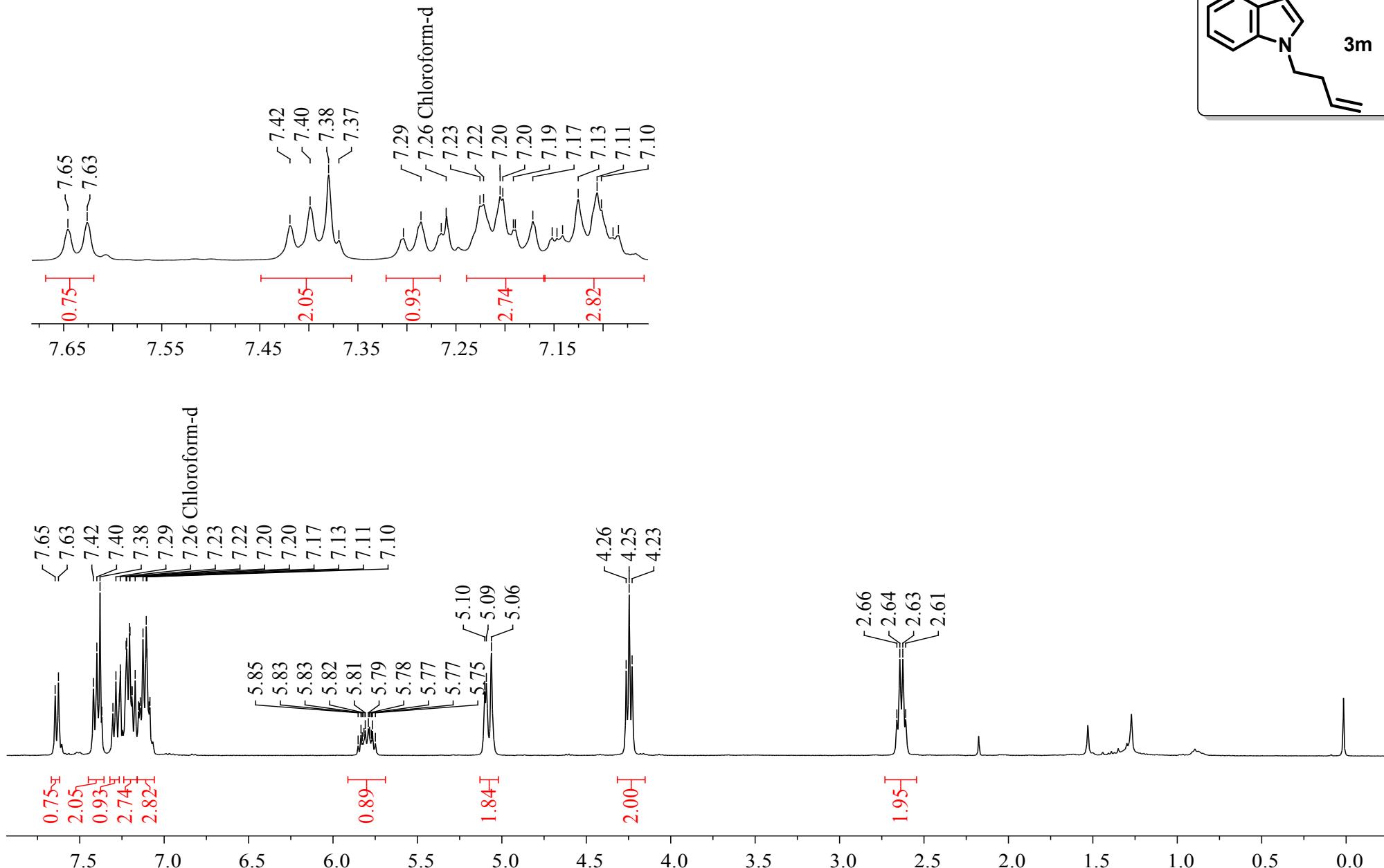
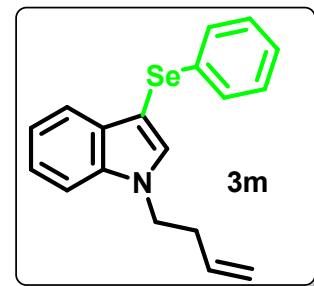
¹³C NMR - 1-methyl-3-(phenylselanyl)-1H-indole (3l).



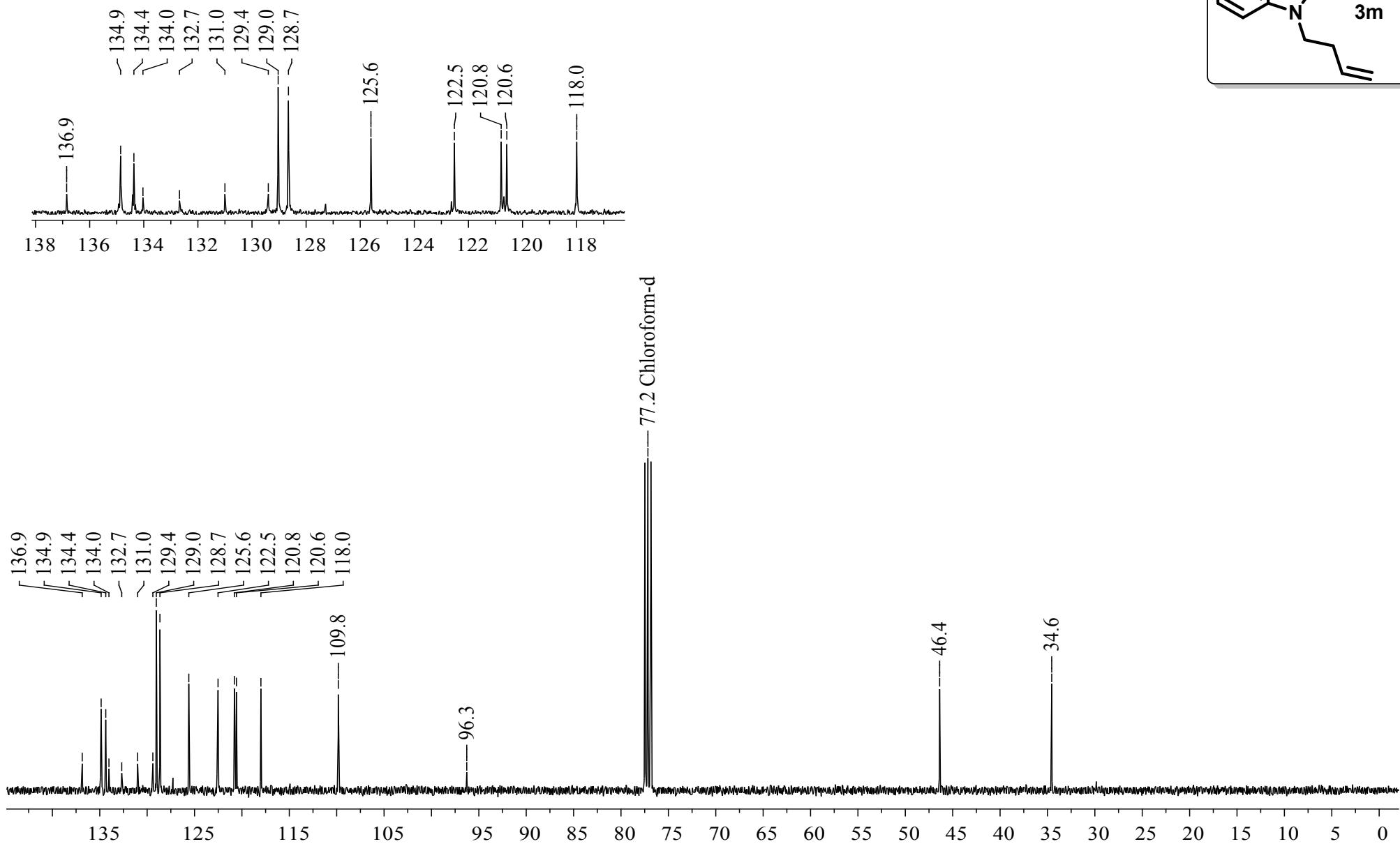
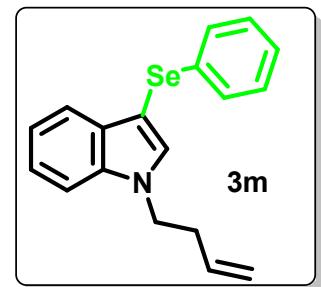
⁷⁷Se NMR - 1-methyl-3-(phenylselanyl)-1H-indole (3l).



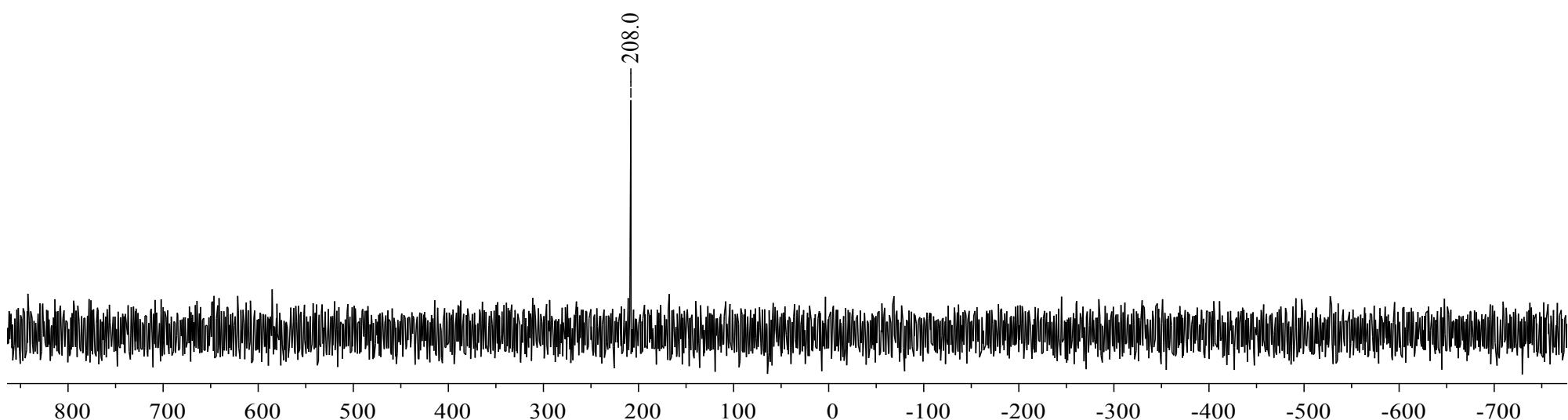
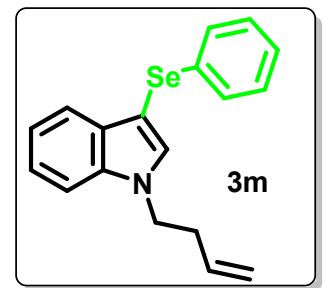
¹H NMR - 1-(but-3-en-1-yl)-3-(phenylselanyl)-1H-indole (3m).



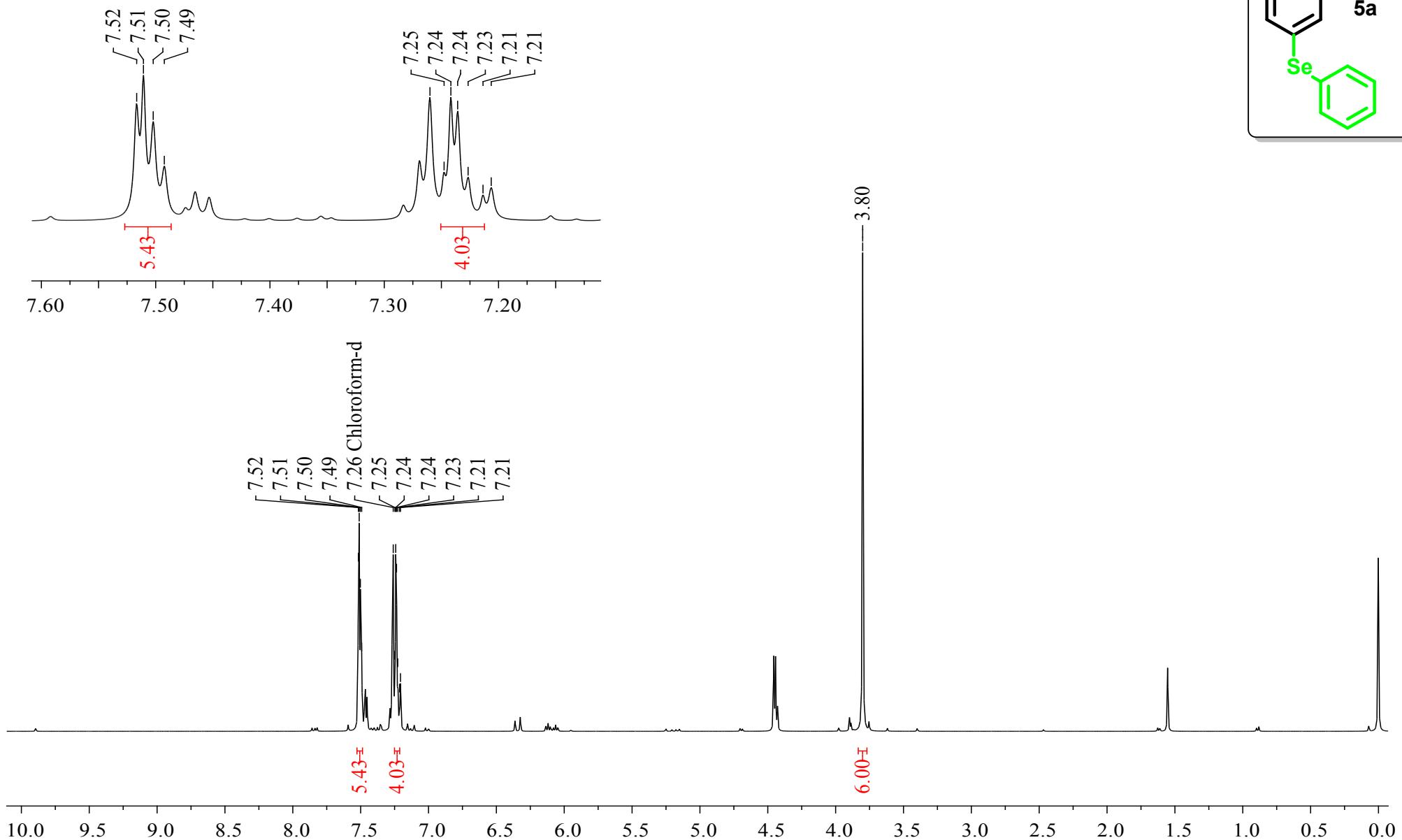
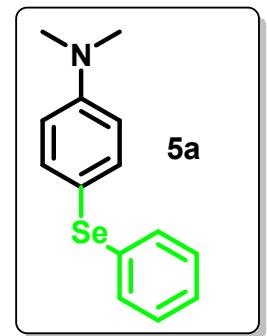
¹³C NMR - 1-(but-3-en-1-yl)-3-(phenylselanyl)-1H-indole (3m).



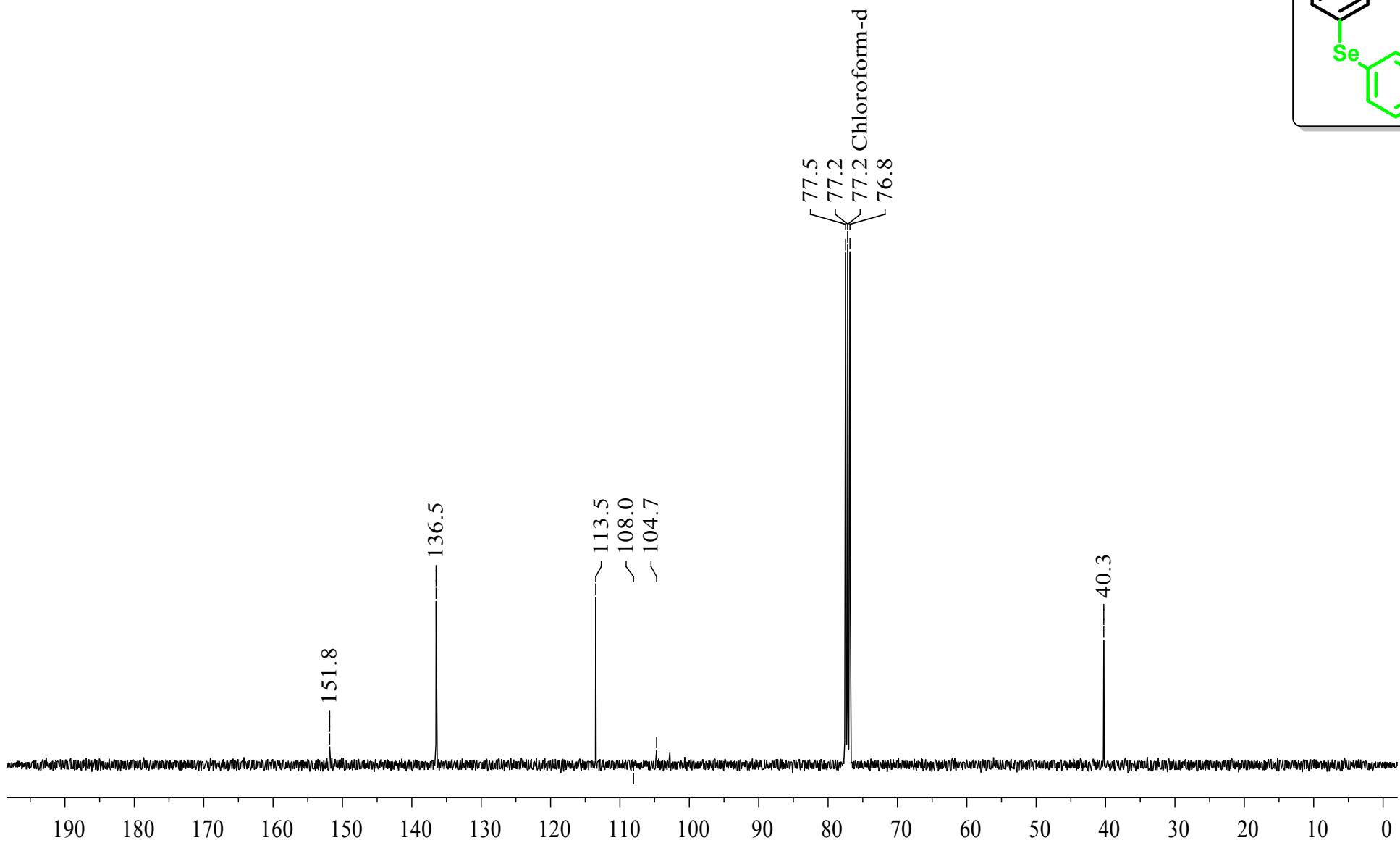
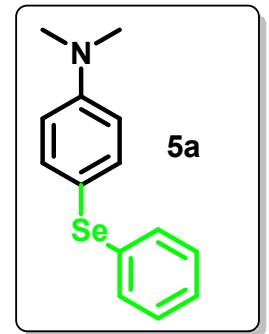
⁷⁷Se NMR - 1-(but-3-en-1-yl)-3-(phenylselanyl)-1H-indole (3m).



¹H NMR - *N,N*-dimethyl-4-(phenylselanyl)aniline (5a)

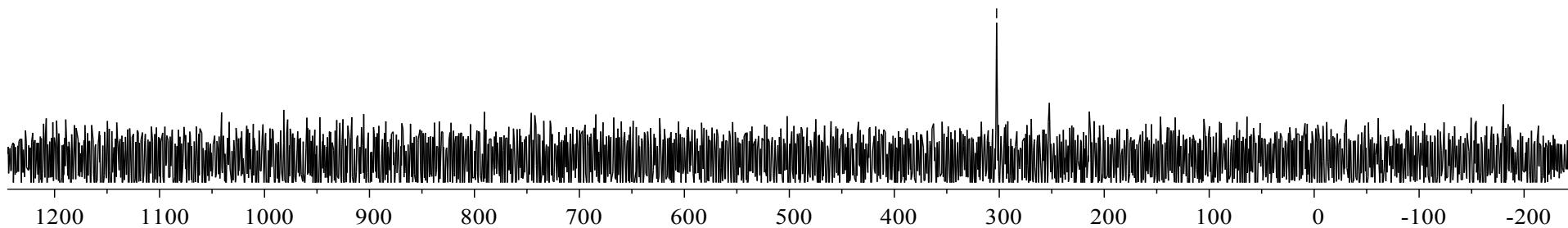
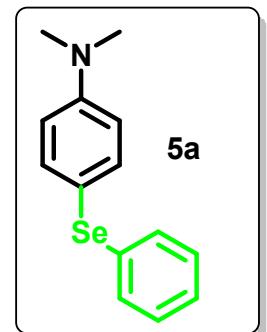


¹³C NMR - *N,N*-dimethyl-4-(phenylselanyl)aniline (5a)

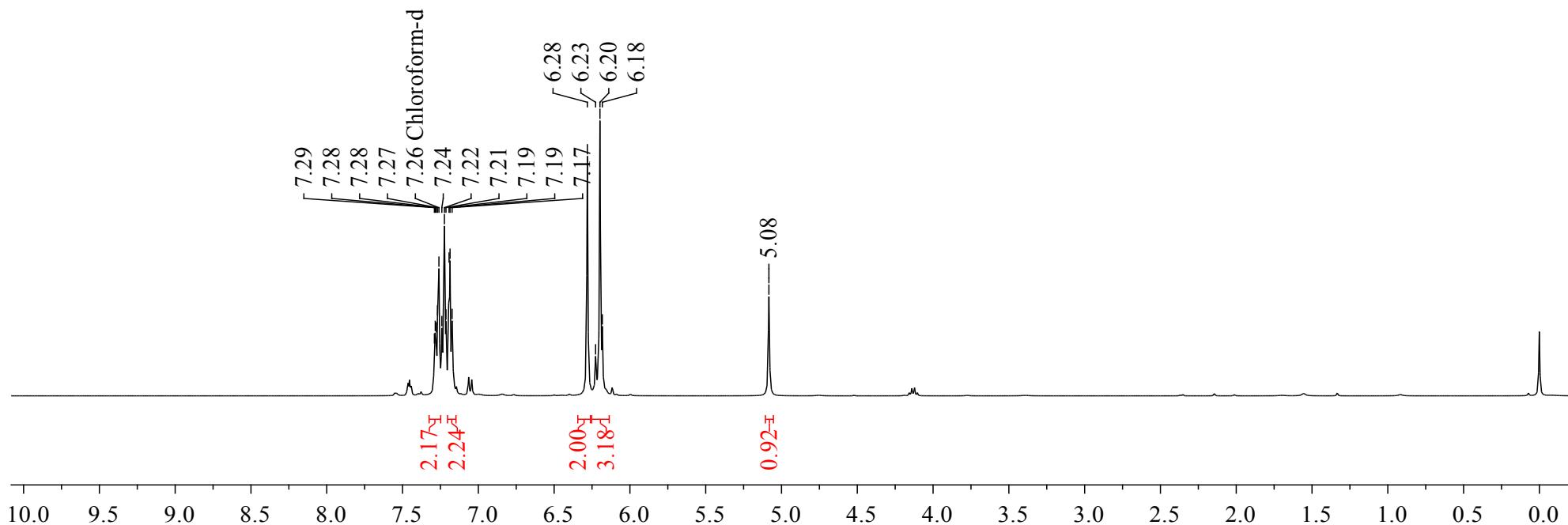
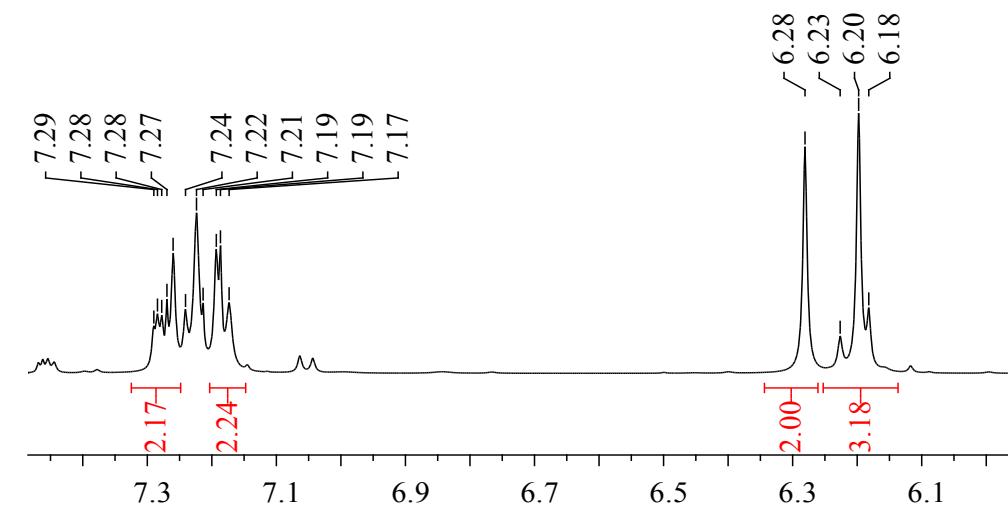
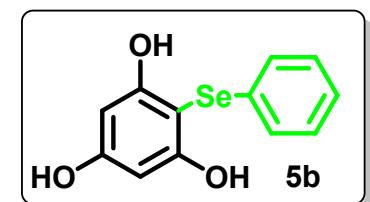


⁷⁷Se NMR - *N,N*-dimethyl-4-(phenylselanyl)aniline (5a)

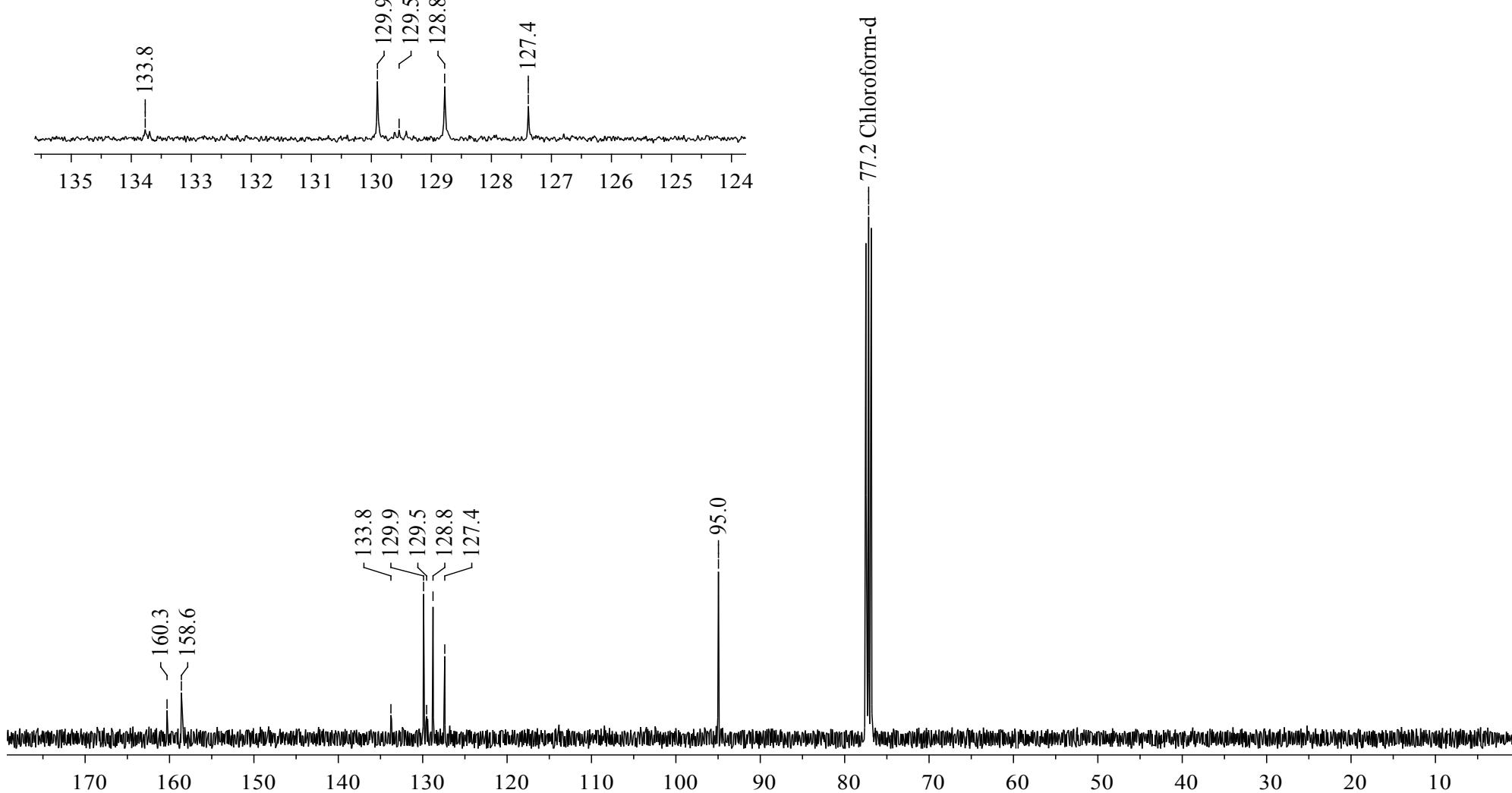
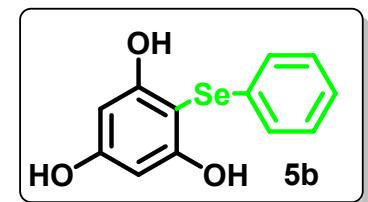
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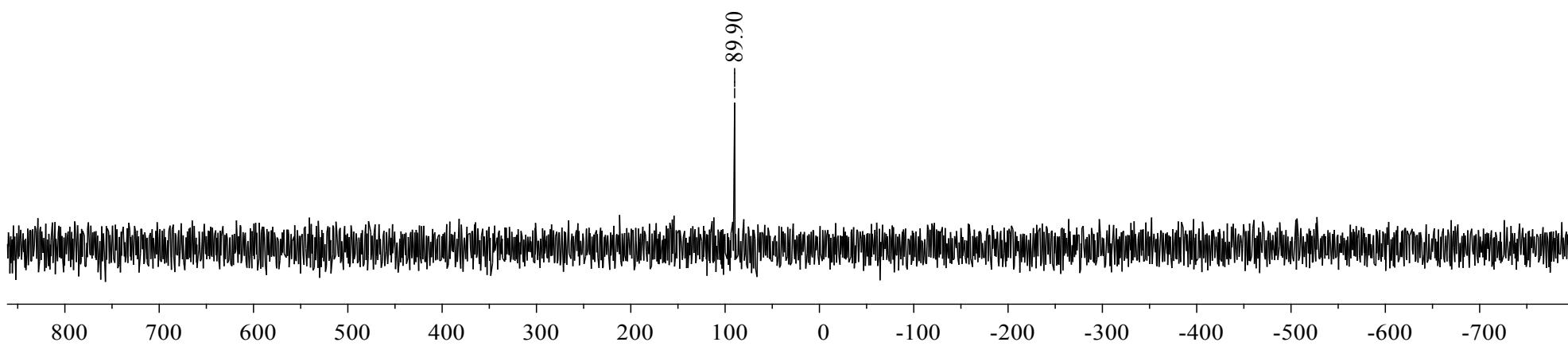
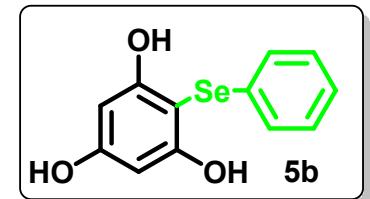
¹H NMR - 2-(phenylselanyl)benzene-1,3,5-triol (5b).



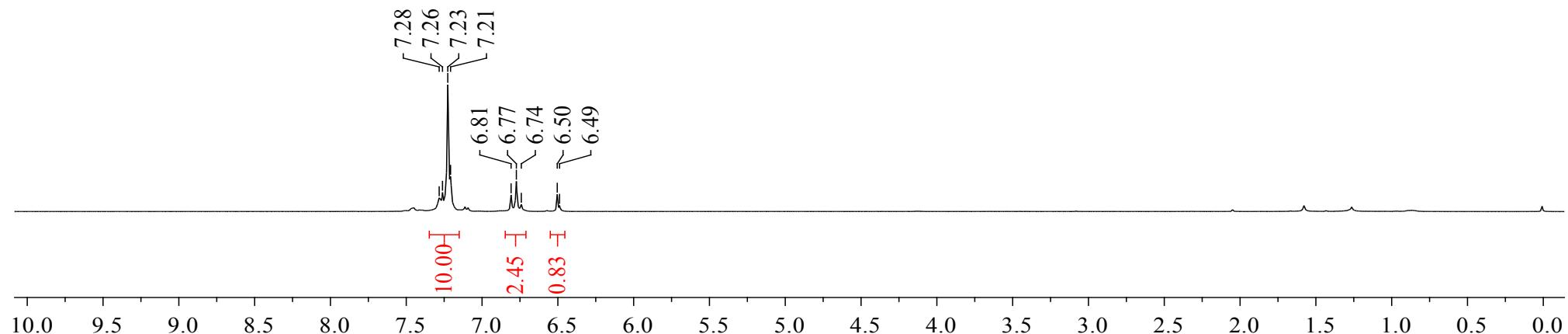
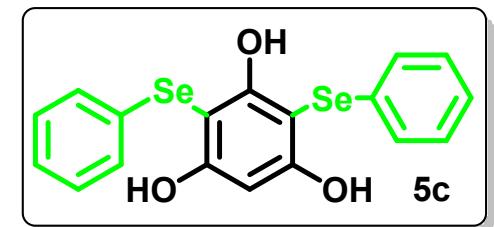
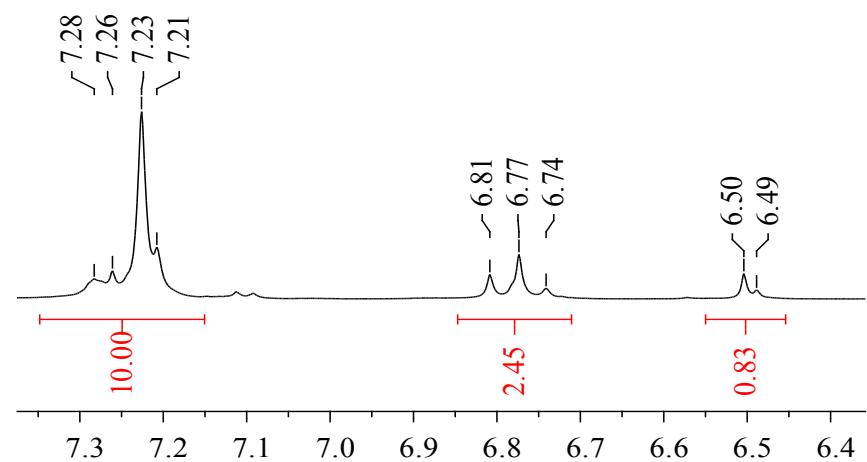
¹³C NMR - 2-(phenylselanyl)benzene-1,3,5-triol (5b).



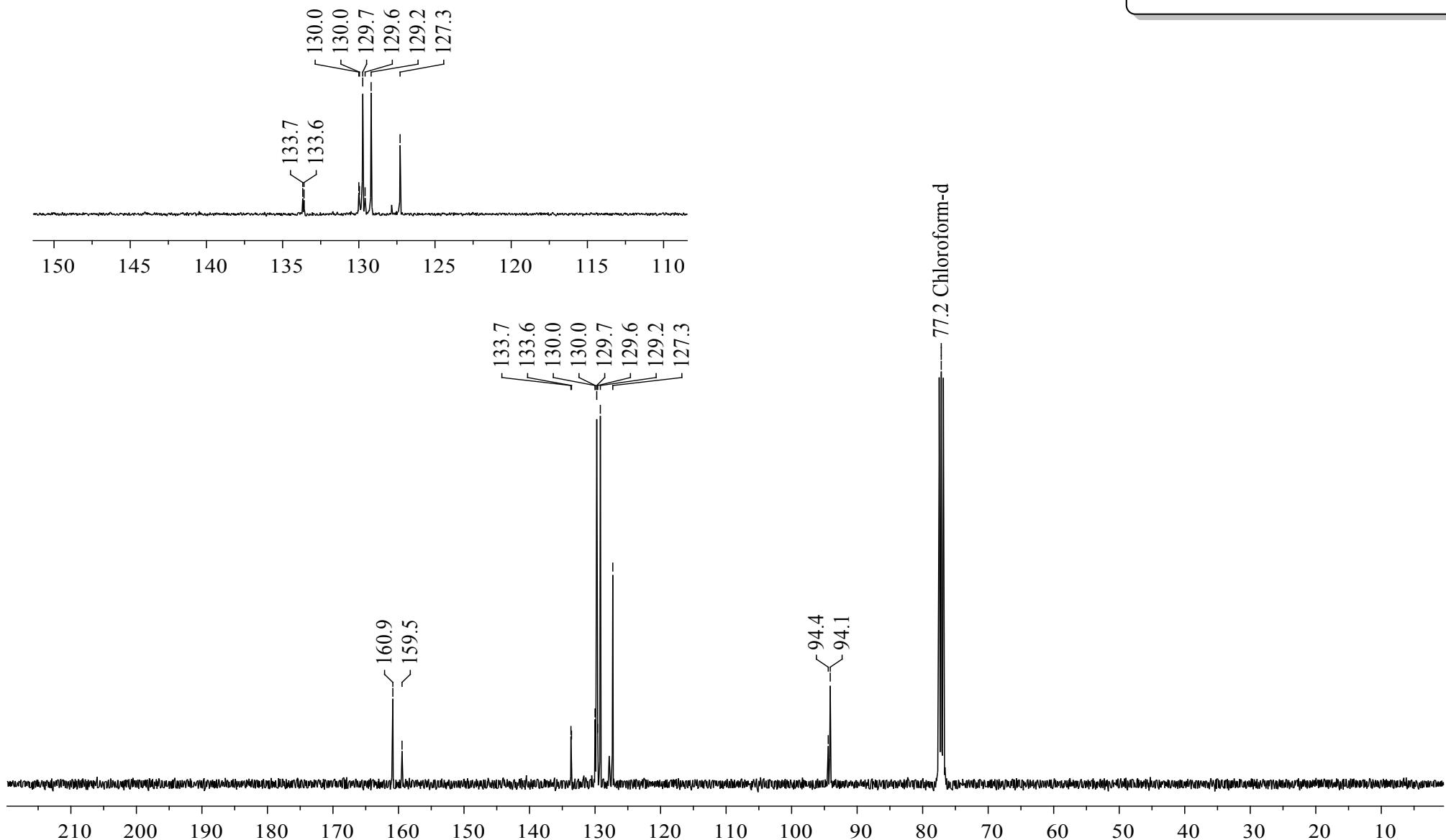
⁷⁷Se NMR - 2-(phenylselanyl)benzene-1,3,5-triol (5b).



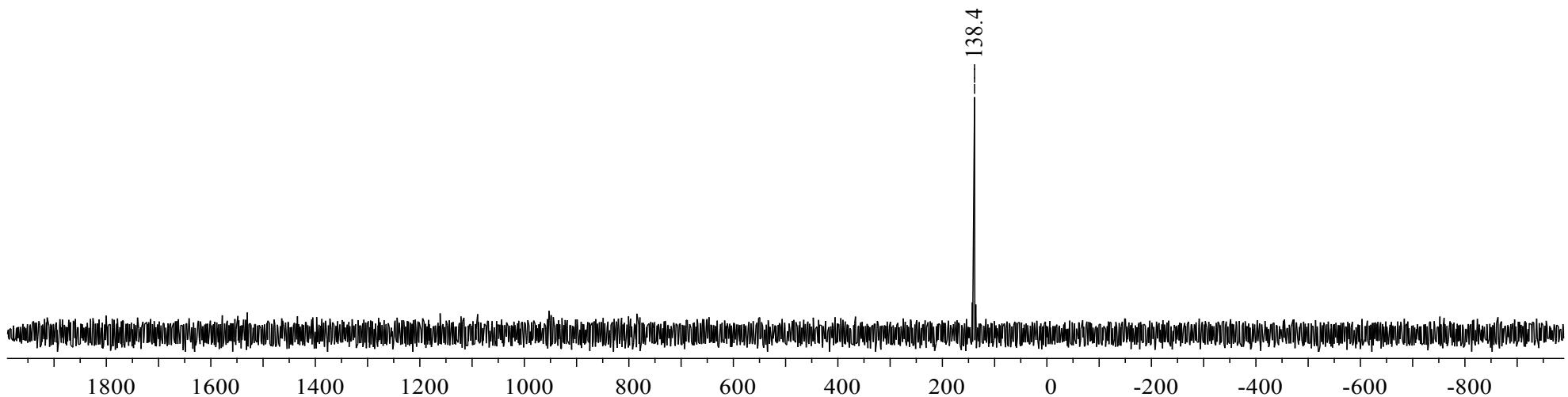
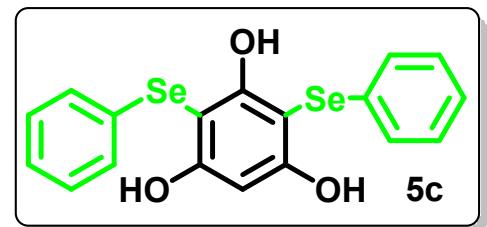
¹H NMR - 2,4-bis(phenylselanyl)benzene-1,3,5-triol (5c).



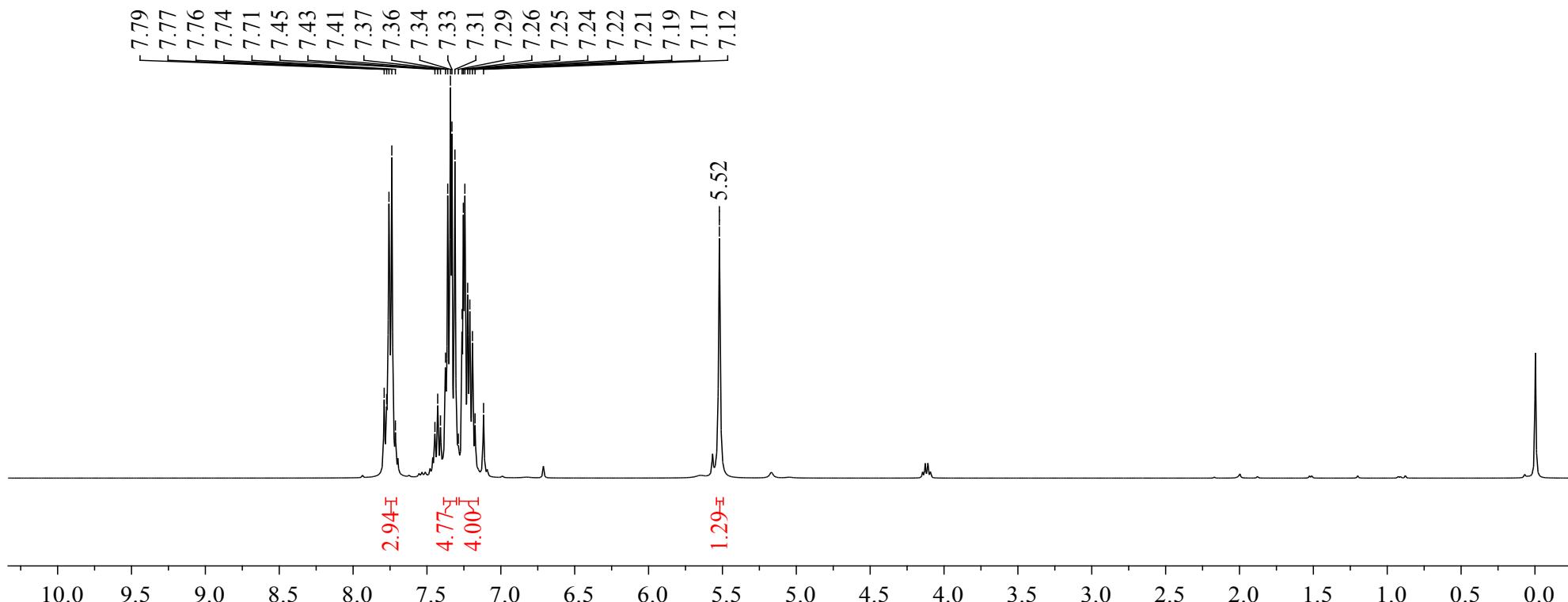
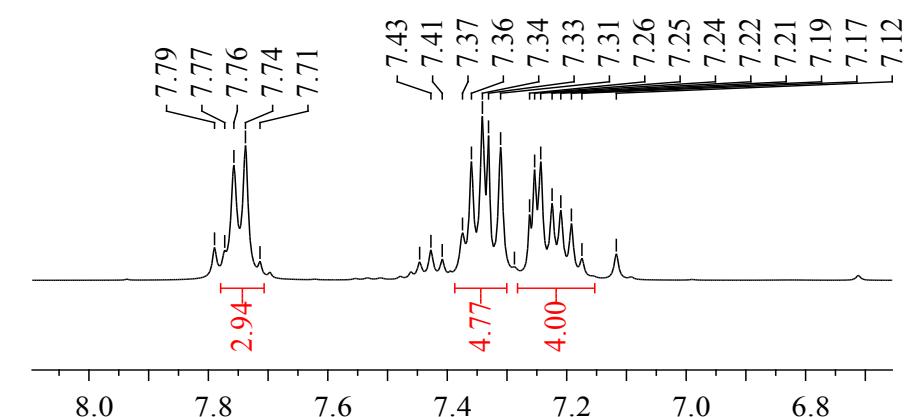
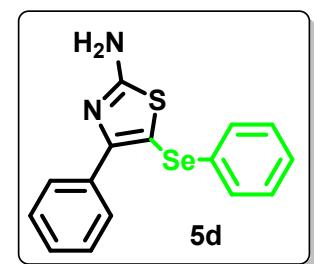
¹³C NMR - 2,4-bis(phenylselanyl)benzene-1,3,5-triol (5c).



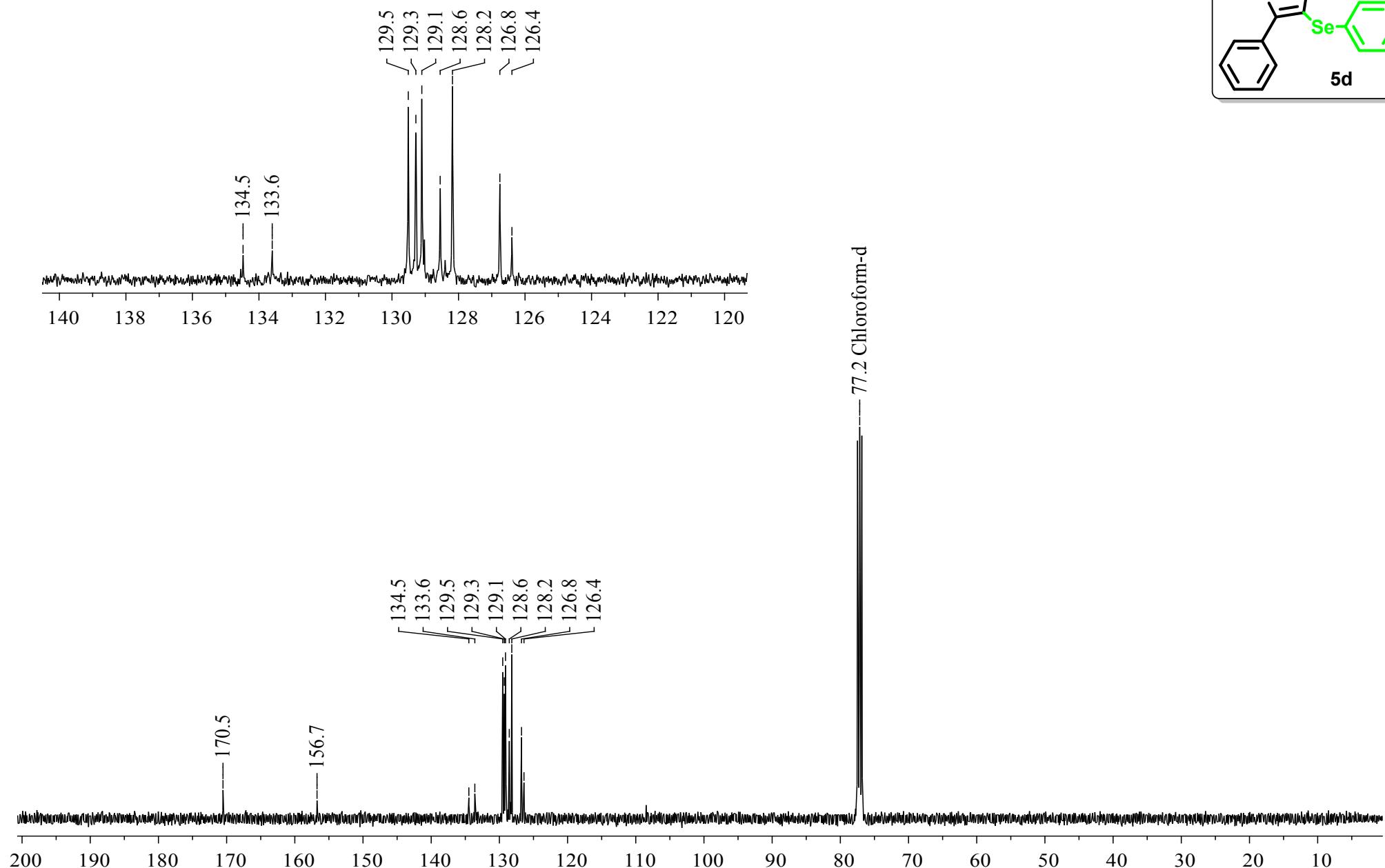
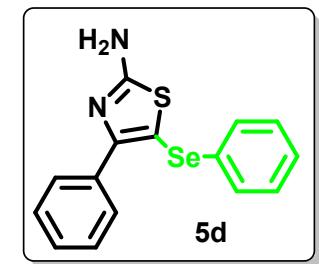
⁷⁷Se NMR - 2,4-bis(phenylselanyl)benzene-1,3,5-triol (5c).



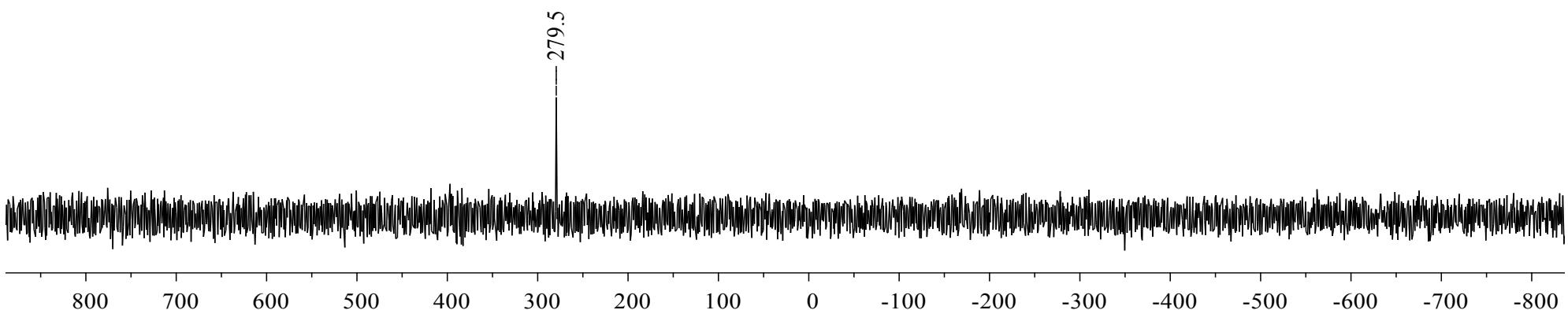
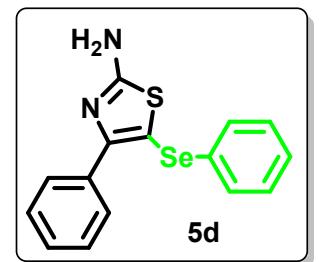
¹H NMR - 4-phenyl-5-(phenylselanyl)thiazol-2-amine (5d).



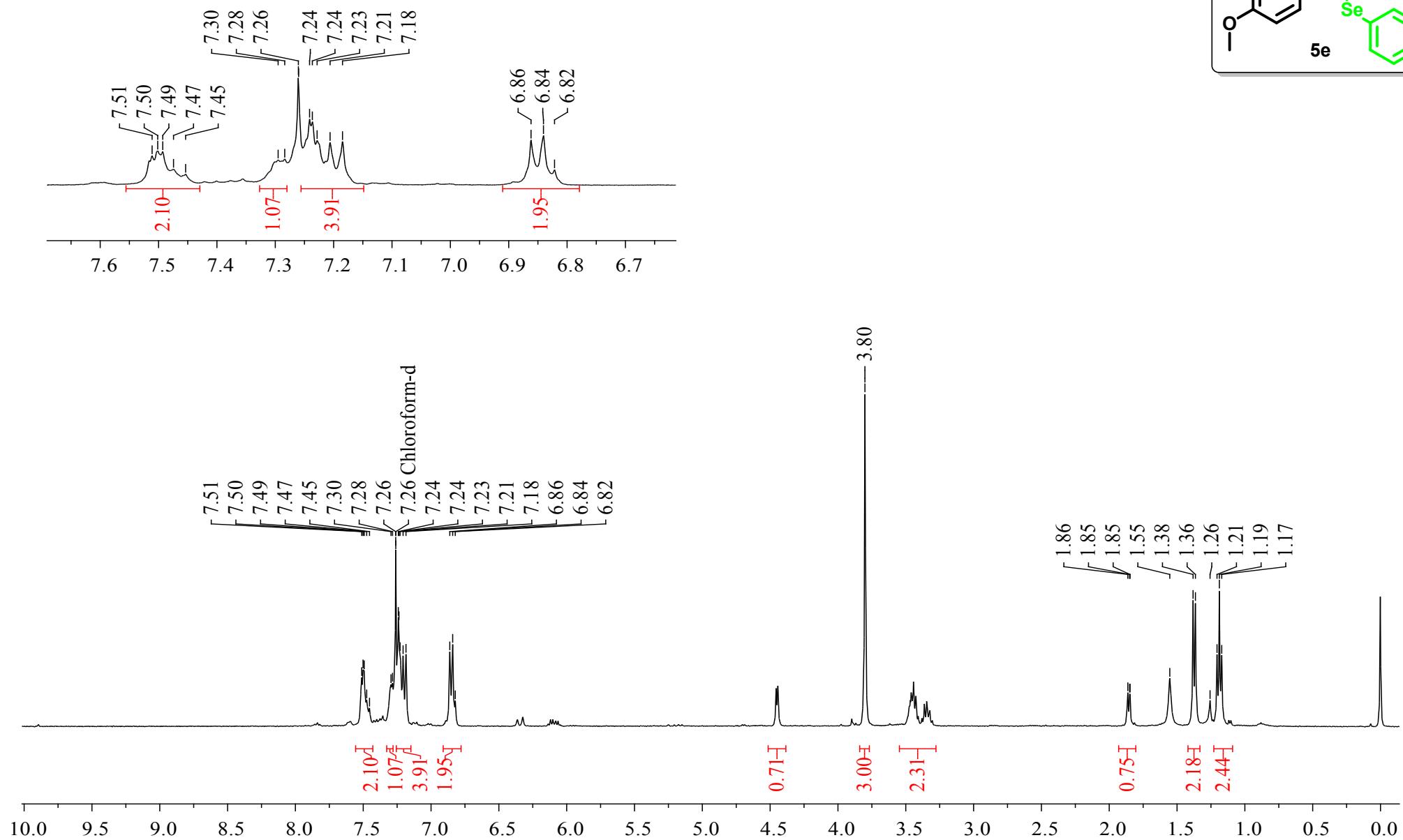
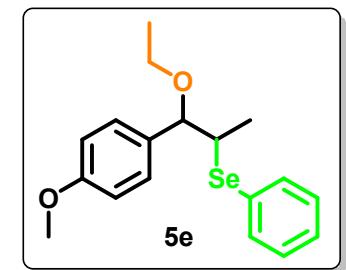
¹³C NMR - 4-phenyl-5-(phenylselanyl)thiazol-2-amine (5d).



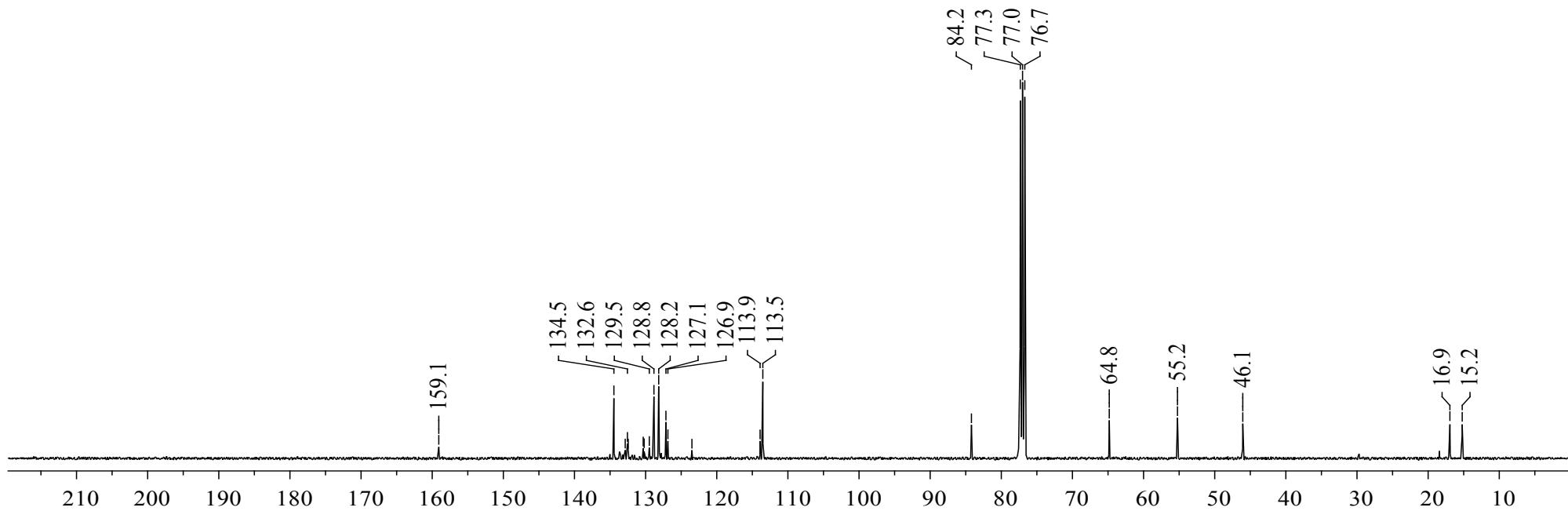
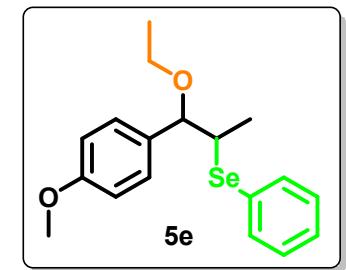
⁷⁷Se NMR - 4-phenyl-5-(phenylselanyl)thiazol-2-amine (5d).



¹H NMR - (1-ethoxy-1-(4-methoxyphenyl)propan-2-yl)(phenyl)selane (5e).



¹³C NMR - (1-ethoxy-1-(4-methoxyphenyl)propan-2-yl)(phenyl)selane (5e).



⁷⁷Se NMR - (1-ethoxy-1-(4-methoxyphenyl)propan-2-yl)(phenyl)selane (5e).

