

Organocatalytic asymmetric Neber reaction for the enantioselective synthesis of spirooxindole 2*H*-azirines

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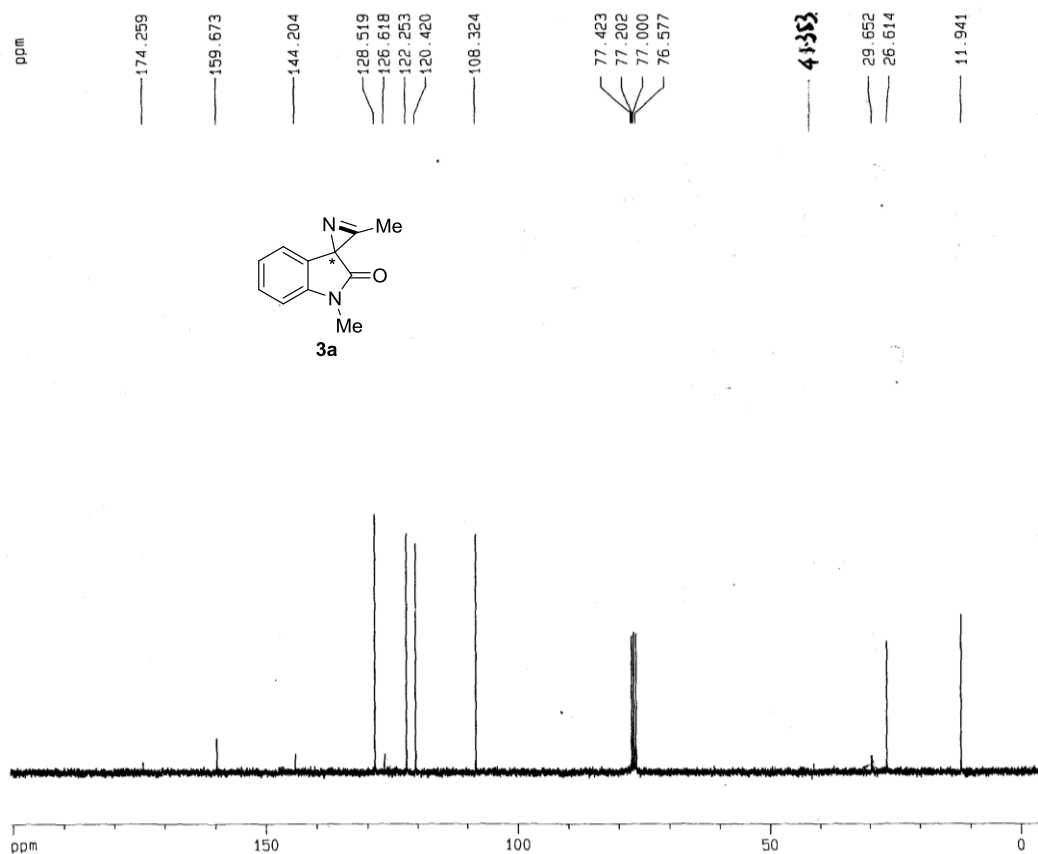
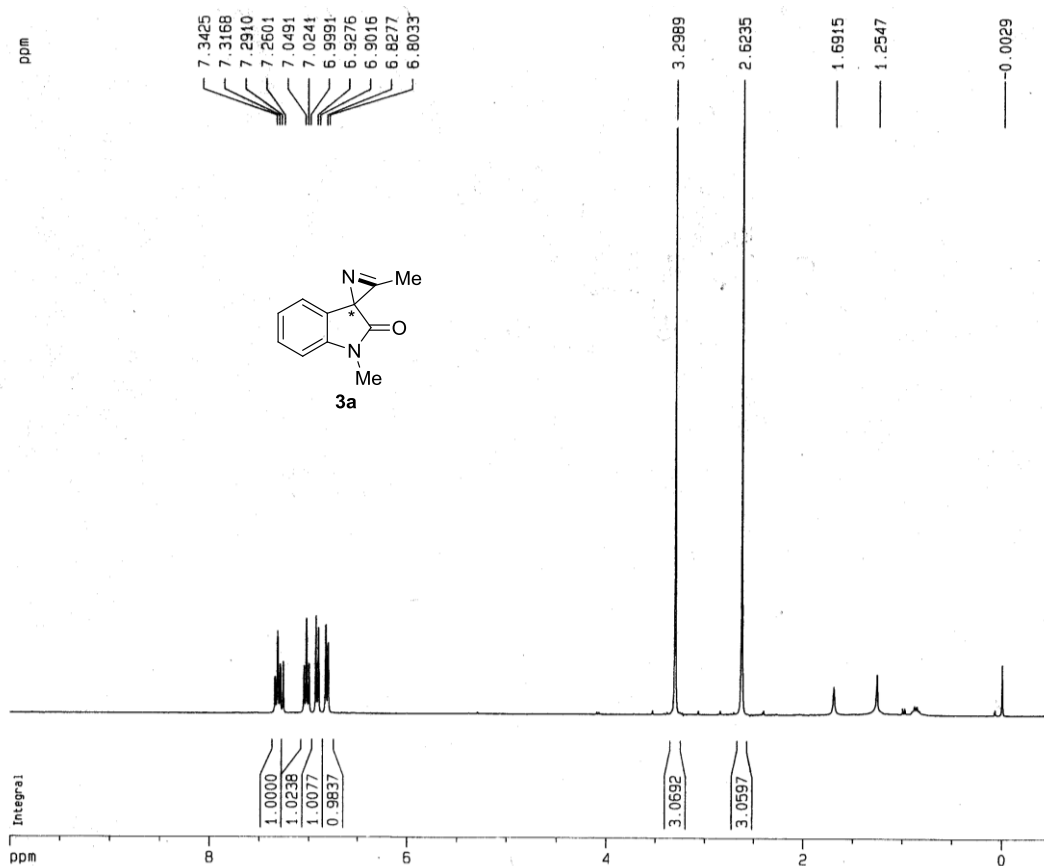
xuxy@cioc.ac.cn; yuanwc@cioc.ac.cn

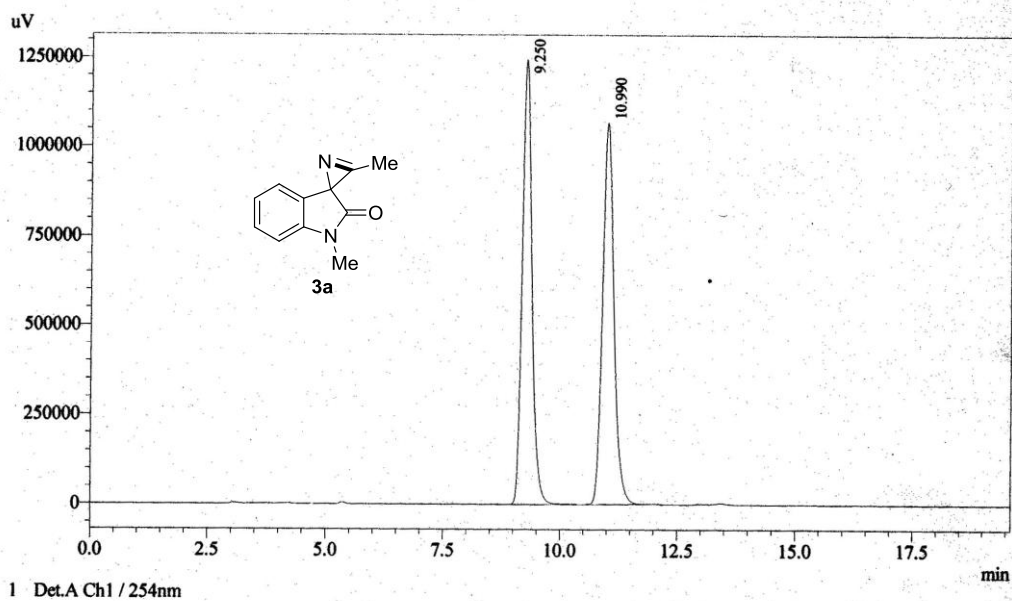
Supporting Information

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¹ H NMR, ¹³ C NMR and HPLC spectra for compounds 3a-r , 4 and 5	S1
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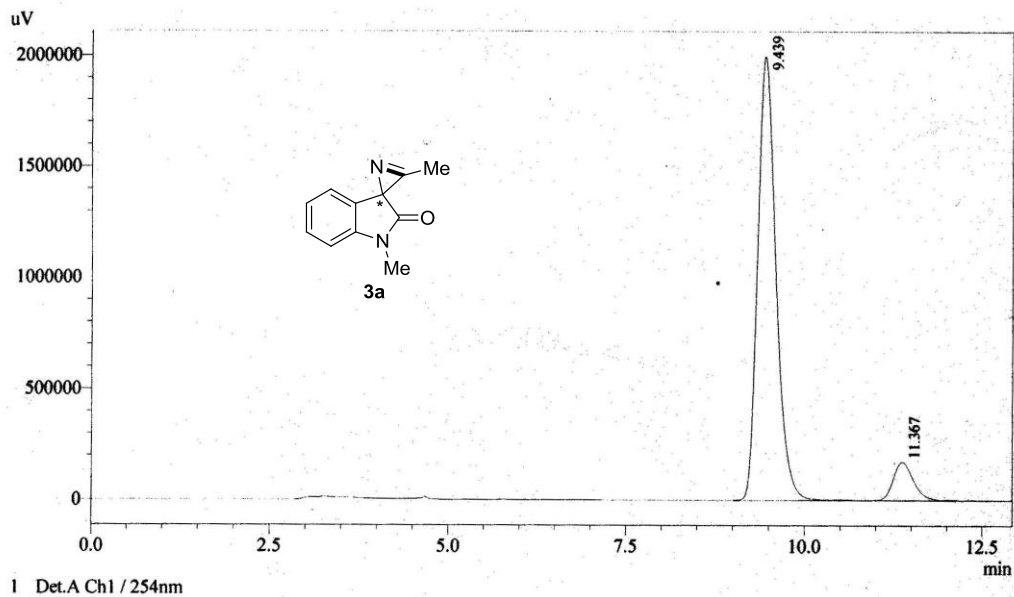
¹H NMR, ¹³C NMR and HPLC of compound **3a**





Detector A Ch1 254nm

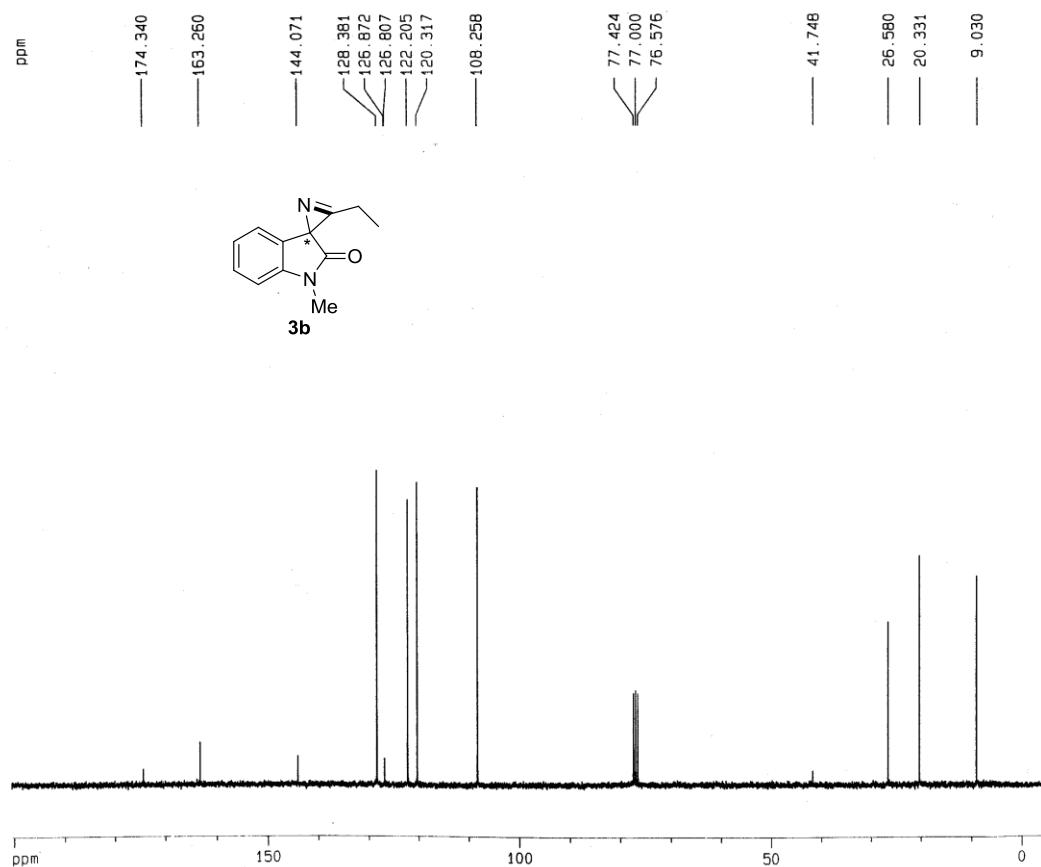
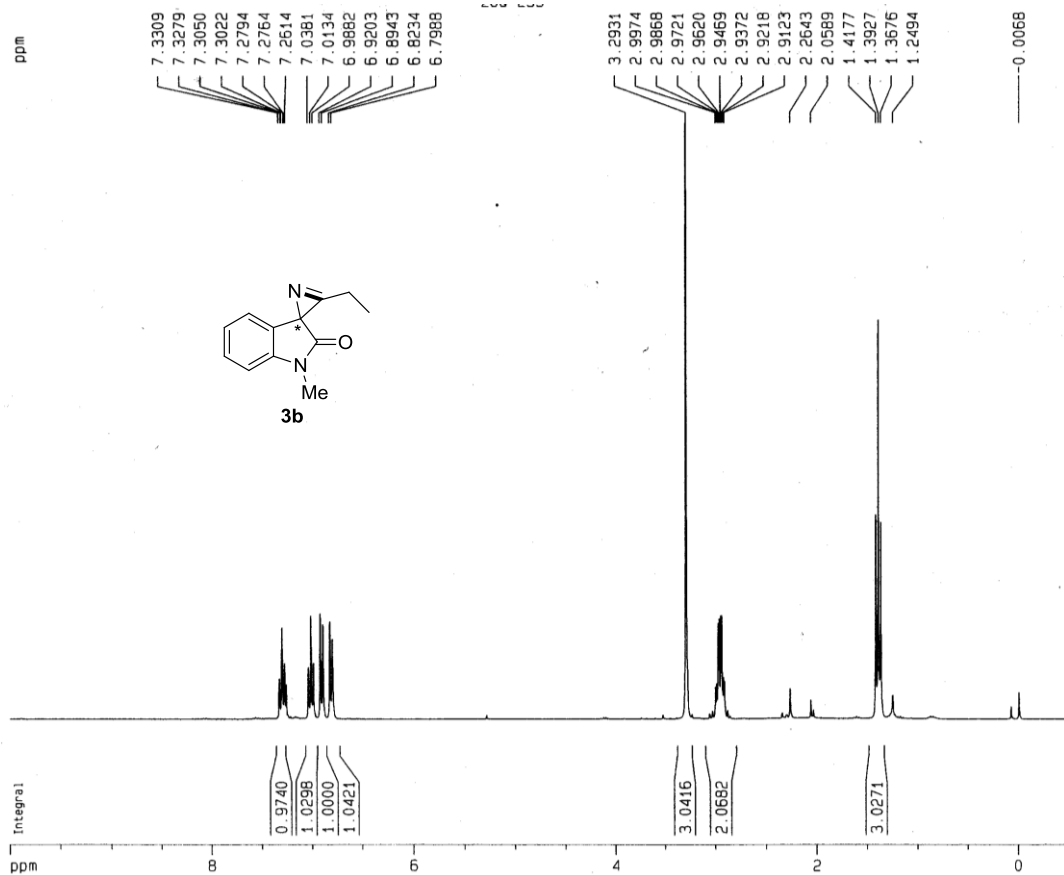
Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.250	18004853	1244344	50.020	53.849
2	10.990	17990386	1066451	49.980	46.151
Total		35995238	2310795	100.000	100.000

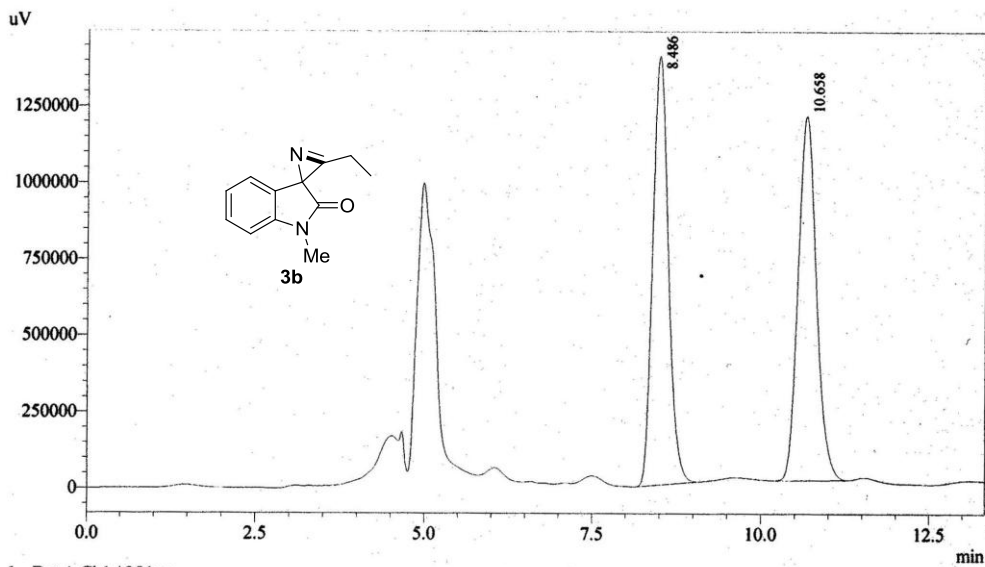


Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.439	35399586	1998453	91.254	92.048
2	11.367	3392648	172640	8.746	7.952
Total		38792234	2171093	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3b**

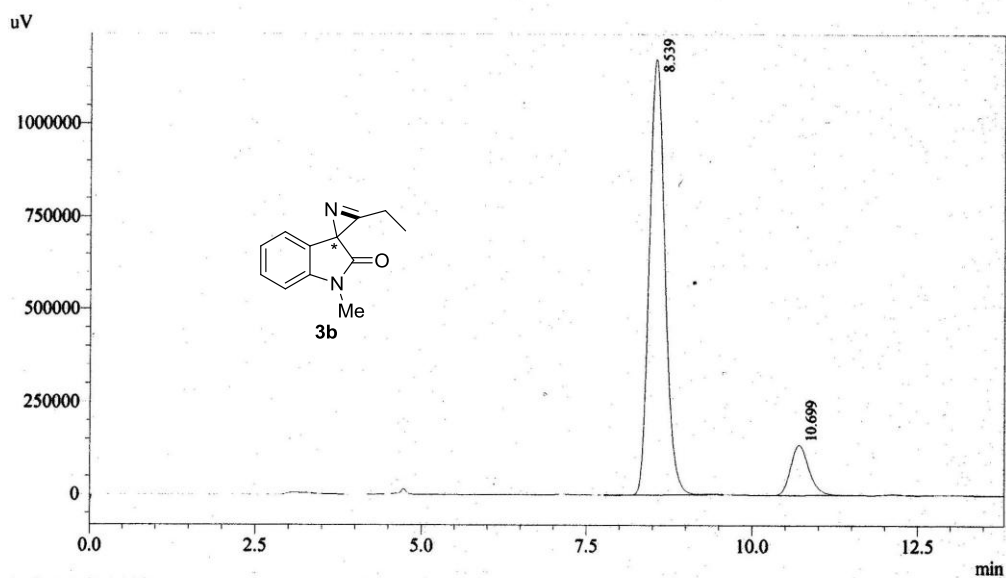




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.486	22591969	1404235	50.061	54.084
2	10.658	22537174	1192140	49.939	45.916
Total		45129143	2596374	100.000	100.000

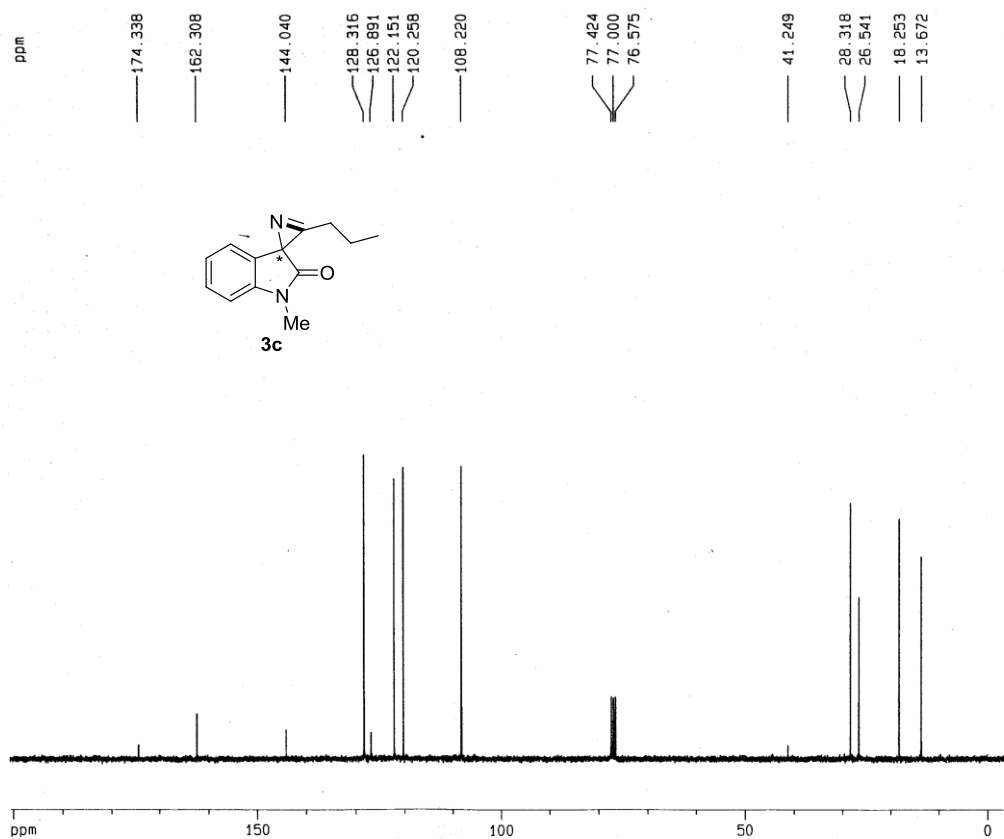
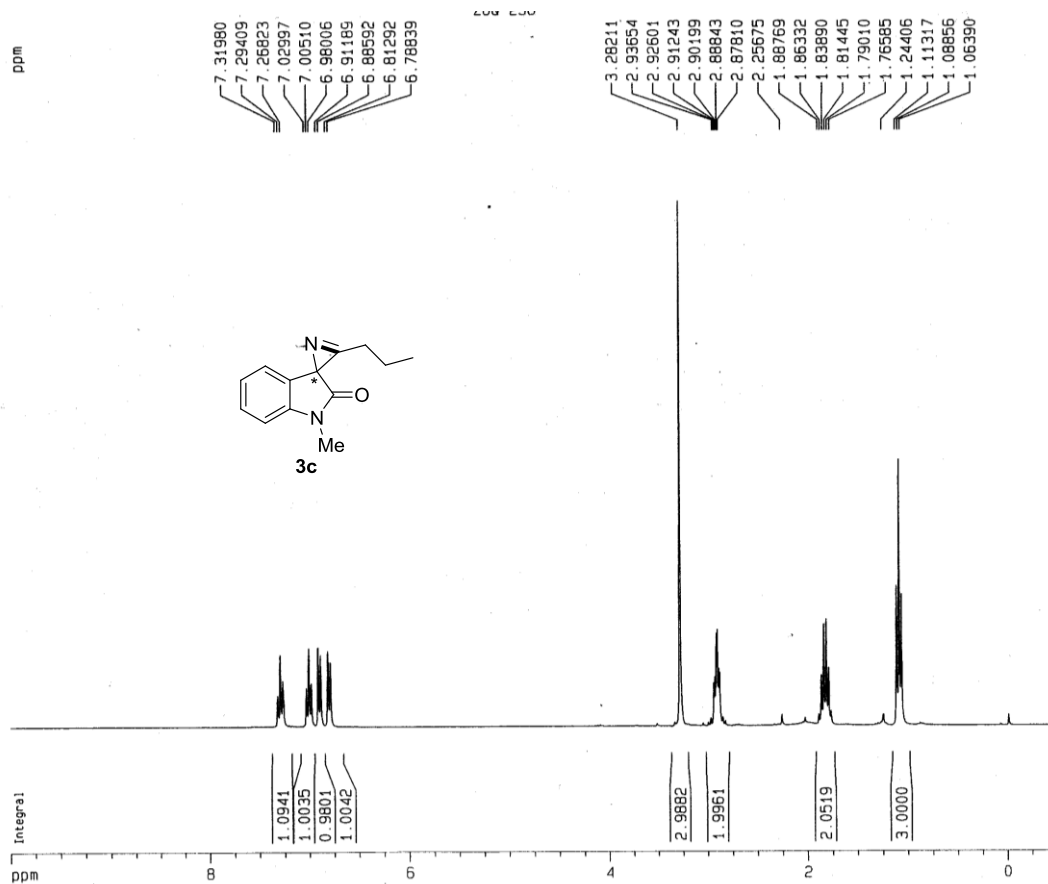


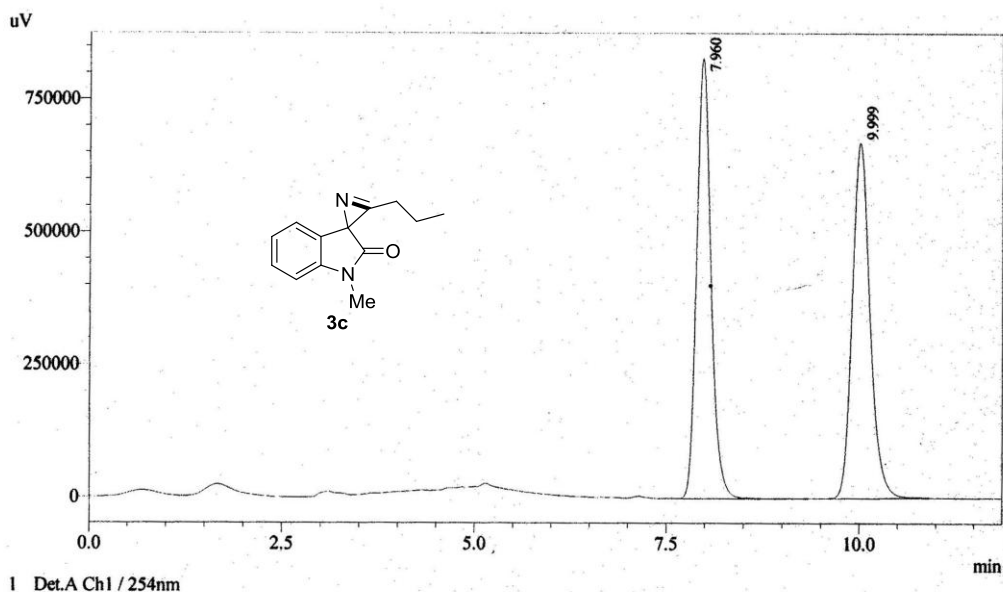
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.539	19395513	1175611	88.264	89.697
2	10.699	2578983	135032	11.736	10.303
Total		21974496	1310644	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3c**

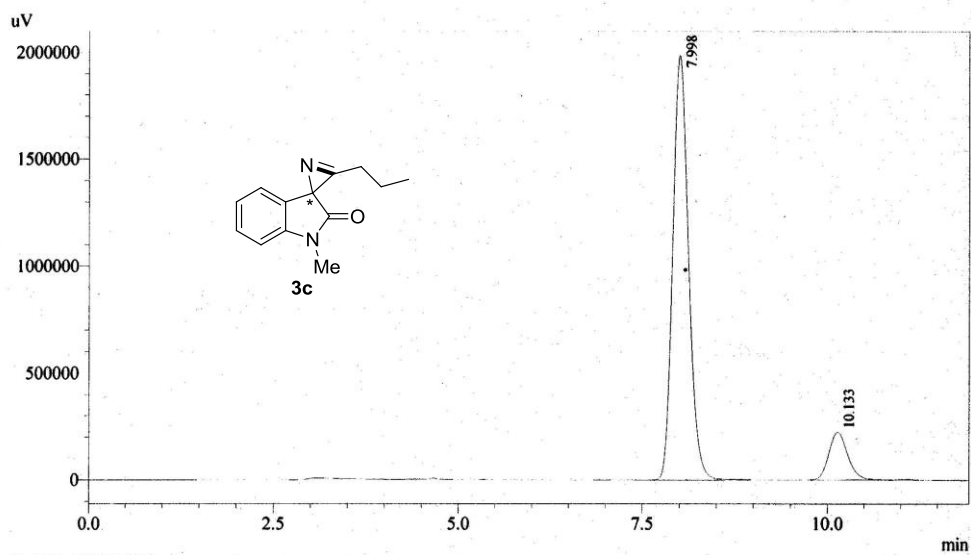




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.960	10764459	830394	49.922	55.382
2	9.999	10797934	669010	50.078	44.618
Total		21562393	1499404	100.000	100.000

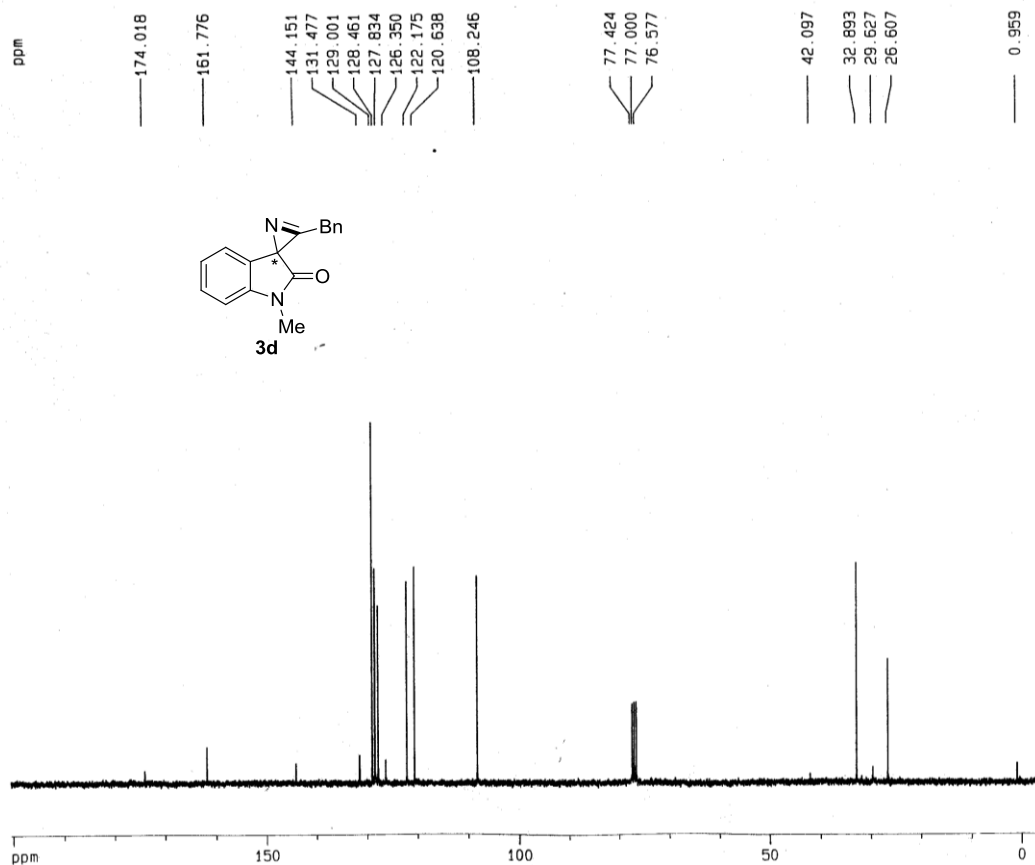
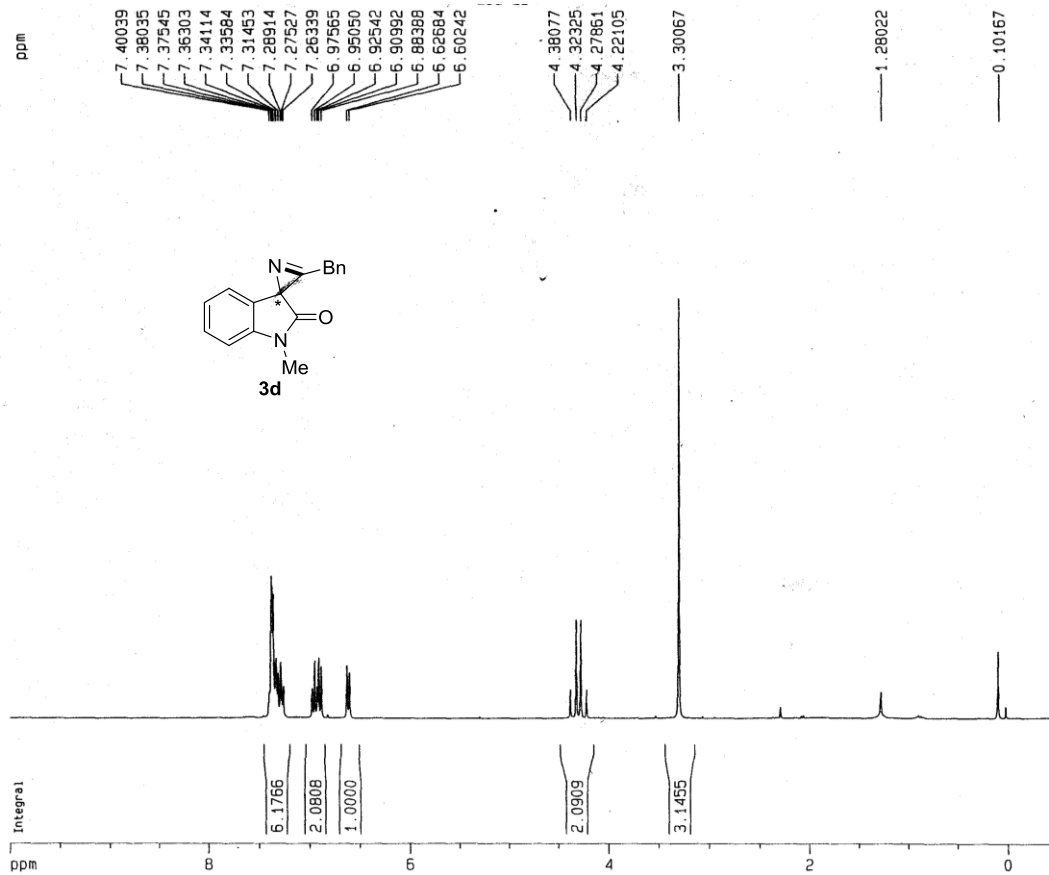


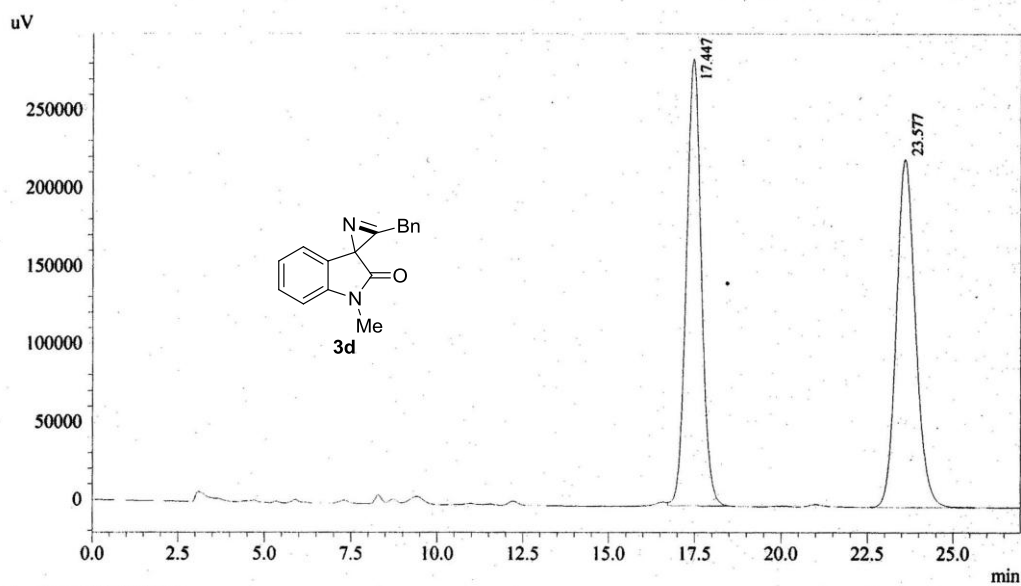
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.998	29402626	1987583	87.941	89.883
2	10.133	4031987	223723	12.059	10.117
Total		33434613	2211306	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3d**

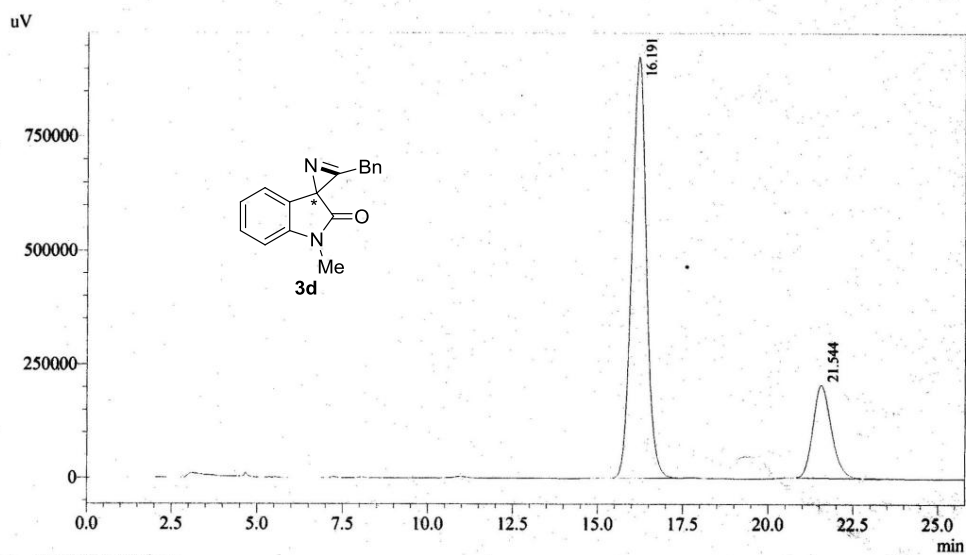




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	17.447	8698689	287015	49.933	56.233
2	23.577	8722074	223389	50.067	43.767
Total		17420762	510405	100.000	100.000

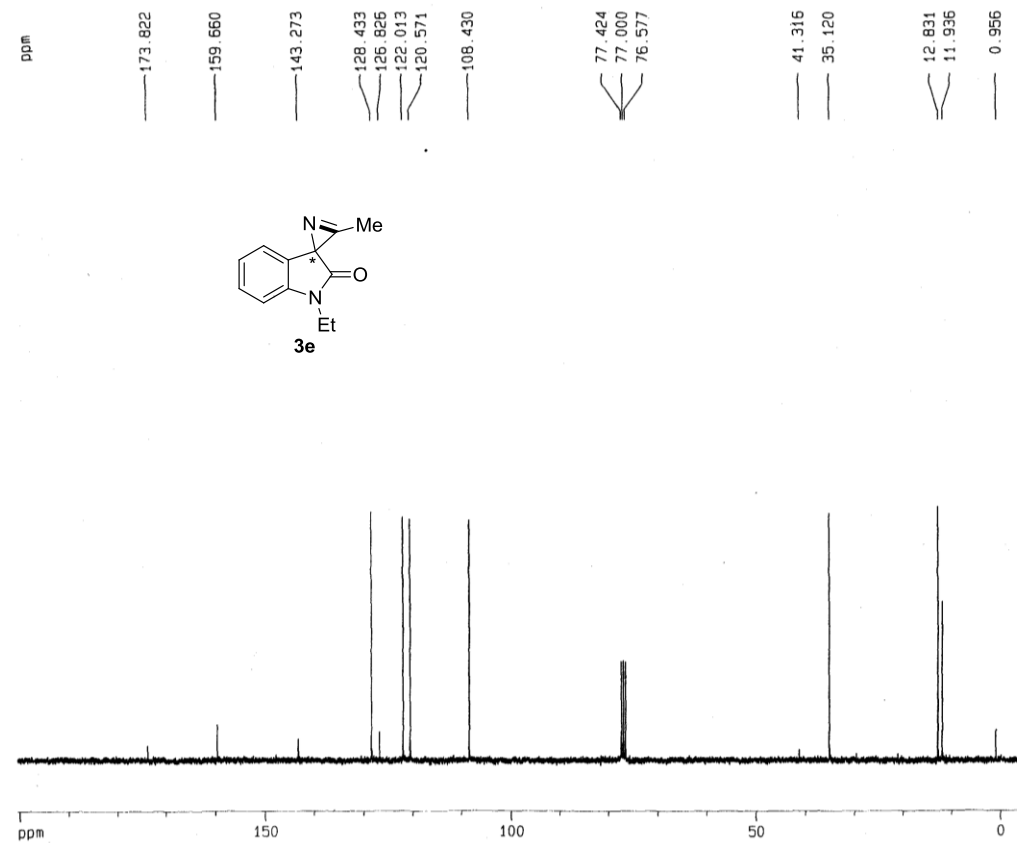
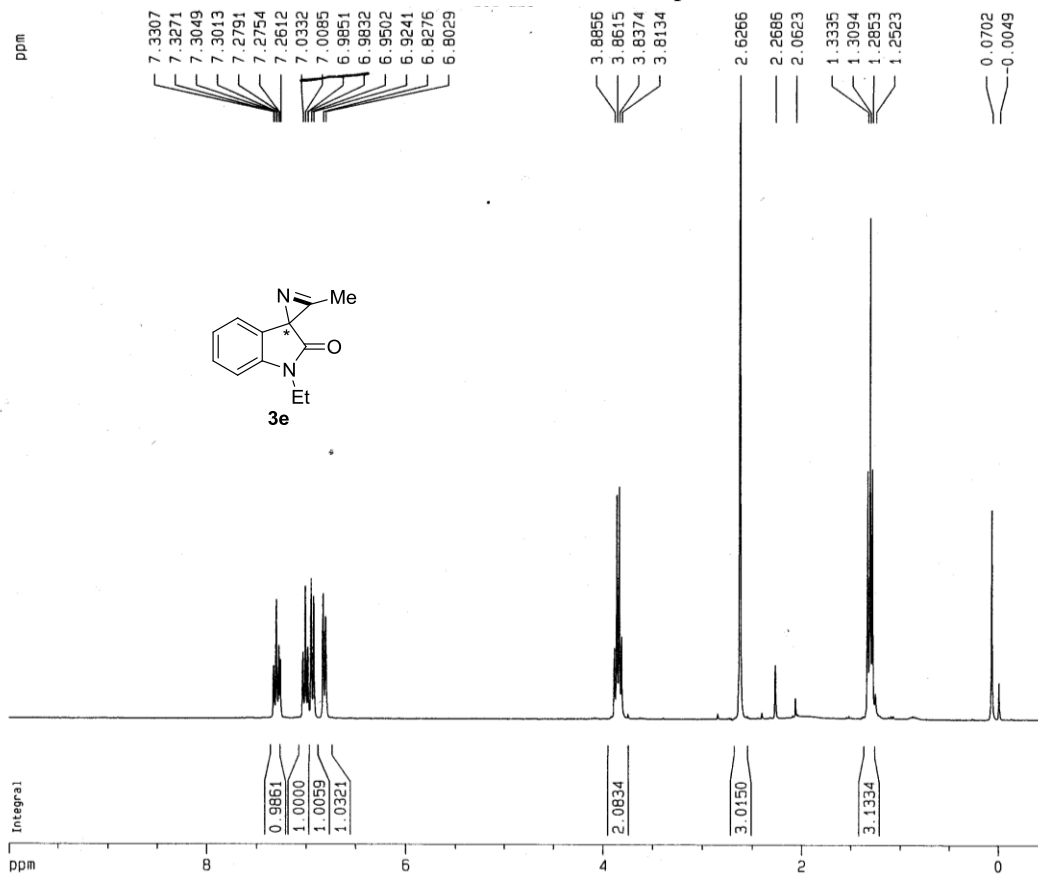


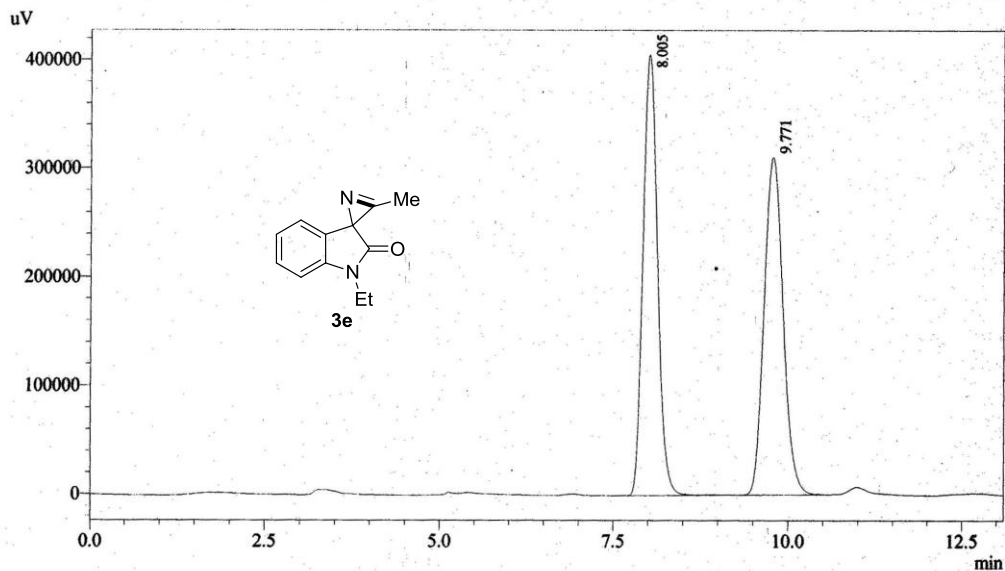
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	16.191	27588914	926915	78.150	81.879
2	21.544	7713730	205134	21.850	18.121
Total		35302644	1132050	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3e**

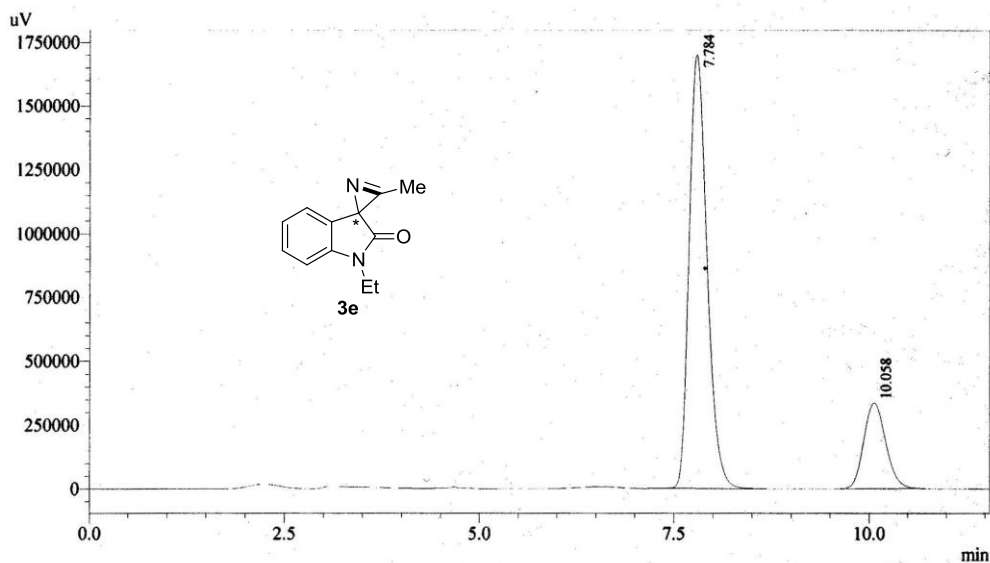




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.005	5886324	405921	50.025	56.623
2	9.771	5880337	310966	49.975	43.377
Total		11766661	716887	100.000	100.000

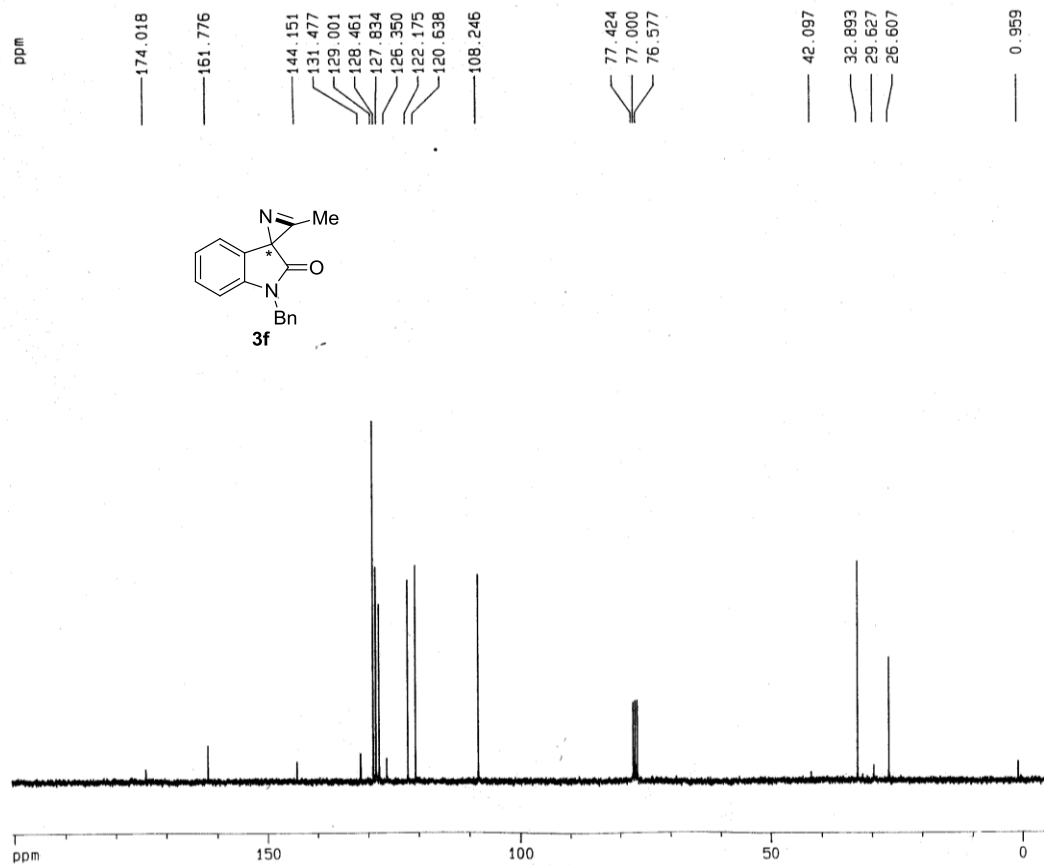
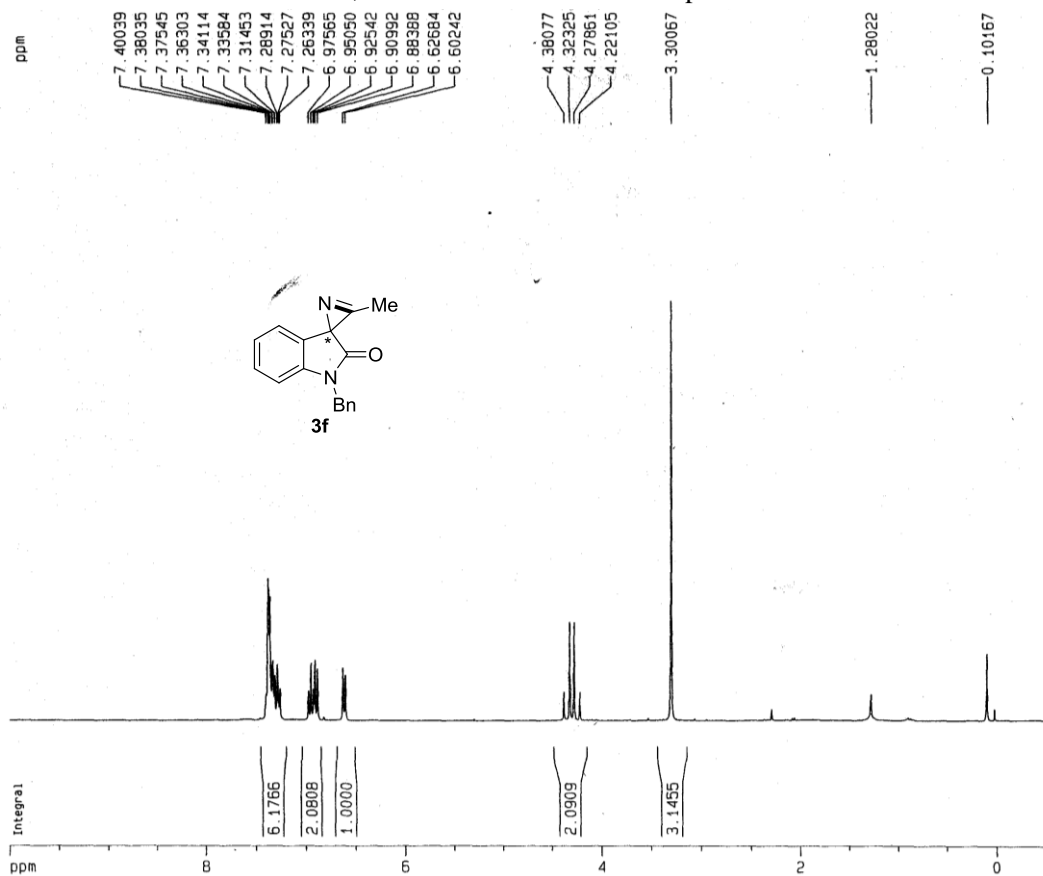


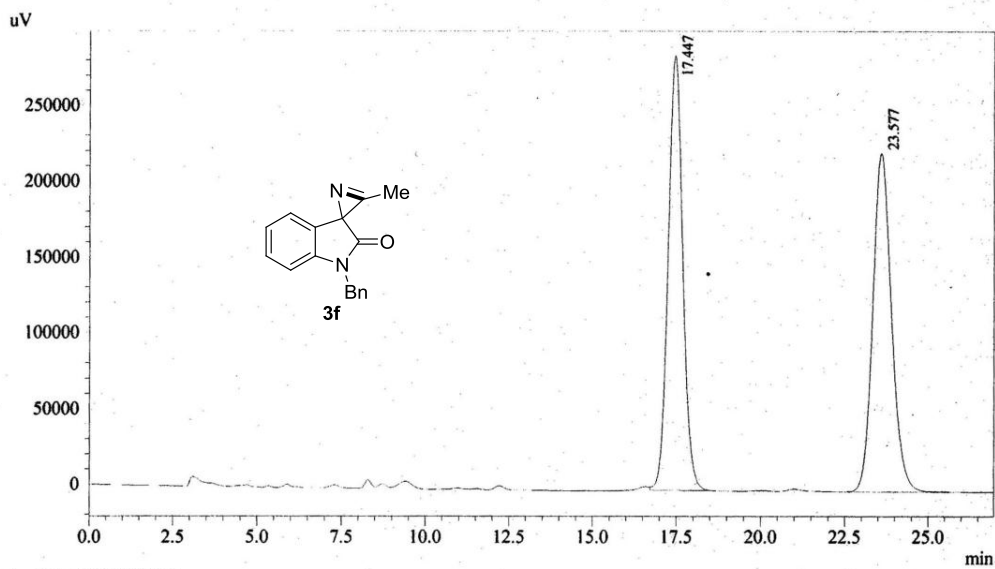
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.784	27104988	1699726	80.316	83.483
2	10.058	6642870	336278	19.684	16.517
Total		33747858	2036004	100.000	100.000

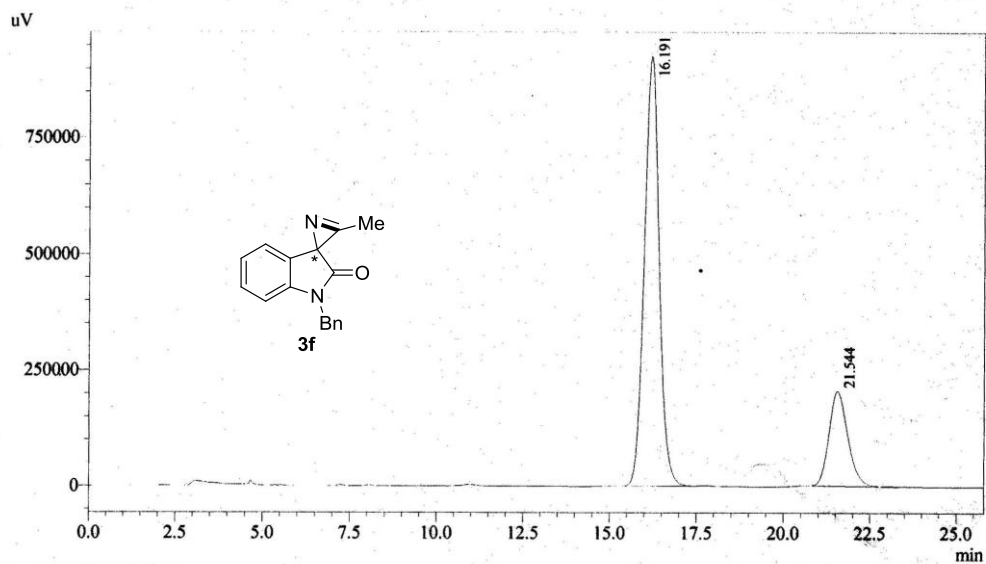
¹H NMR, ¹³C NMR and HPLC of compound **3f**





Detector A Ch1 254nm

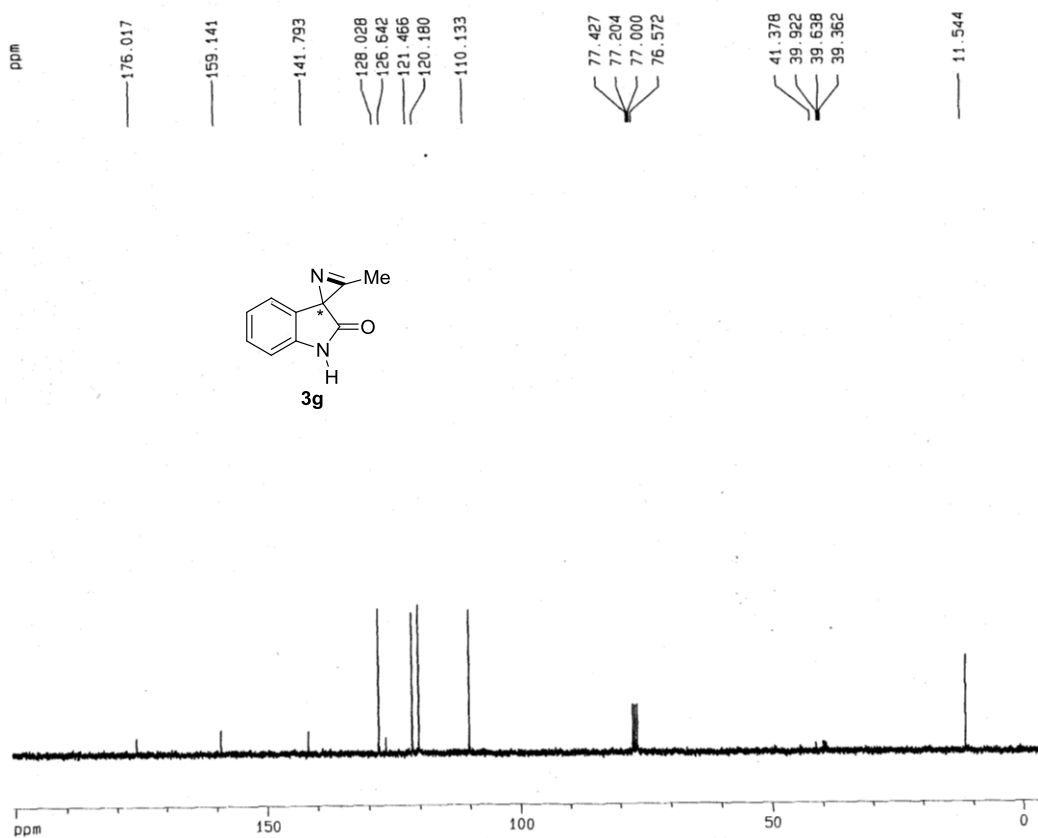
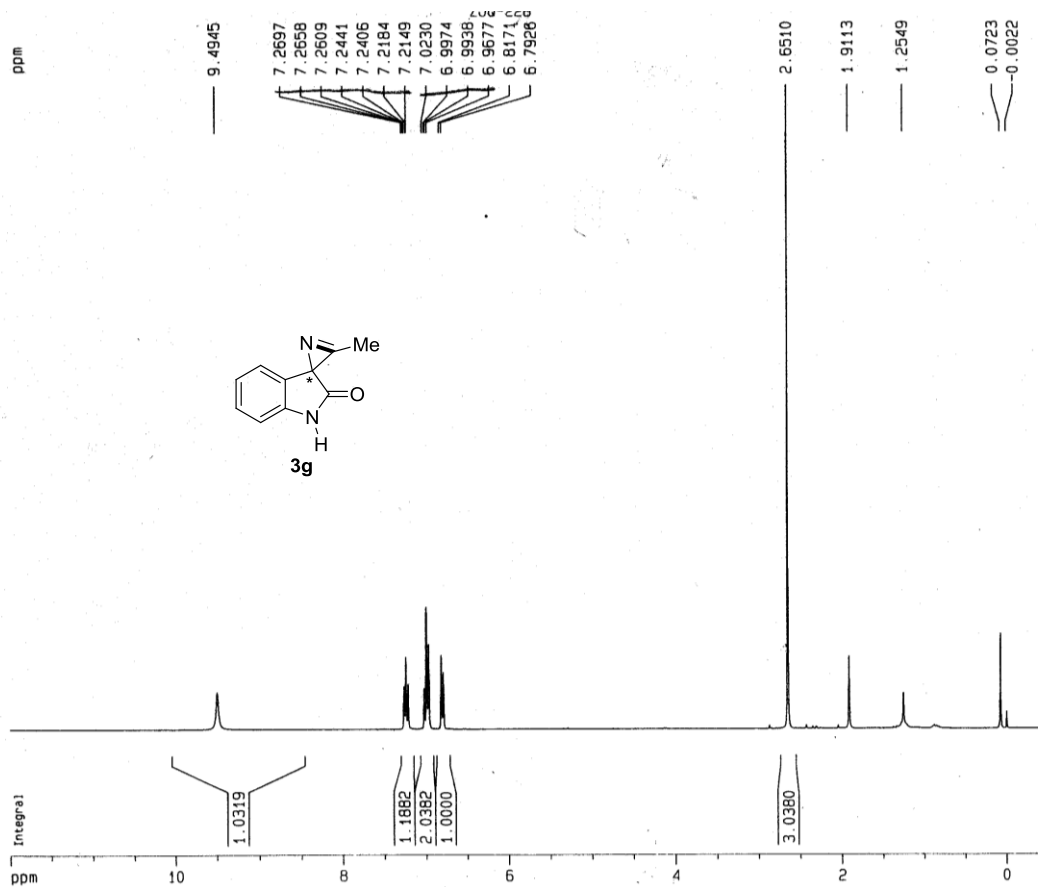
Peak#	Ret. Time	Area	Height	Area %	Height %
1	17.447	8698689	287015	49.933	56.233
2	23.577	8722074	223389	50.067	43.767
Total		17420762	510405	100.000	100.000

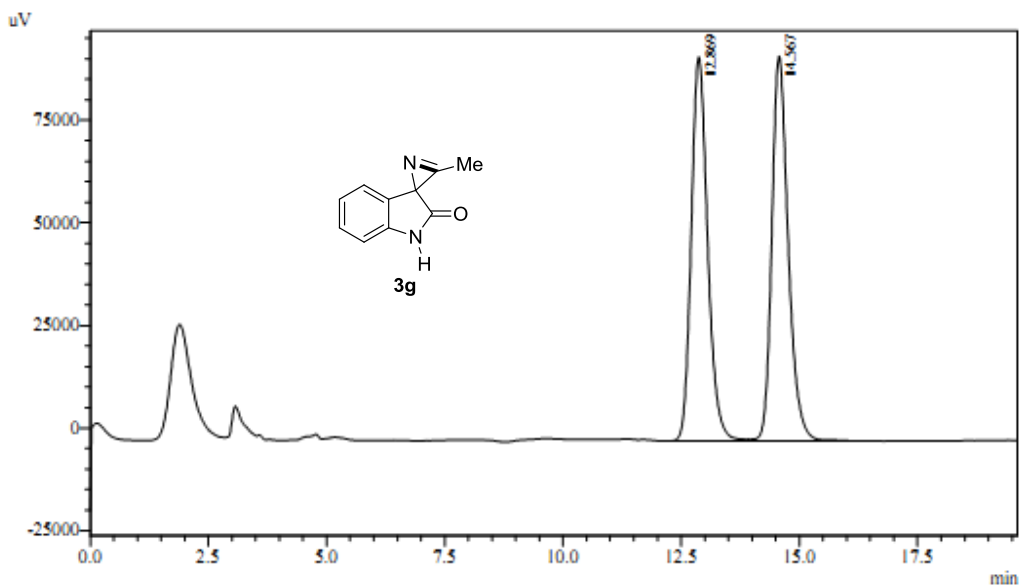


Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	16.191	27588914	926915	78.150	81.879
2	21.544	7713730	205134	21.850	18.121
Total		35302644	1132050	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3g**

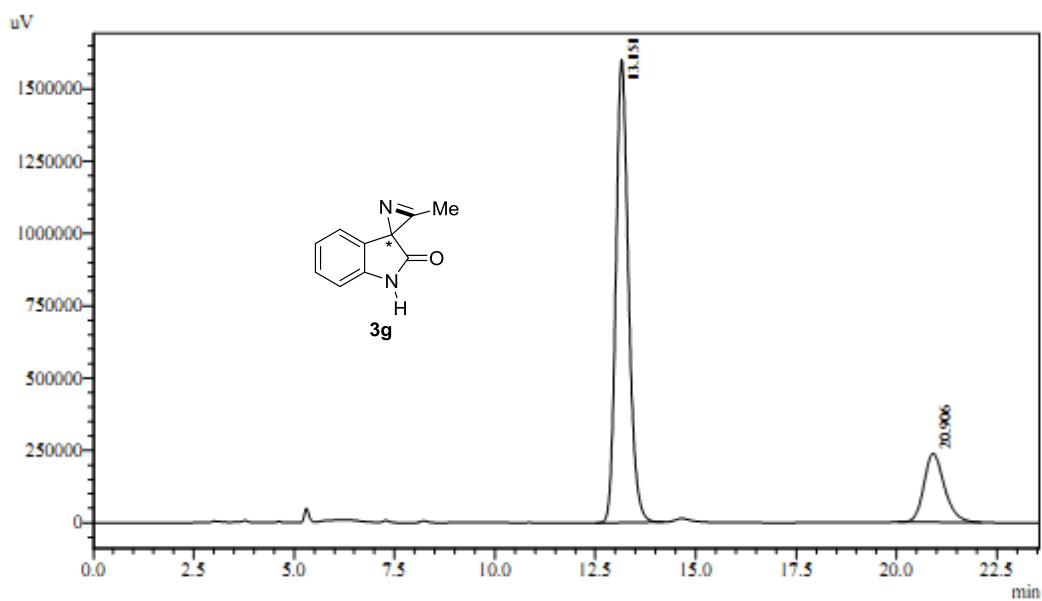




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	12.869	2260509	93582	49.923	49.950
2	14.567	2267481	93770	50.077	50.050
Total		4527990	187351	100.000	100.000

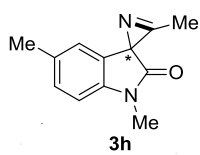
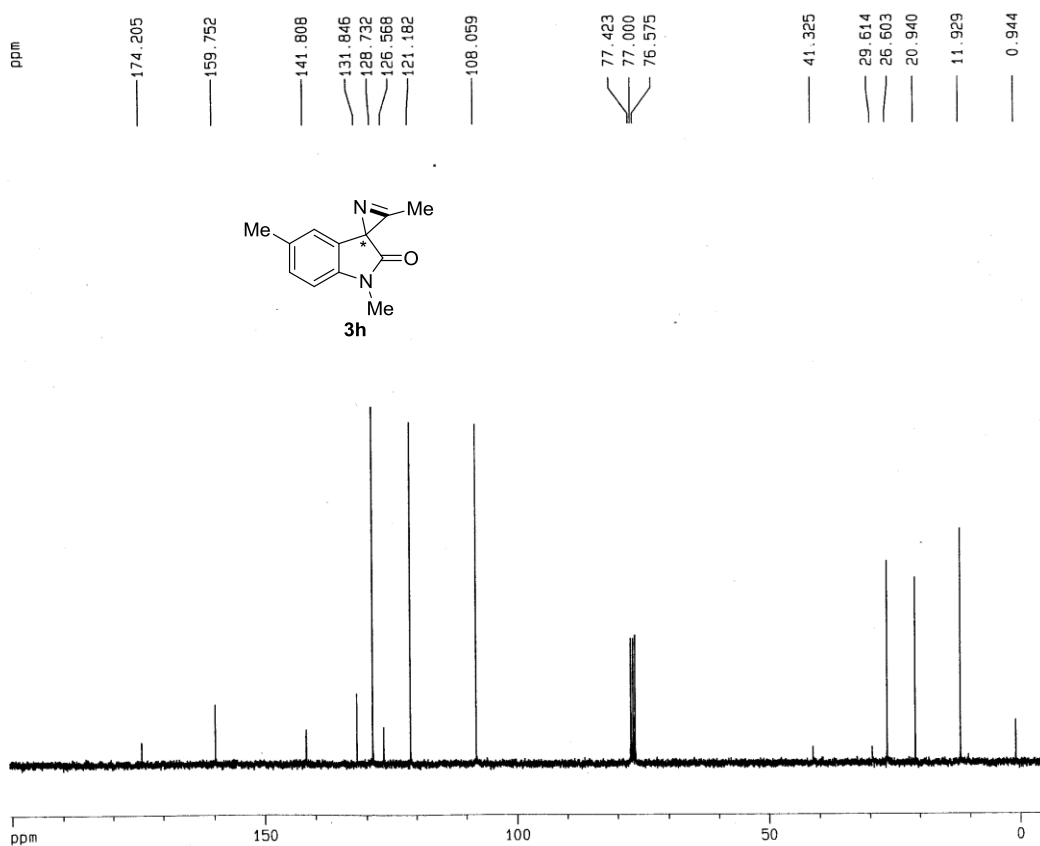
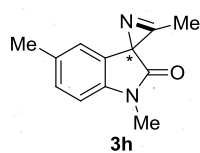
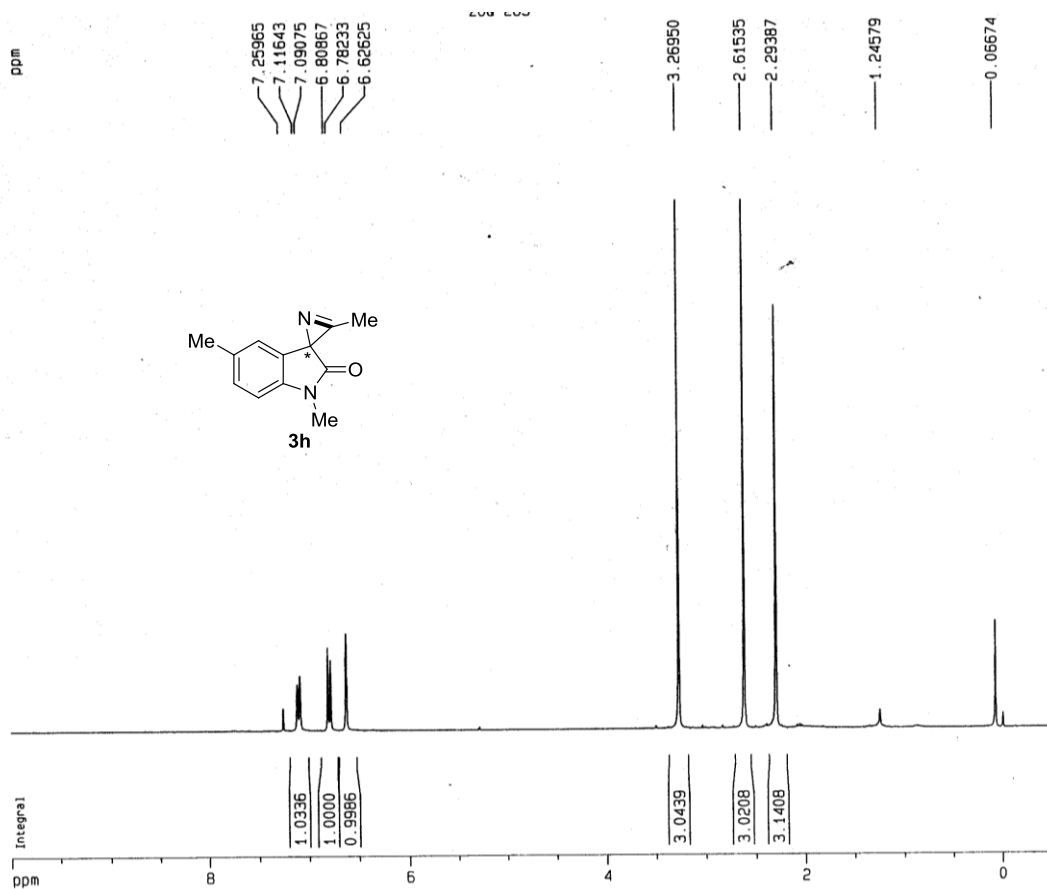


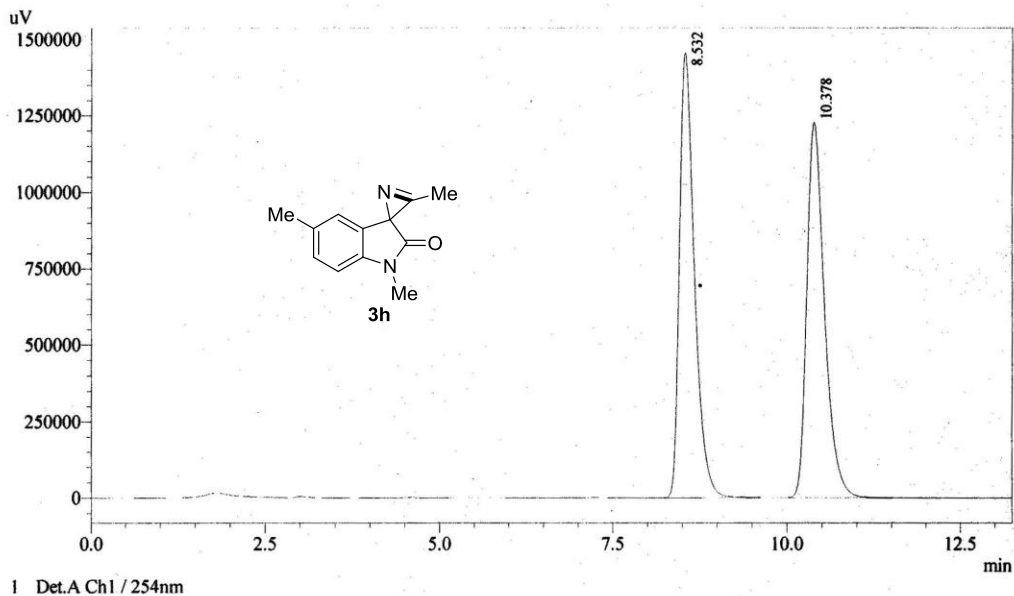
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.151	35012379	1601170	80.528	87.109
2	20.906	8466231	236955	19.472	12.891
Total		43478609	1838124	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3h**

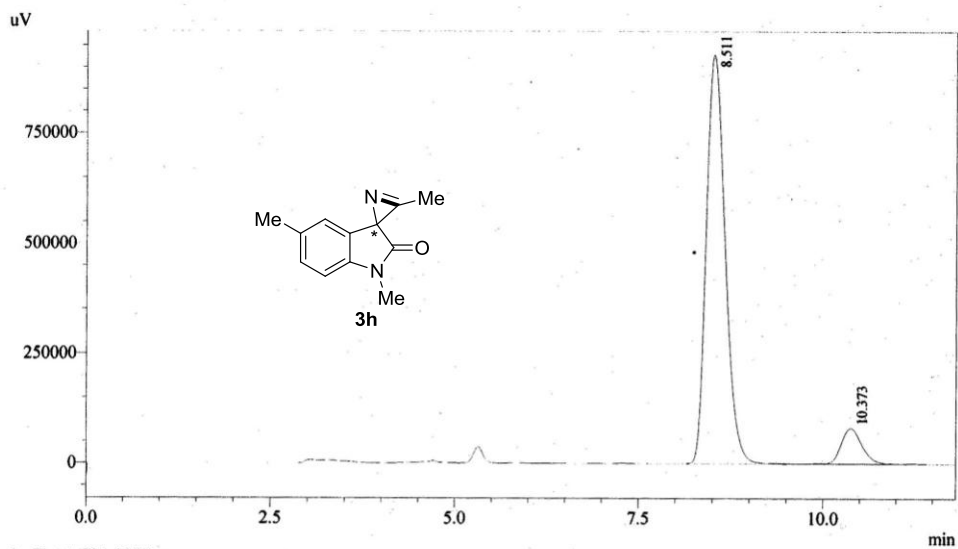




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.532	21754098	1455799	50.079	54.280
2	10.378	21685276	1226204	49.921	45.720
Total		43439374	2682003	100.000	100.000

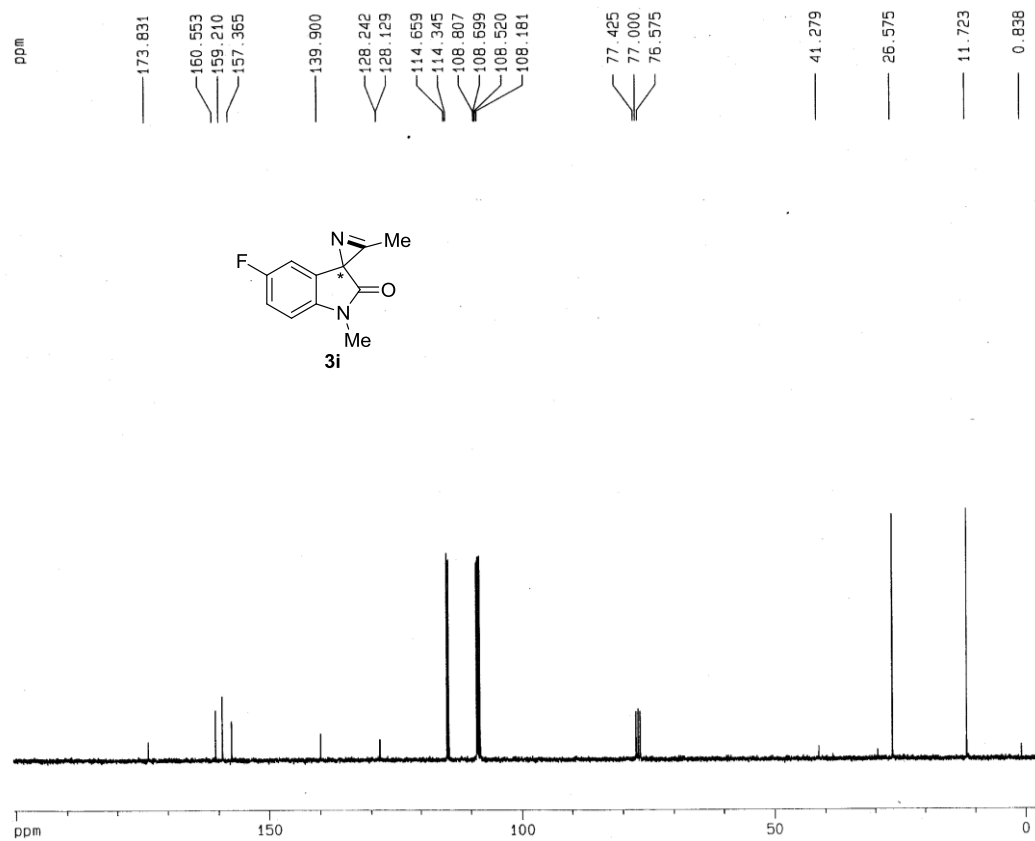
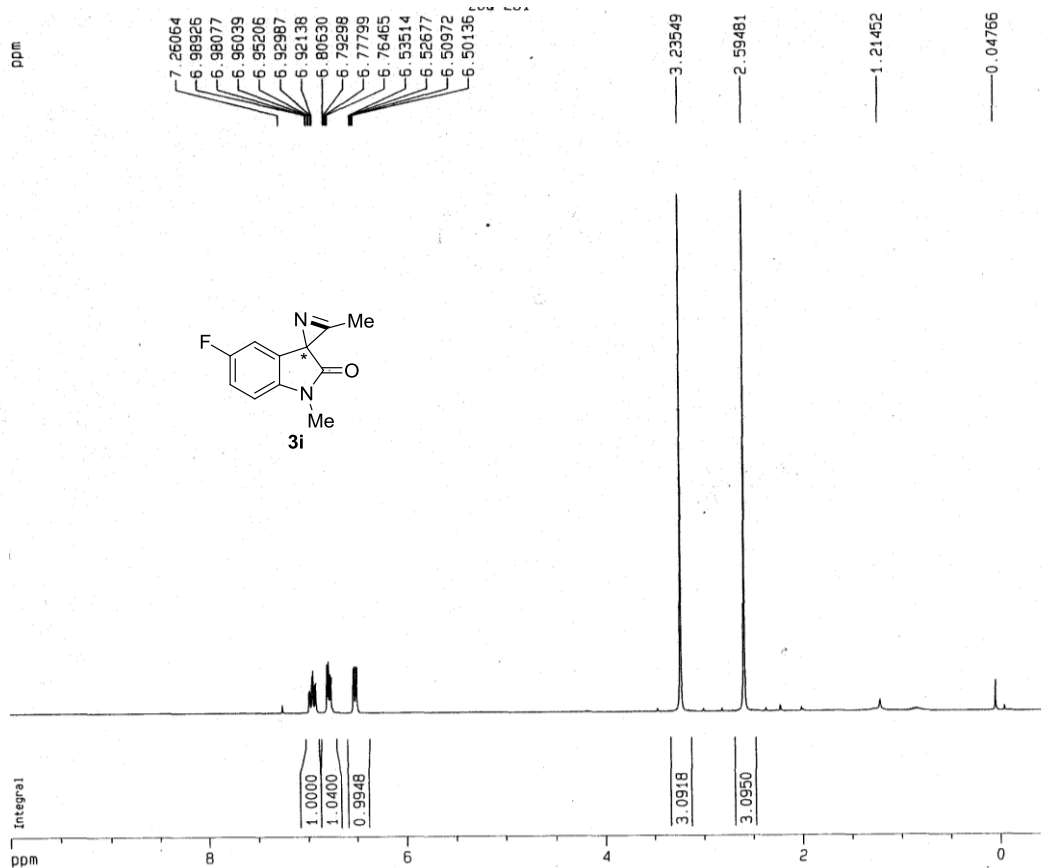


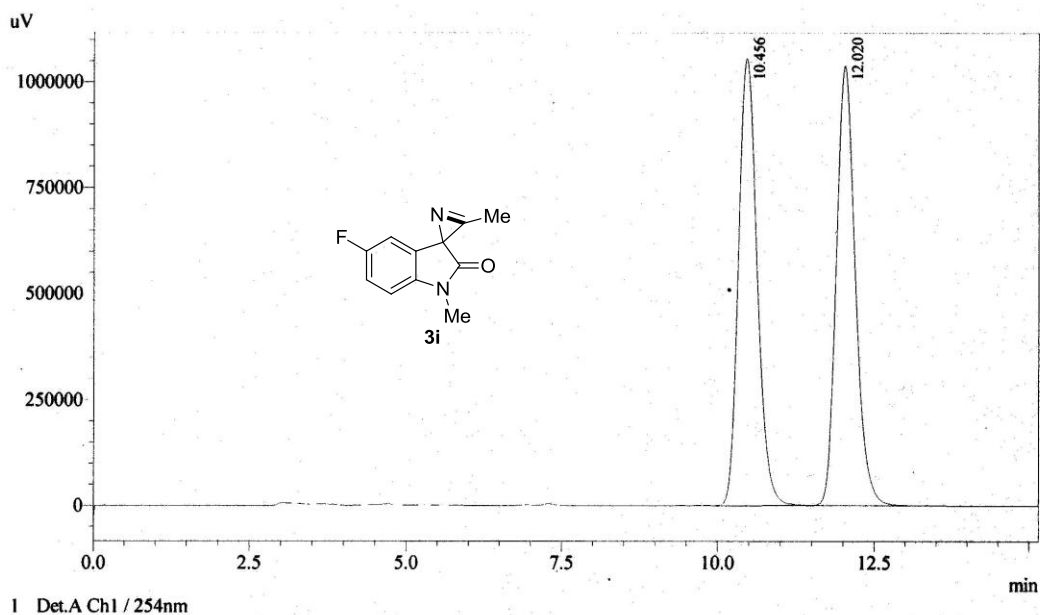
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.511	16489964	929252	91.281	92.004
2	10.373	1574996	80756	8.719	7.996
Total		18064959	1010008	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3i**

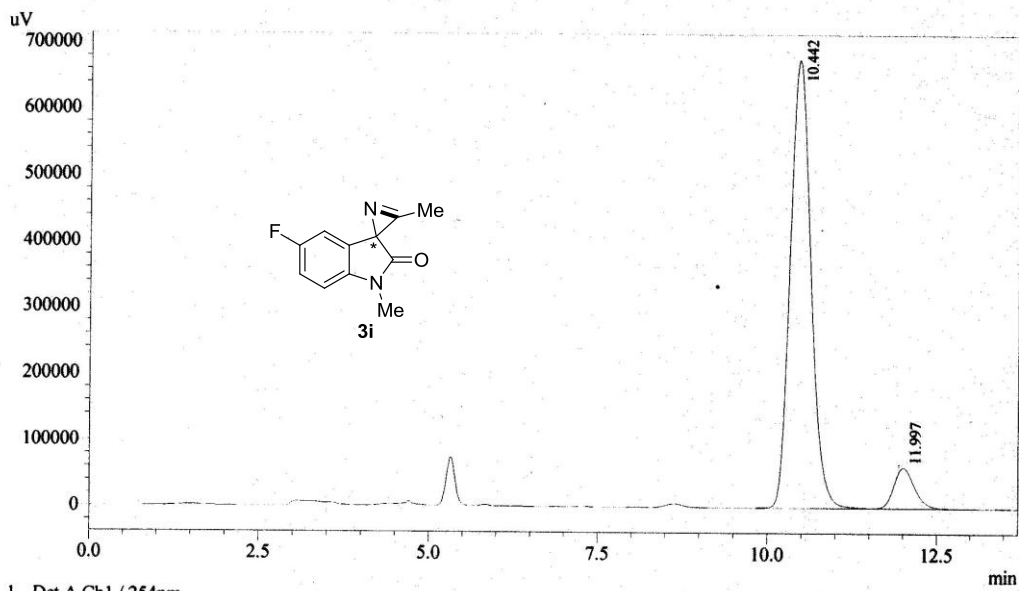




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.456	21957307	1055979	49.997	50.406
2	12.020	21960226	1038987	50.003	49.594
Total		43917533	2094966	100.000	100.000

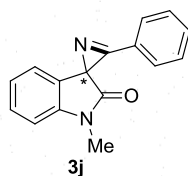
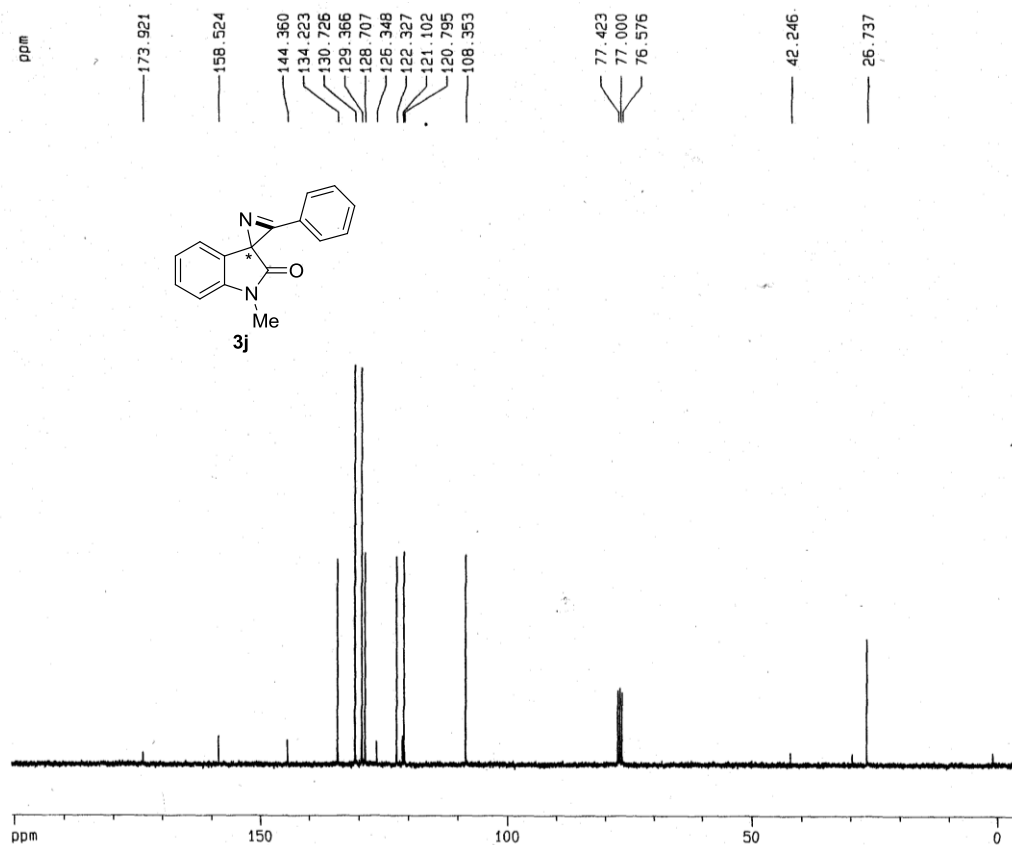
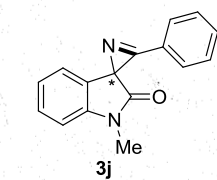
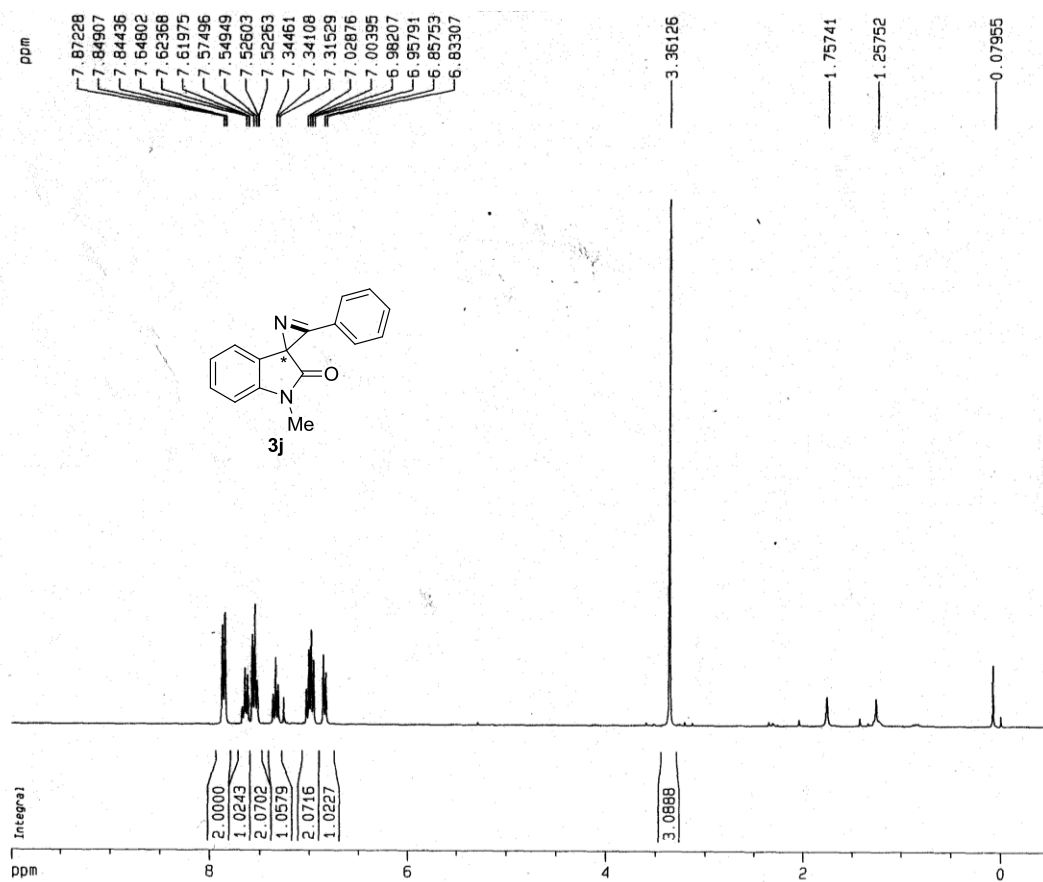


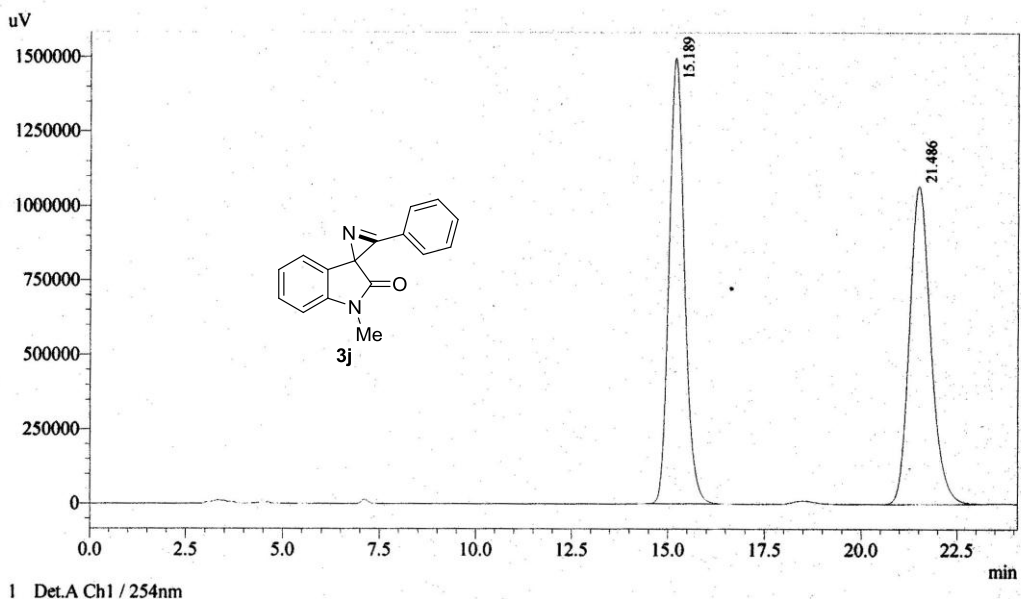
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.442	14332427	676034	91.677	91.665
2	11.997	1301204	61468	8.323	8.335
Total		15633630	737502	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3j**

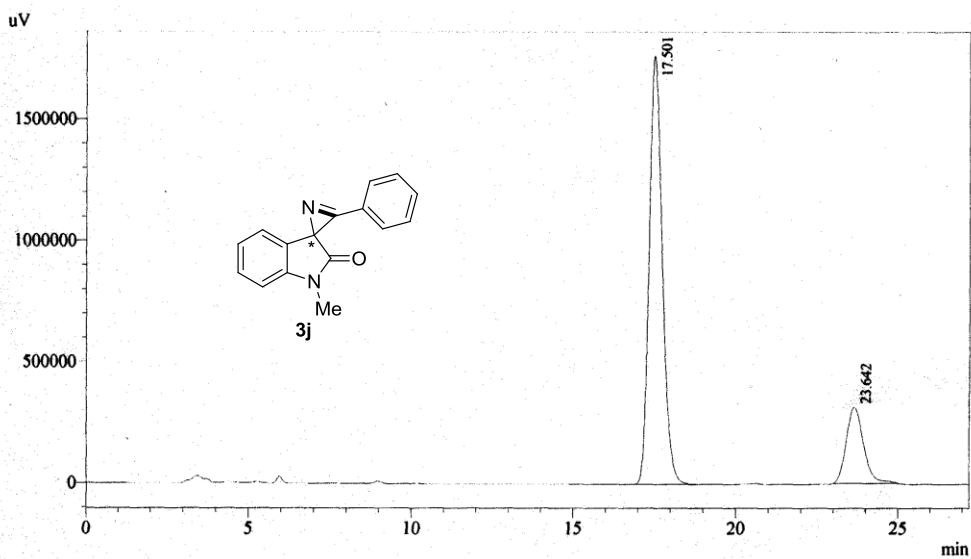




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.189	41633185	1498256	50.173	58.366
2	21.486	41346901	1068765	49.827	41.634
Total		82980086	2567021	100.000	100.000

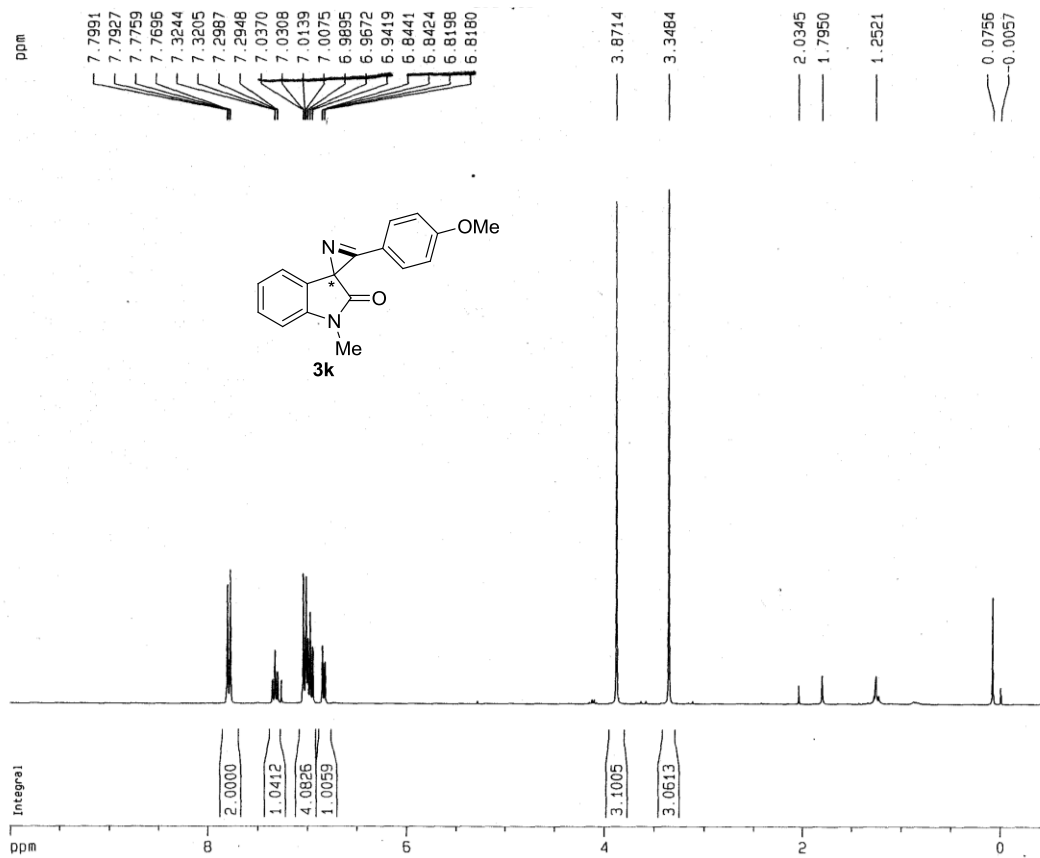
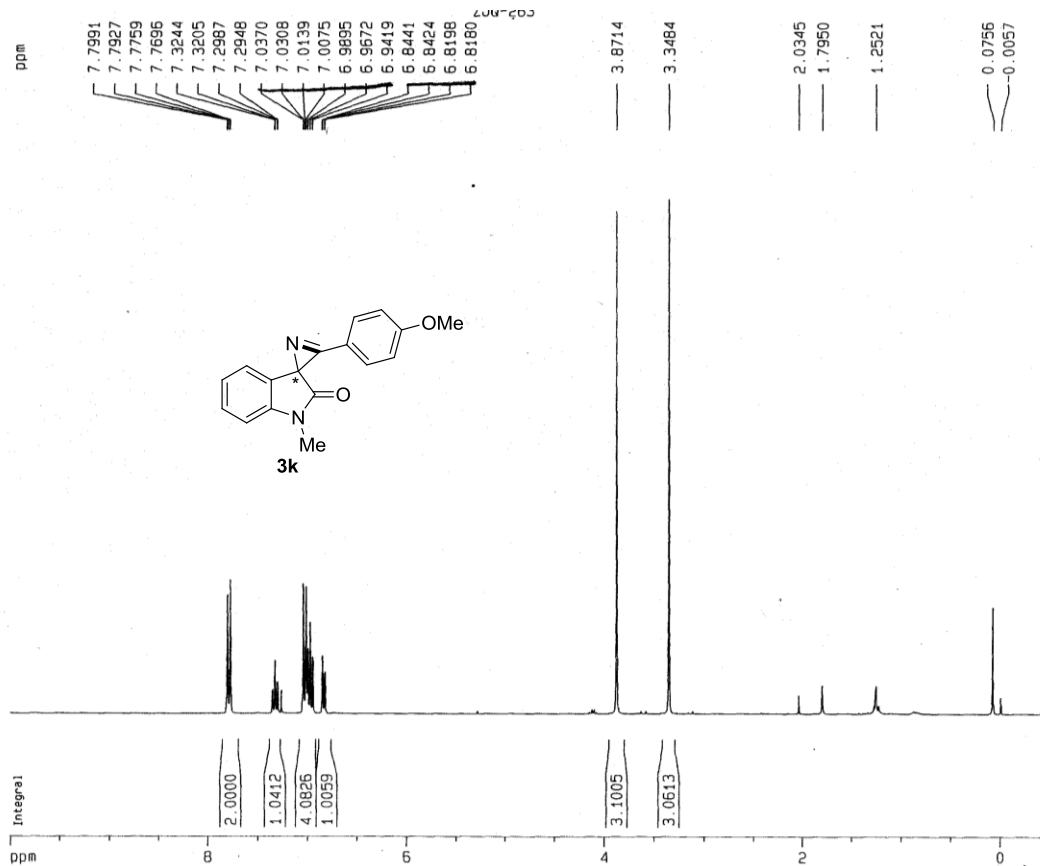


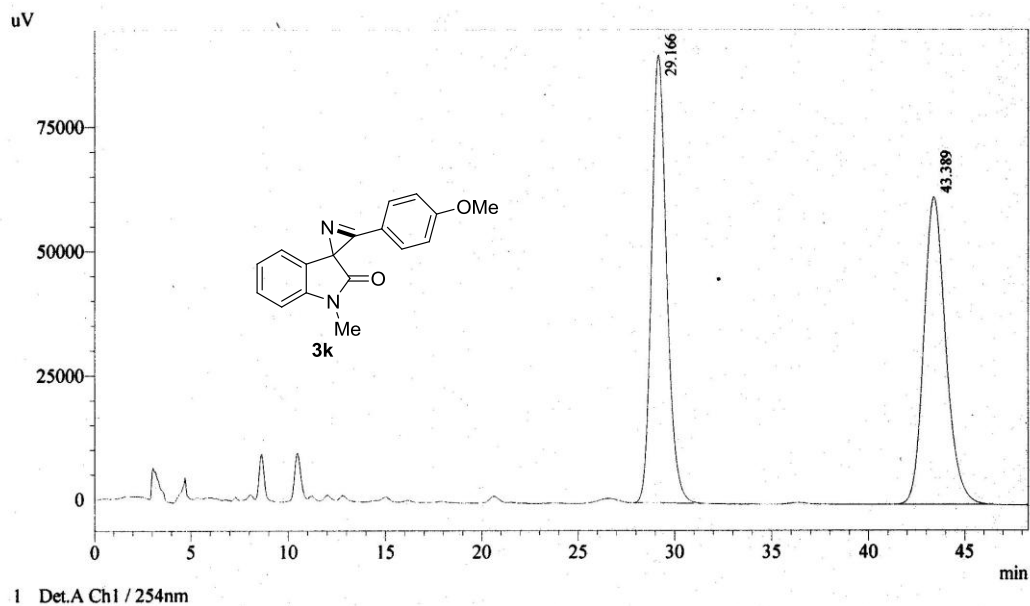
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

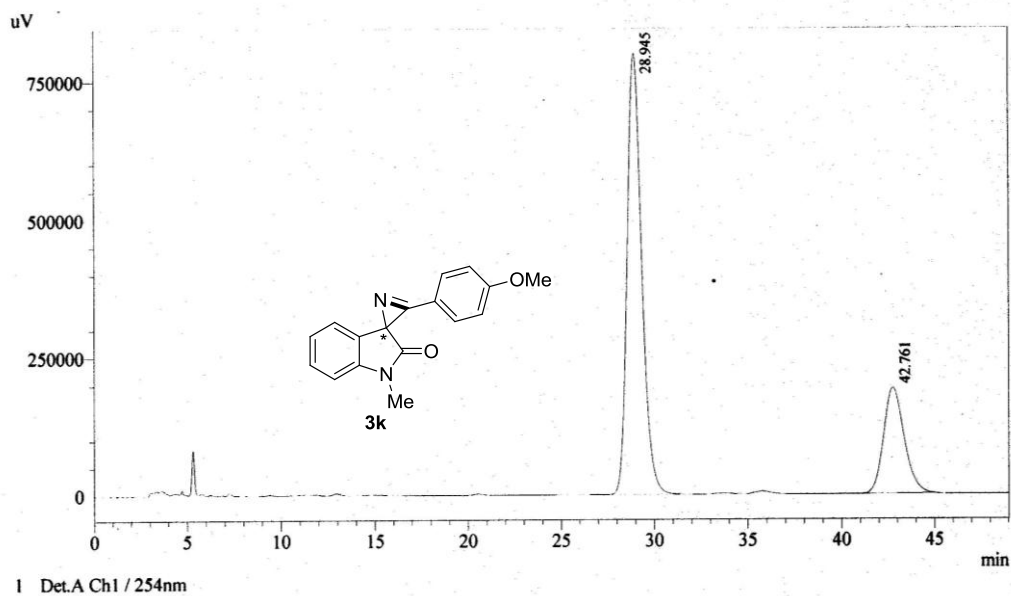
Peak#	Ret. Time	Area	Height	Area %	Height %
1	17.501	49558860	1766614	80.881	84.877
2	23.642	11714569	314763	19.119	15.123
Total		61273429	2081378	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3k**



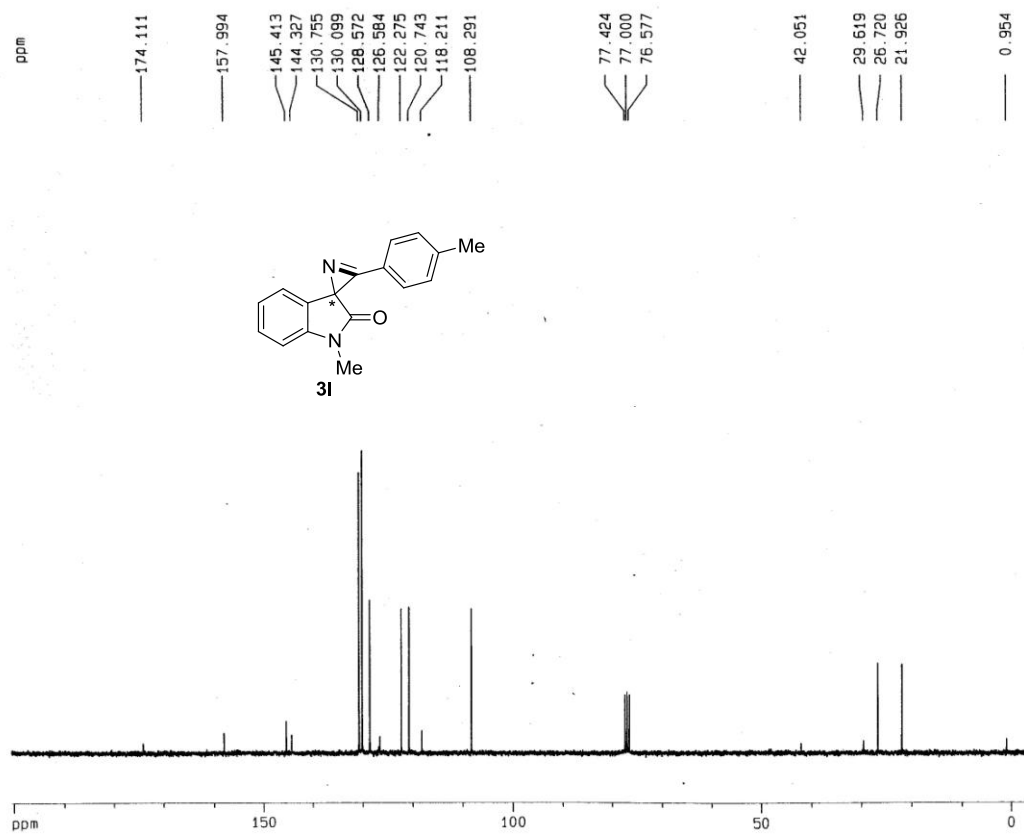
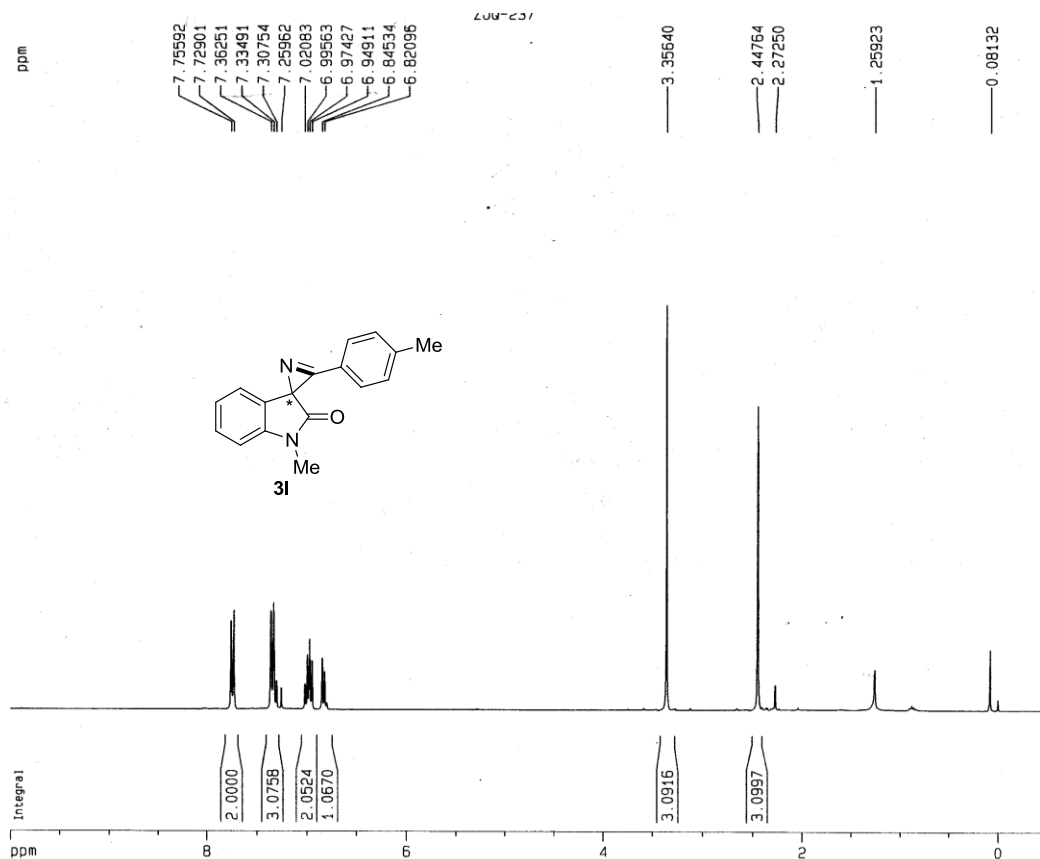


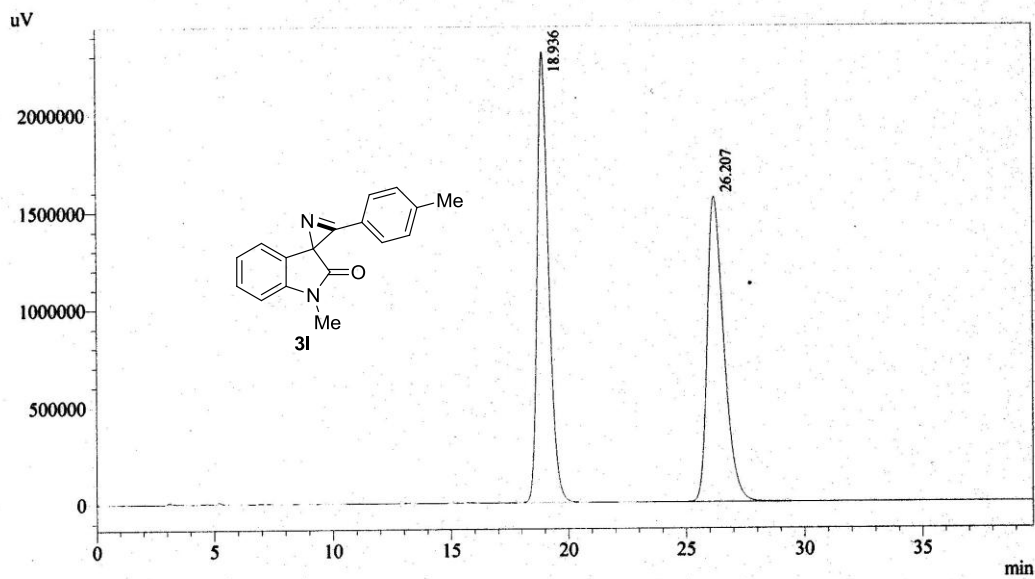
Peak#	Ret. Time	Area	Height	Area %	Height %
1	29.166	4921603	90300	49.822	59.319
2	43.389	4956684	61928	50.178	40.681
Total		9878287	152228	100.000	100.000



Peak#	Ret. Time	Area	Height	Area %	Height %
1	28.945	43564958	800778	74.479	80.597
2	42.761	14927910	192783	25.521	19.403
Total		58492868	993561	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **31**

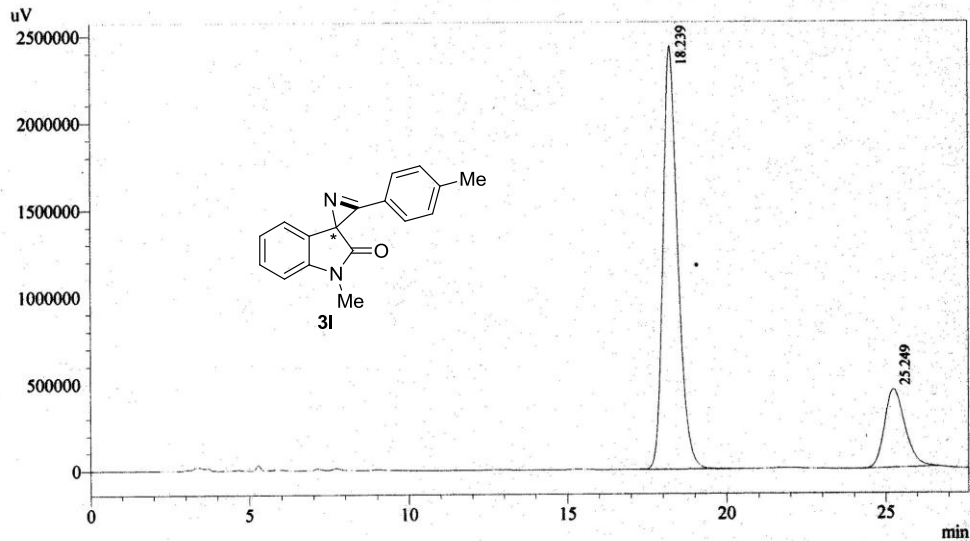




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	18.936	77905636	2315925	50.296	59.628
2	26.207	76987835	1568036	49.704	40.372
Total		154893471	3883961	100.000	100.000

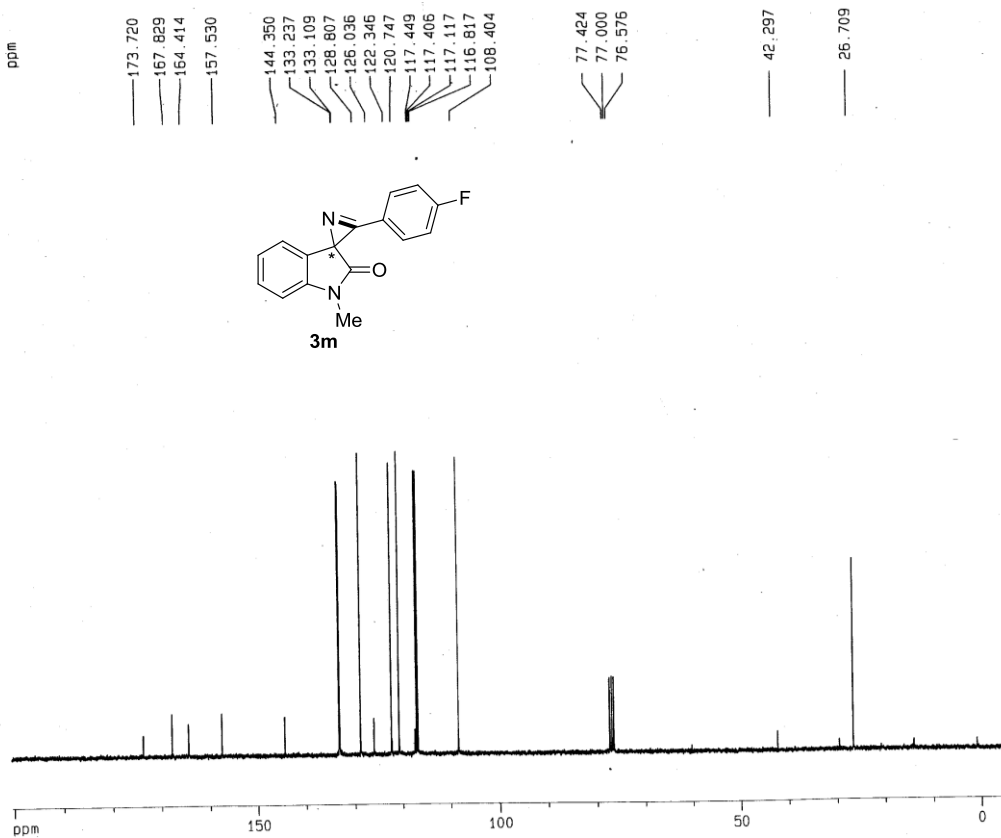
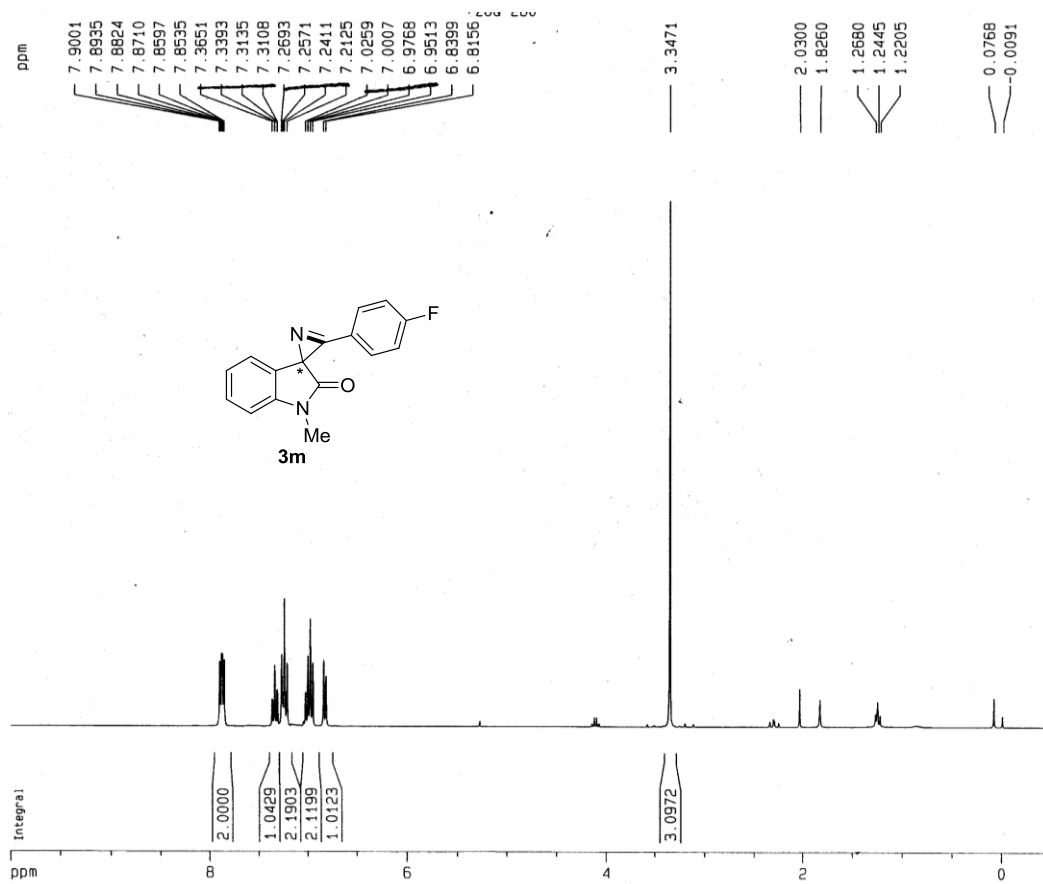


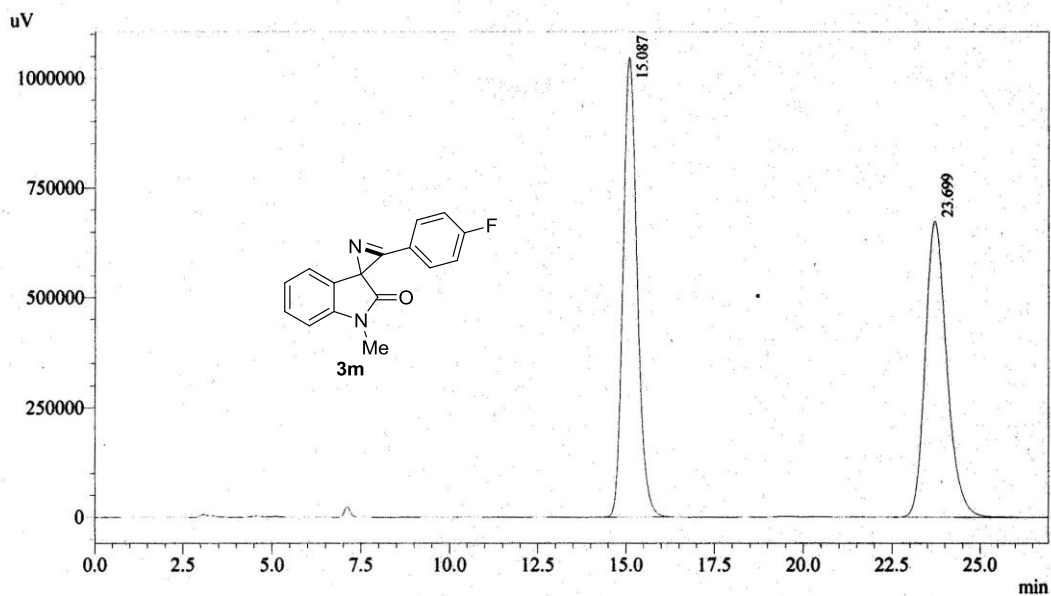
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	18.239	78359719	2437281	79.255	84.346
2	25.249	20510394	452350	20.745	15.654
Total		98870114	2889631	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3m**

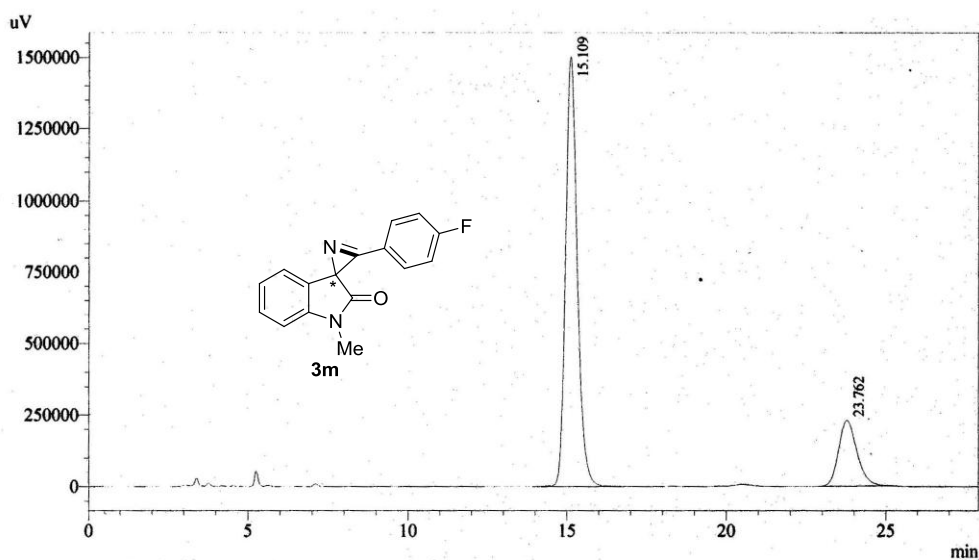




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.087	29136752	1047458	50.252	60.807
2	23.699	28844115	675150	49.748	39.193
Total		57980867	1722608	100.000	100.000

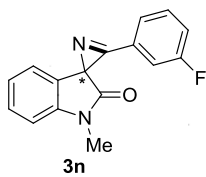
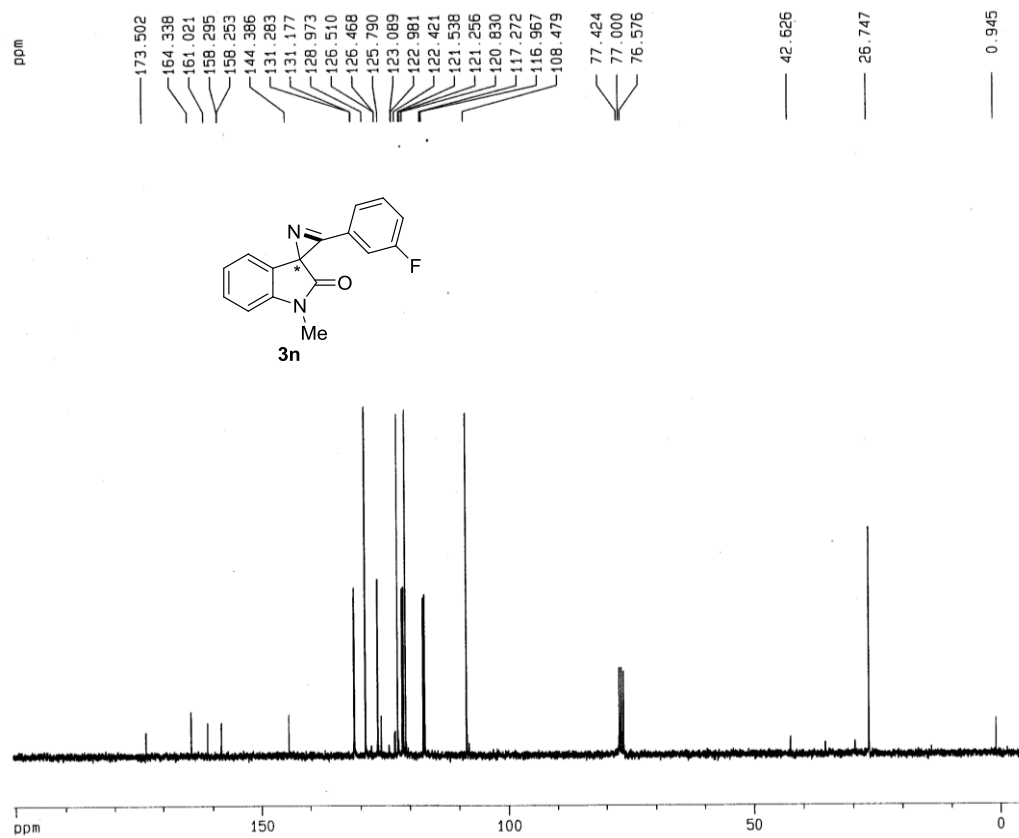
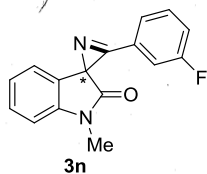
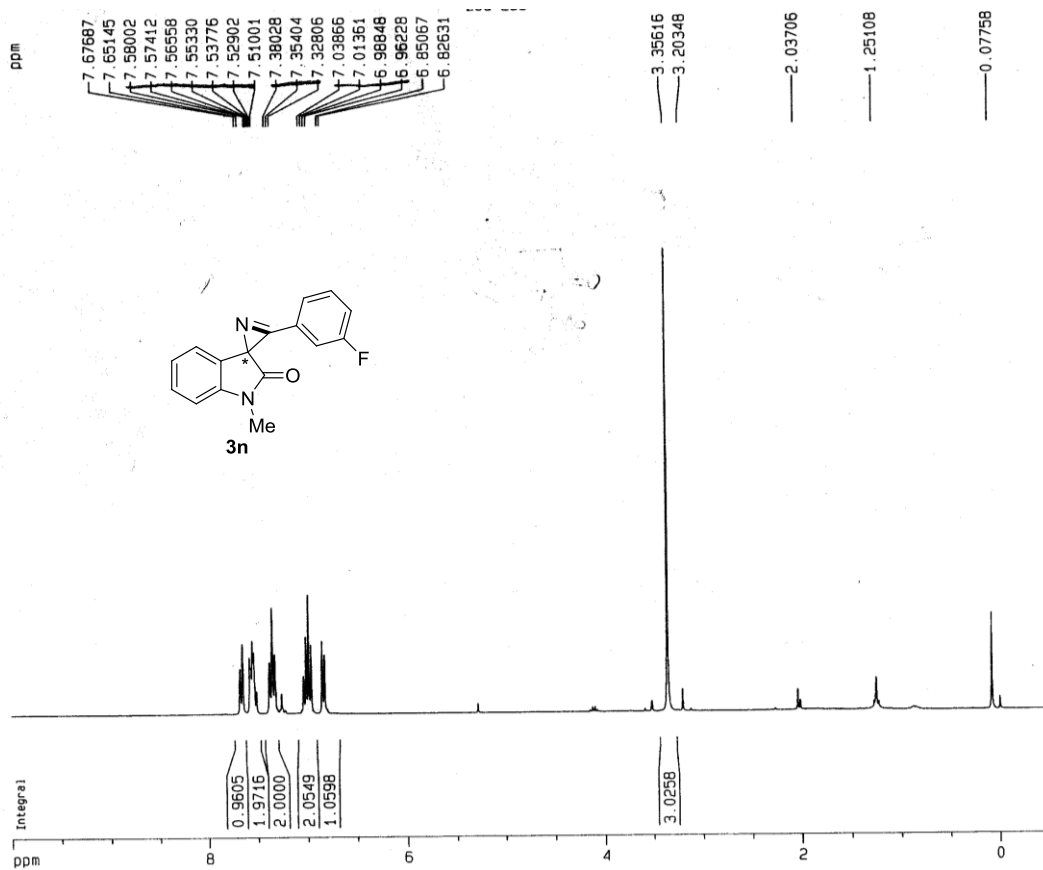


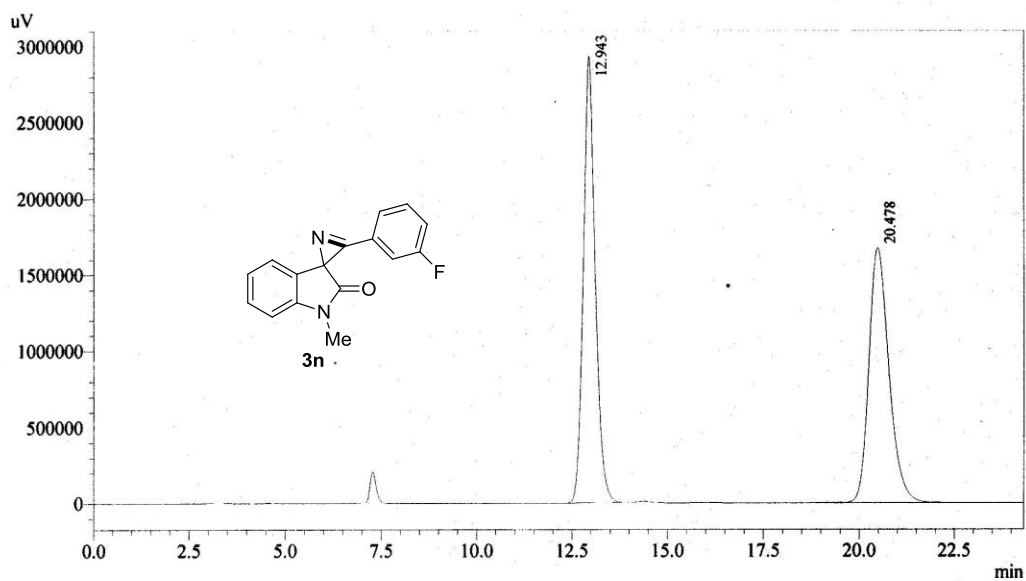
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.109	38342078	1503369	80.471	86.690
2	23.762	9304937	230817	19.529	13.310
Total		47647015	1734186	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3n**

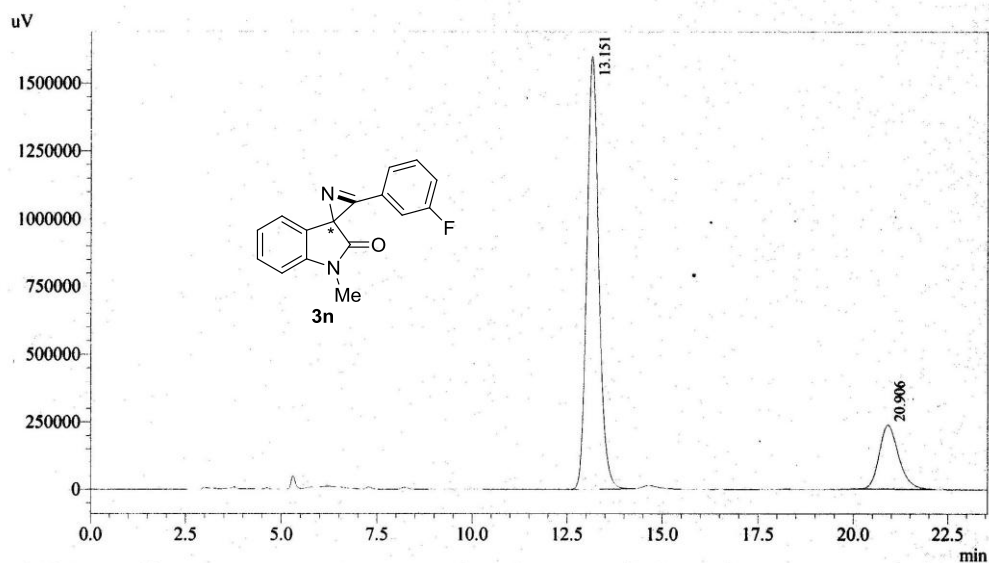




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	12.943	63458599	2935100	50.867	63.653
2	20.478	61296232	1676001	49.133	36.347
Total		124754831	4611101	100.000	100.000

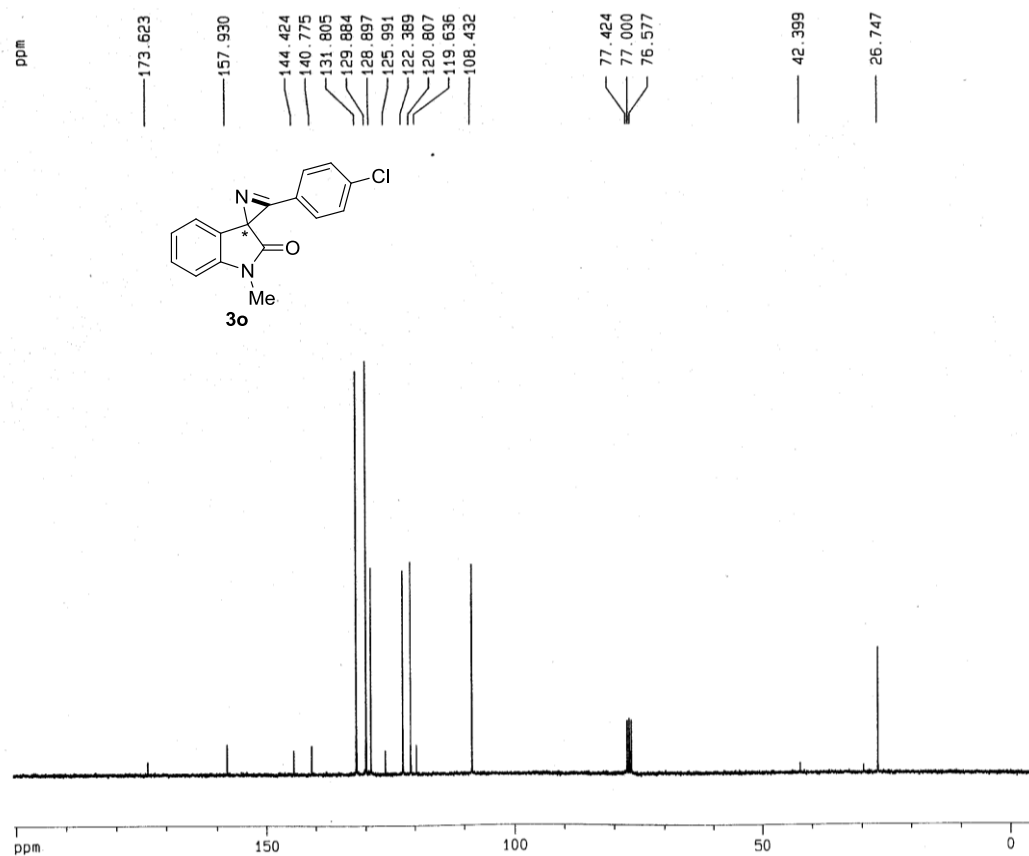
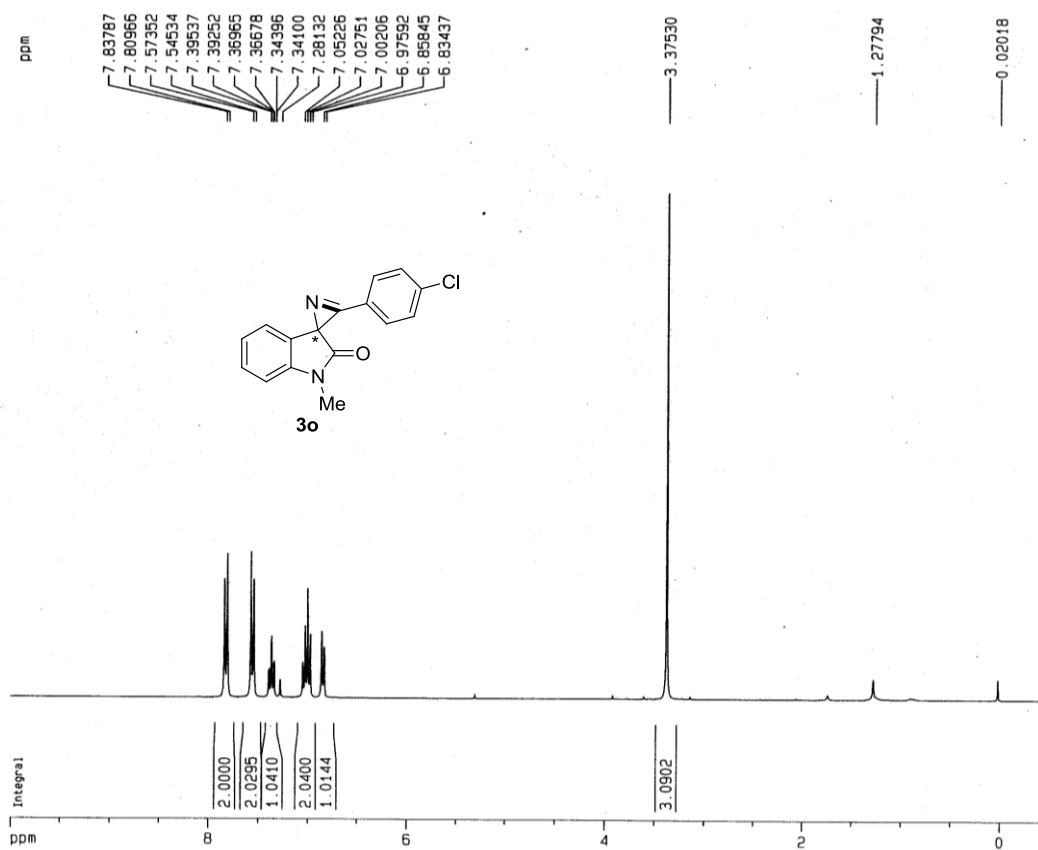


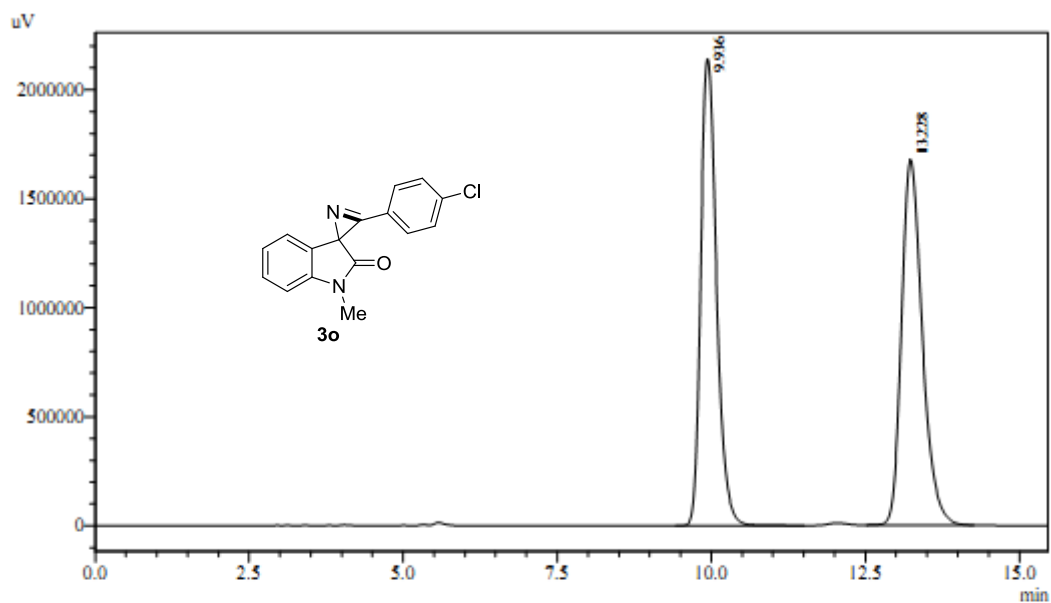
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.151	35012379	1601170	80.528	87.109
2	20.906	8466231	236955	19.472	12.891
Total		43478609	1838124	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3o**

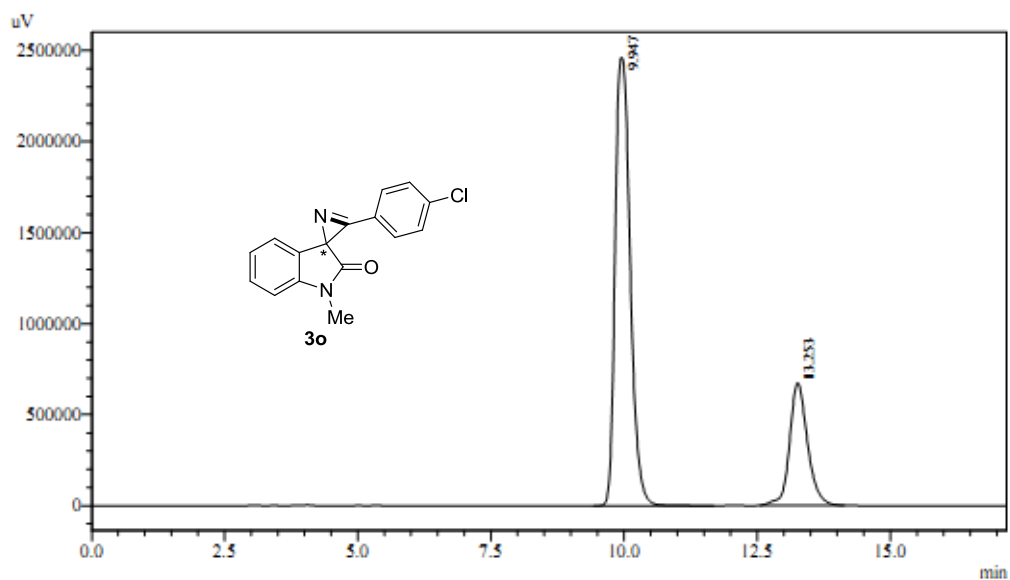




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.936	38203596	2141791	49.223	56.050
2	13.228	39410192	1679437	50.777	43.950
Total		77613789	3821228	100.000	100.000

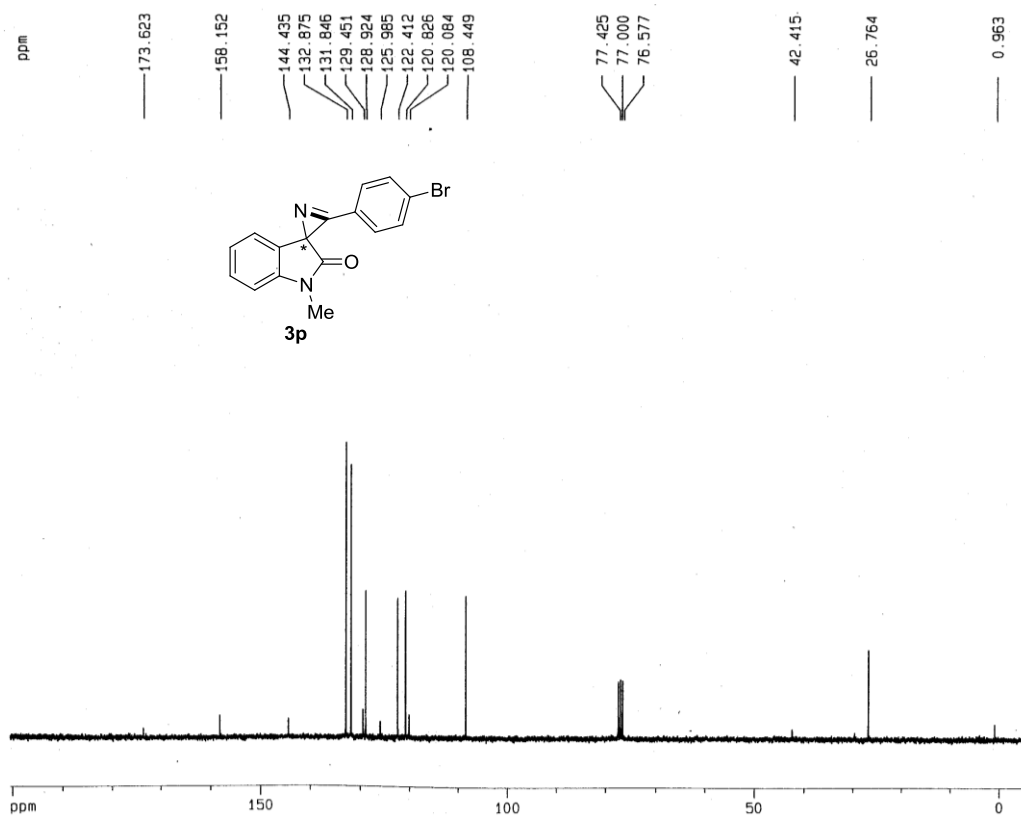
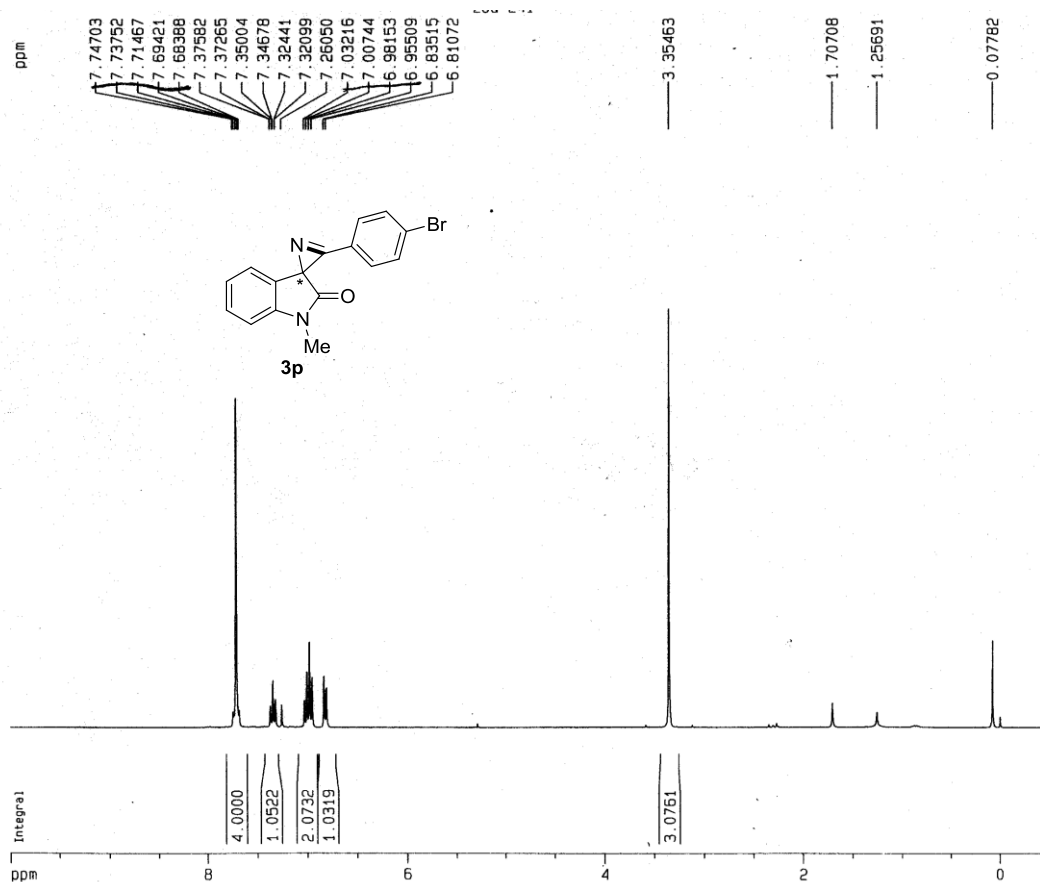


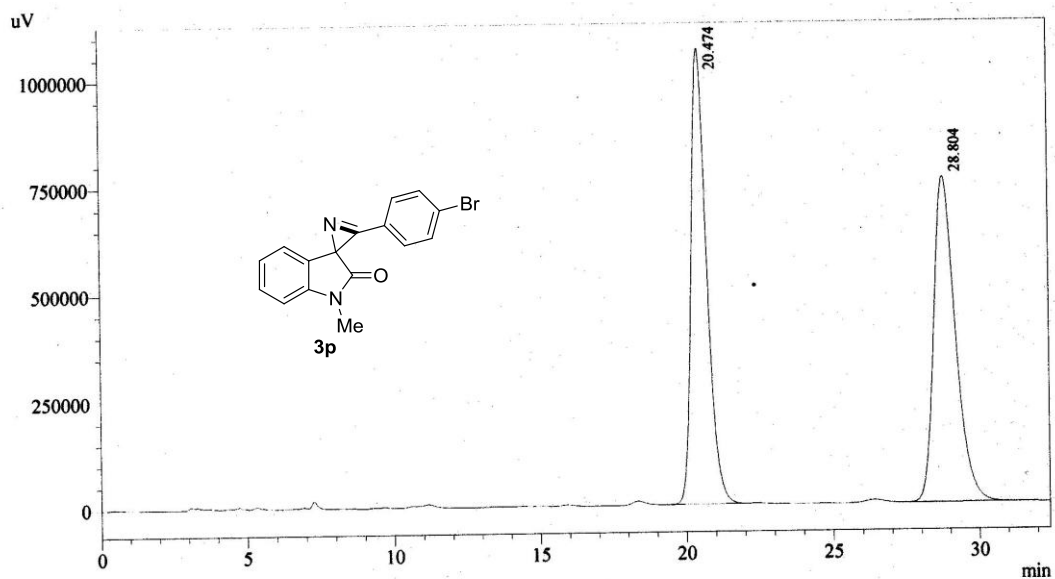
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.947	48508450	2462736	75.418	78.574
2	13.253	15811055	671554	24.582	21.426
Total		64319506	3134290	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3p**

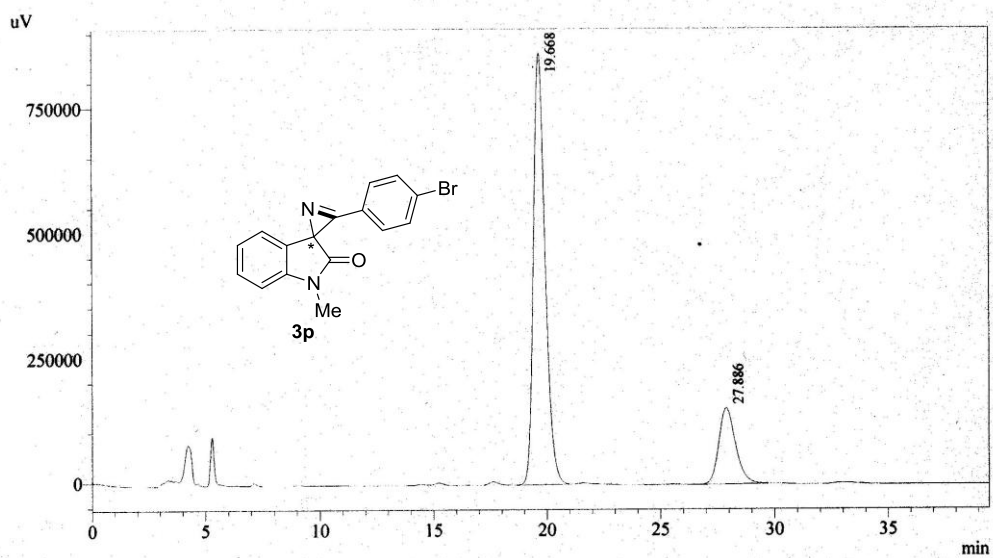




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	20.474	39266090	1066887	49.904	58.357
2	28.804	39417586	761332	50.096	41.643
Total		78683676	1828218	100.000	100.000

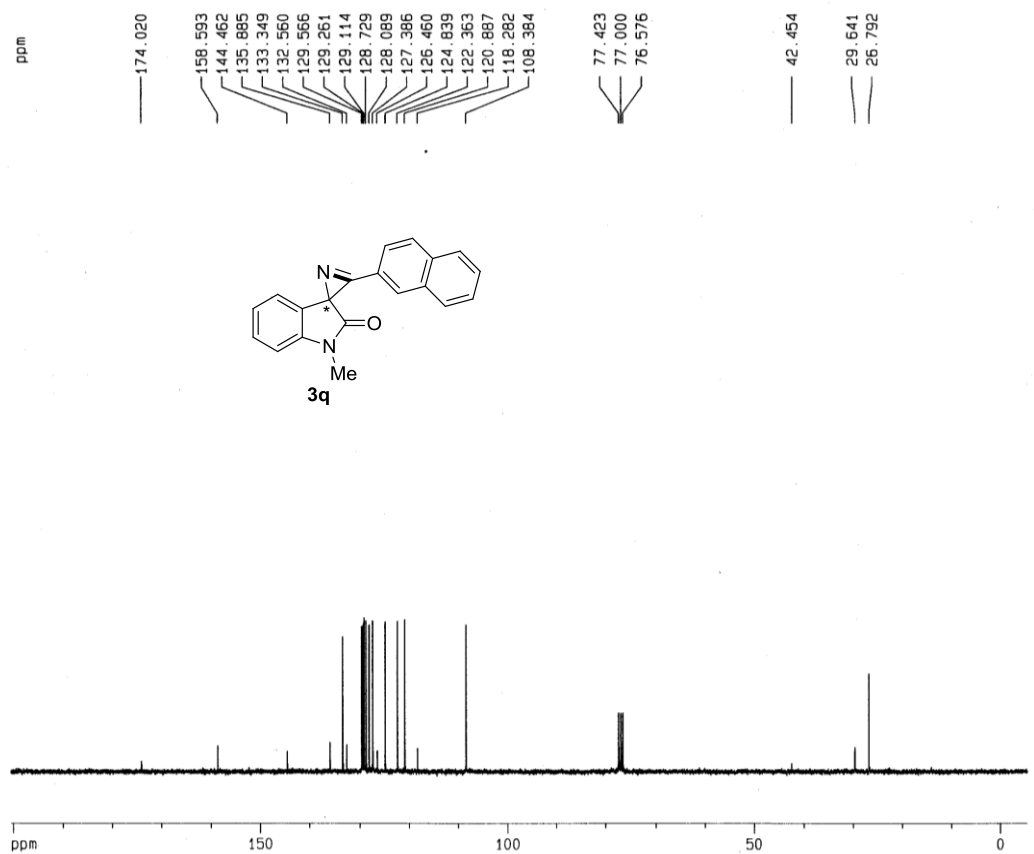
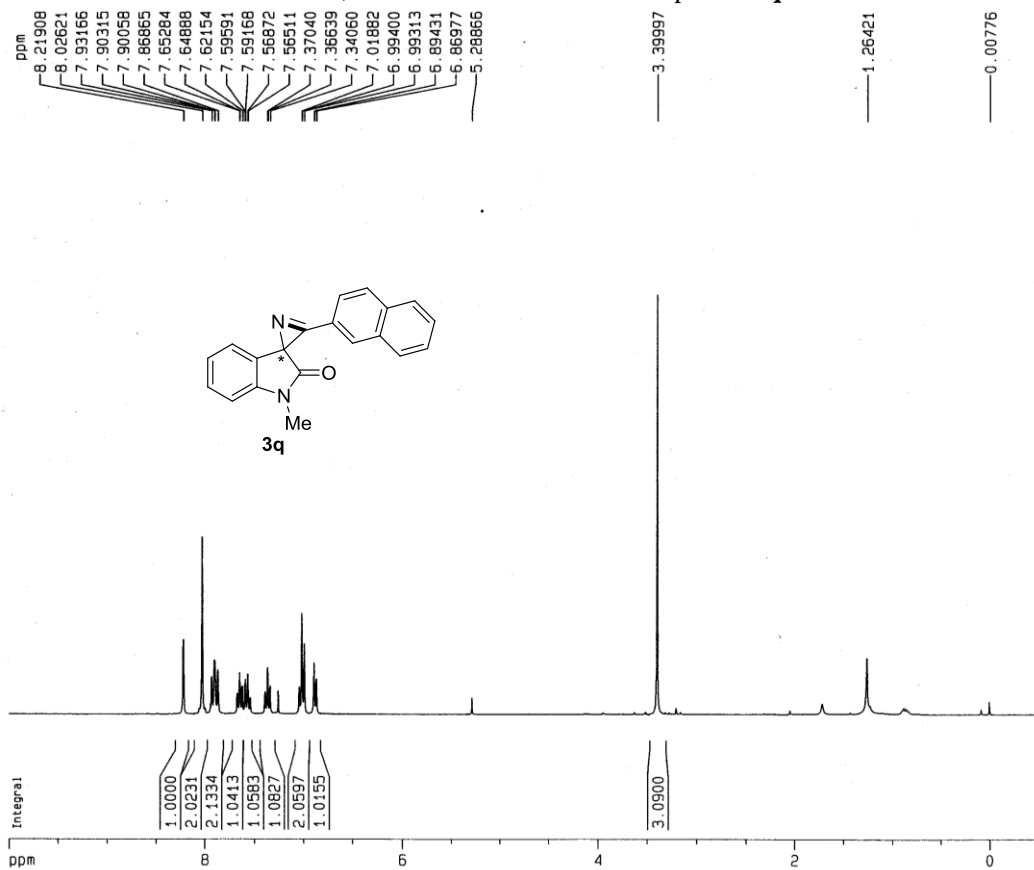


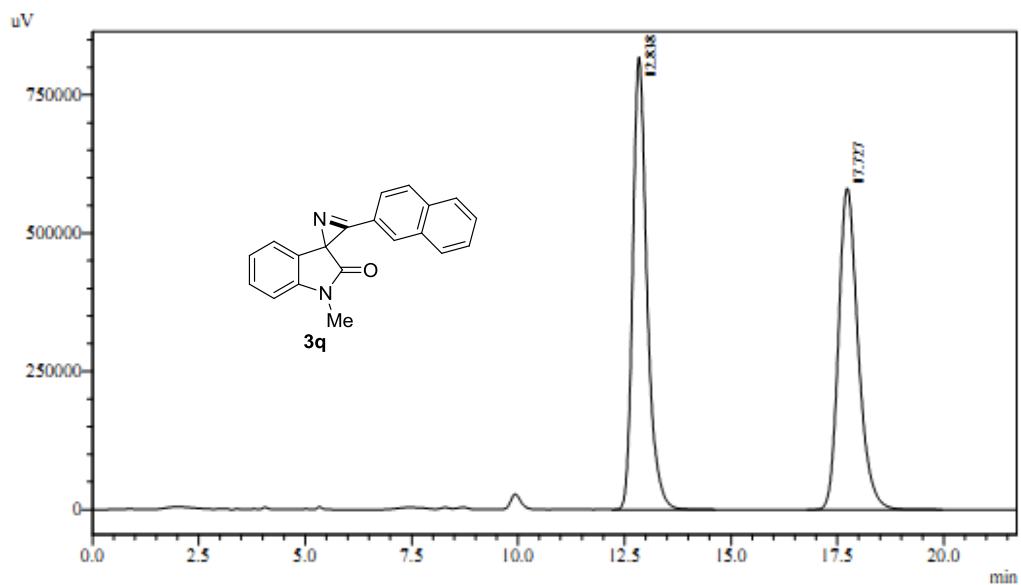
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	19.668	31104472	865742	80.043	85.026
2	27.886	7755473	152462	19.957	14.974
Total		38859946	1018204	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3q**

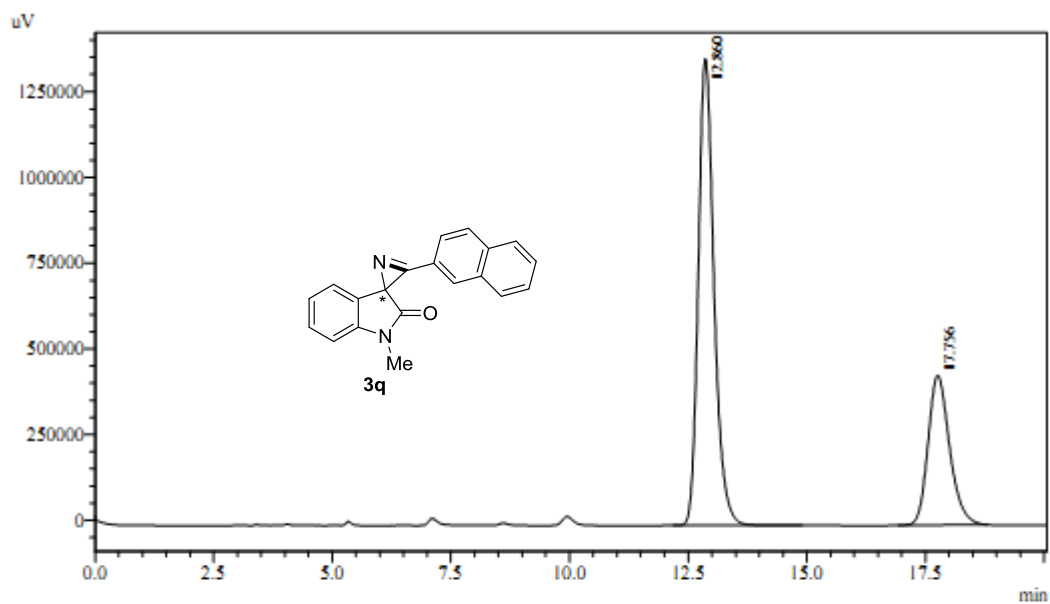




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	12.838	19019488	818666	50.485	58.457
2	17.727	18654360	581801	49.515	41.543
Total		37673848	1400467	100.000	100.000

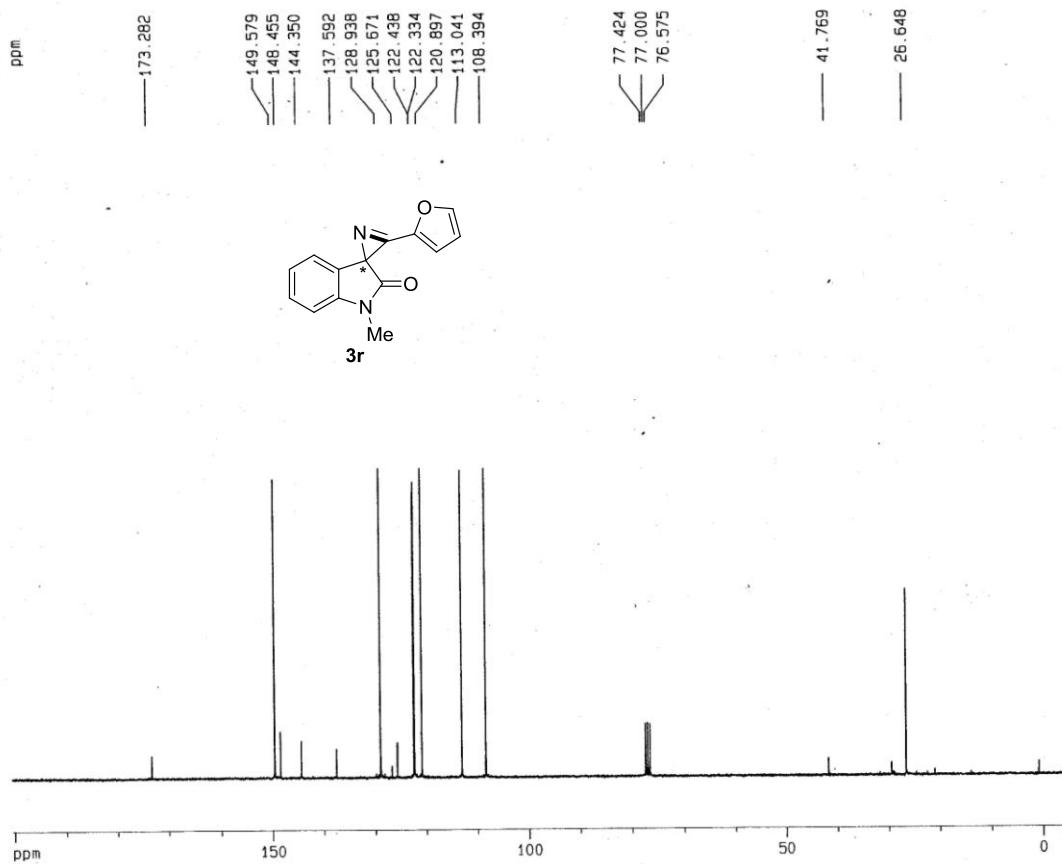
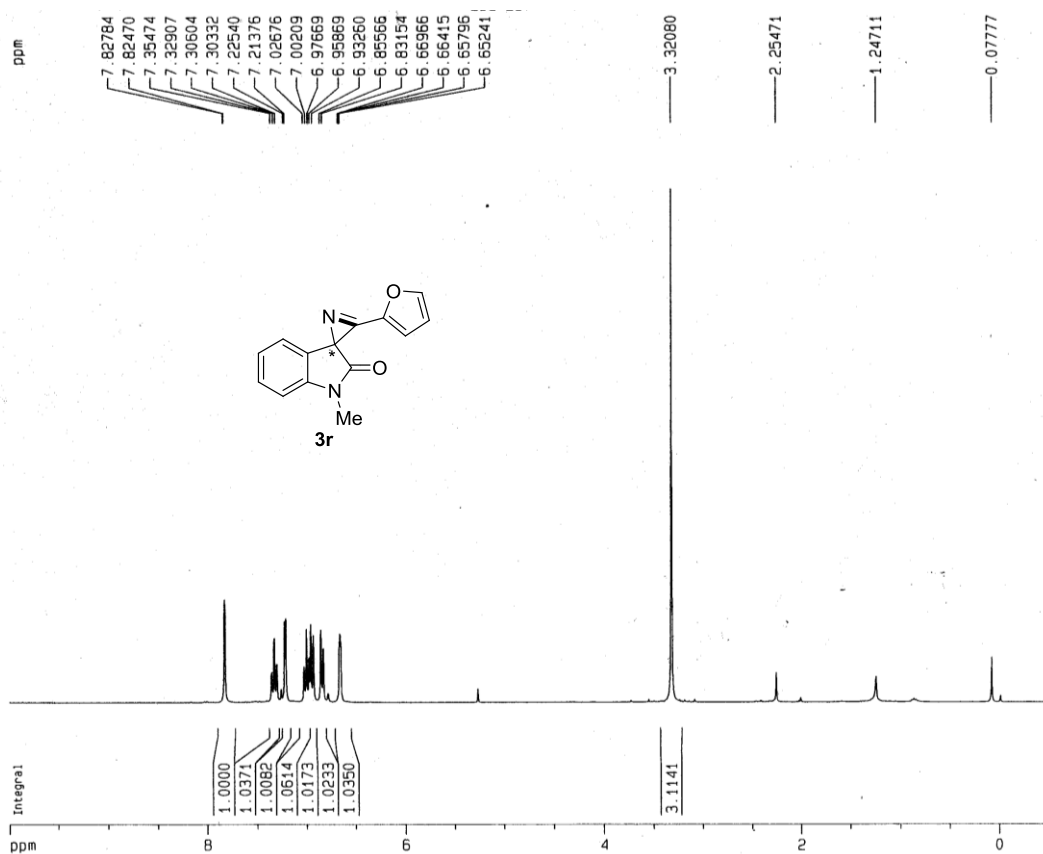


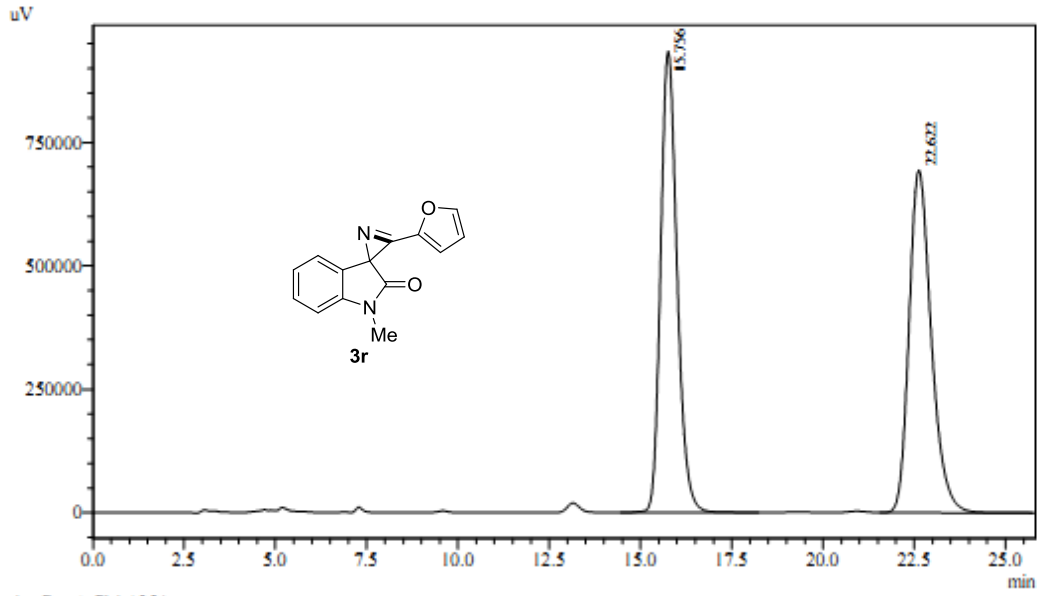
1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	12.860	31459564	1360998	69.479	75.709
2	17.756	13819616	436665	30.521	24.291
Total		45279180	1797663	100.000	100.000

¹H NMR, ¹³C NMR and HPLC of compound **3r**

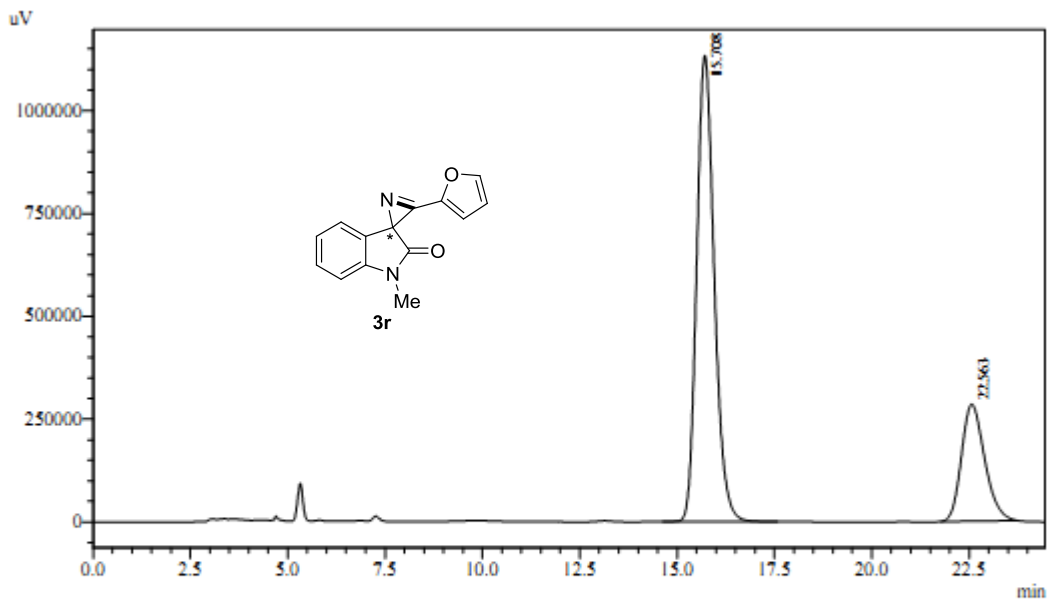




1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.756	29351062	934265	49.958	57.399
2	22.622	29400153	693406	50.042	42.601
Total		58751215	1627672	100.000	100.000

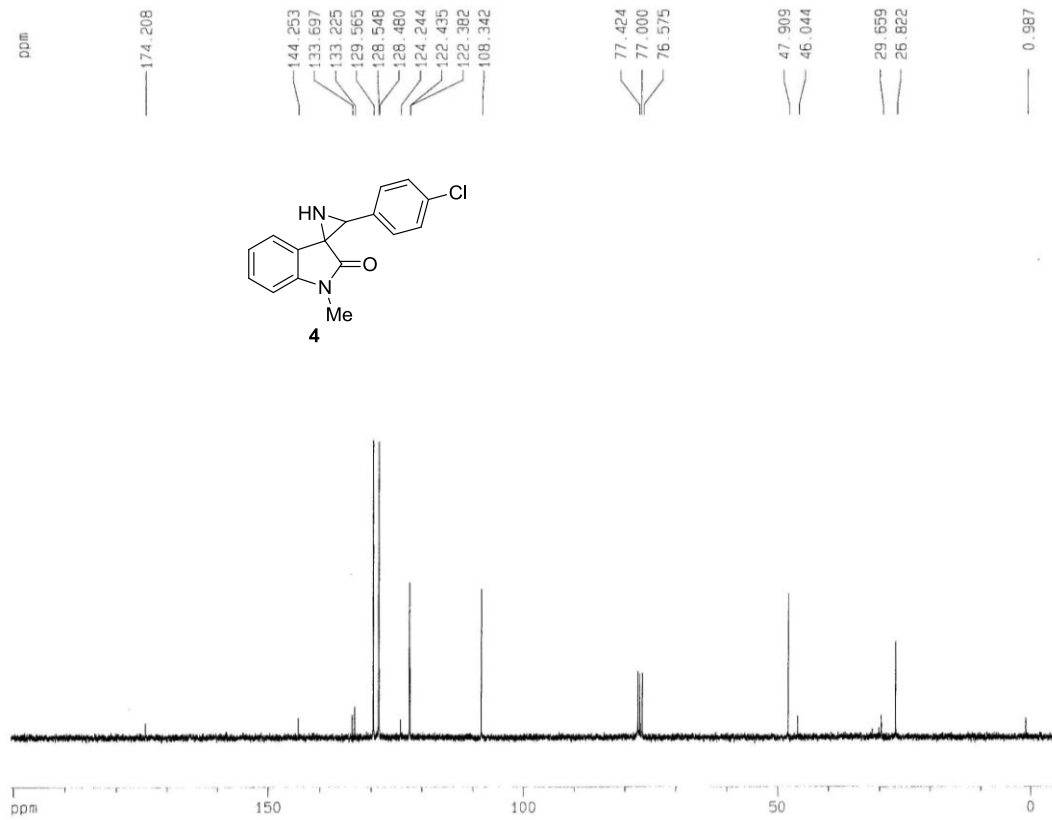
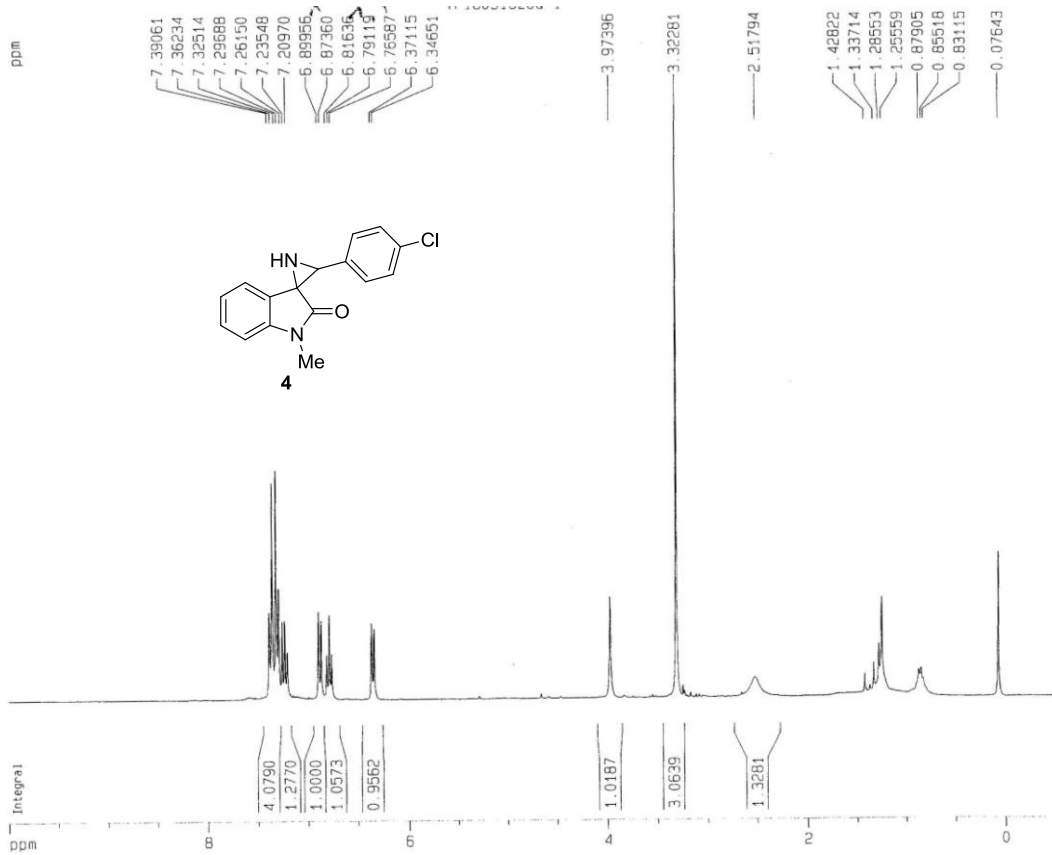


1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.708	35682379	1132855	75.142	79.950
2	22.563	11804375	284091	24.858	20.050
Total		47486754	1416946	100.000	100.000

¹H NMR and ¹³C NMR of compound 4



¹H NMR and ¹³C NMR of compound 5

