

**PPh<sub>3</sub> Mediated Reductive Annulation Reaction between Isatins  
and Electron Deficient Dienes to Construct Spirooxindole  
Compounds**

**Supportting information**

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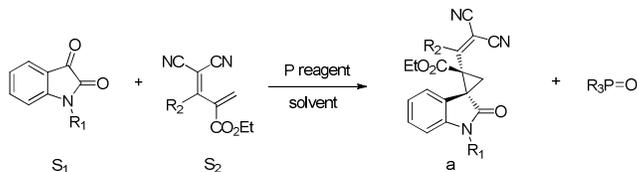
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# 1. Mechanistic and control experiment

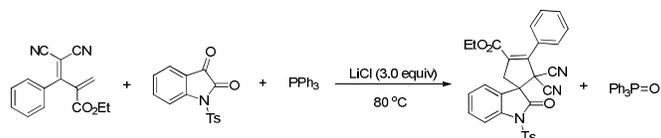
**Table S1. Screening of the solvents for cyclopropanation**



entry	R <sub>1</sub>	R <sub>2</sub>	P reagent	S1:S2:P reagent	dr <sup>d</sup>	solvent	temp (°C)	time (h)	yield <sup>b</sup> (%)
1	Ts	Ph	PPh <sub>3</sub>	1.5:1:1.5	6:1	CHCl <sub>3</sub>	reflux	10	77
2	Ts	Ph	PPh <sub>3</sub>	1.5:1:1.5	6:1	DCM	reflux	12	75
3	Ts	Ph	PPh <sub>3</sub>	1.5:1:1.5	6:1	CH <sub>3</sub> CN	60	10	72
4	Ts	Ph	PPh <sub>3</sub>	1.5:1:1.5	6:1	THF	reflux	30	58
5	Ts	Ph	PPh <sub>3</sub>	1.5:1:1.5	6:1	DMF	60	24	64
6	Ts	Ph	PPh <sub>3</sub>	1.5:1:1.5	--	MeOH	reflux	—	—
7.	Ts	Ph	PPh <sub>3</sub>	1.5:1:1.5	6:1	toluene	60	24	83

<sup>a</sup> Determined by <sup>1</sup>H NMR analysis. <sup>b</sup> Isolated yield of main configuration product.

**Table S2. Screening of the solvents for cyclopentation**

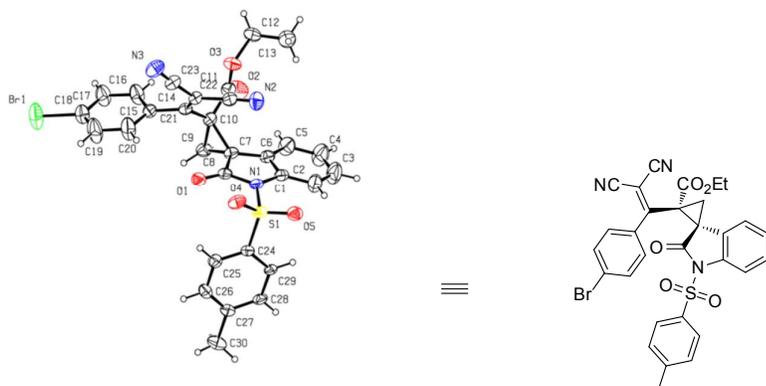


entry	solvent	time (h)	yield <sup>a</sup>
1	MeOH	20	N.R.
2	DCM	20	63%
3	THF	20	15%
4	CH <sub>3</sub> CN	20	19%
5	xylene	20	29%
6	DMF	20	57%
7	toluene	20	69%
8	DCE	20	81%

<sup>a</sup> Isolated yield of the major product.

## 2. Crystallographic Details

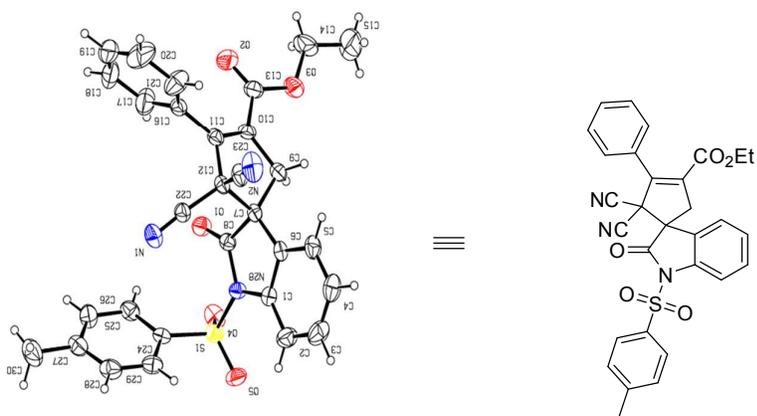
**Figure S1. X-ray crystal structure of 3j**



CCDC number : 1424174

Ellipsoid contour percent probability level: 30%

**Figure S2. X-ray crystal structure of 4a**



CCDC number: 1424175

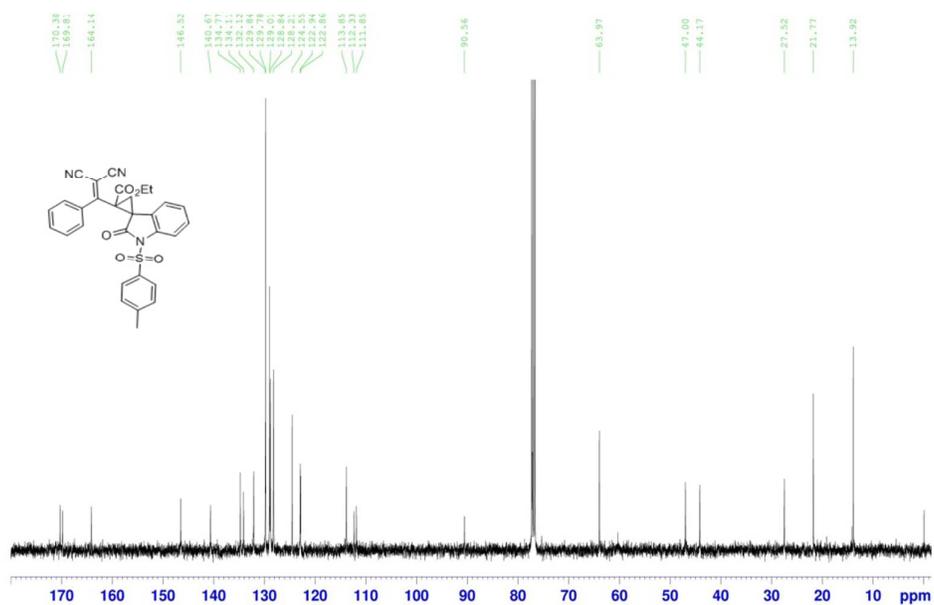
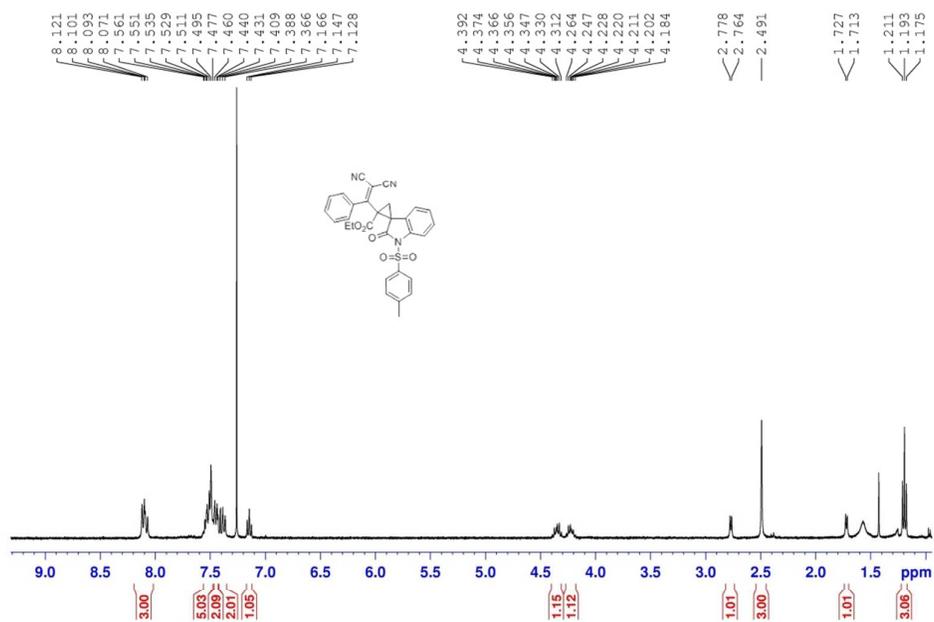
Ellipsoid contour percent probability level: 30%

For more details of X-ray data, see the corresponding “cif” type documents of supporting information.

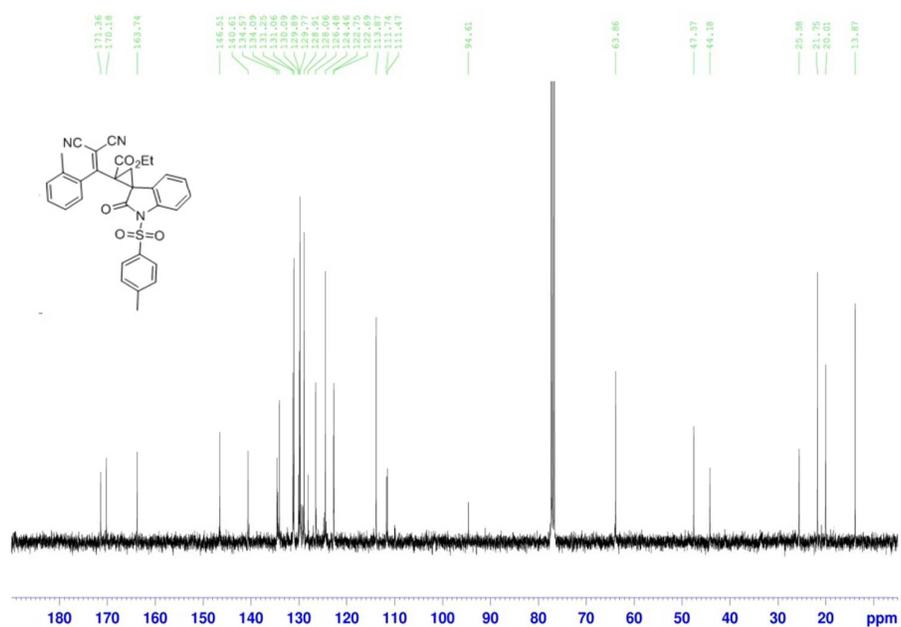
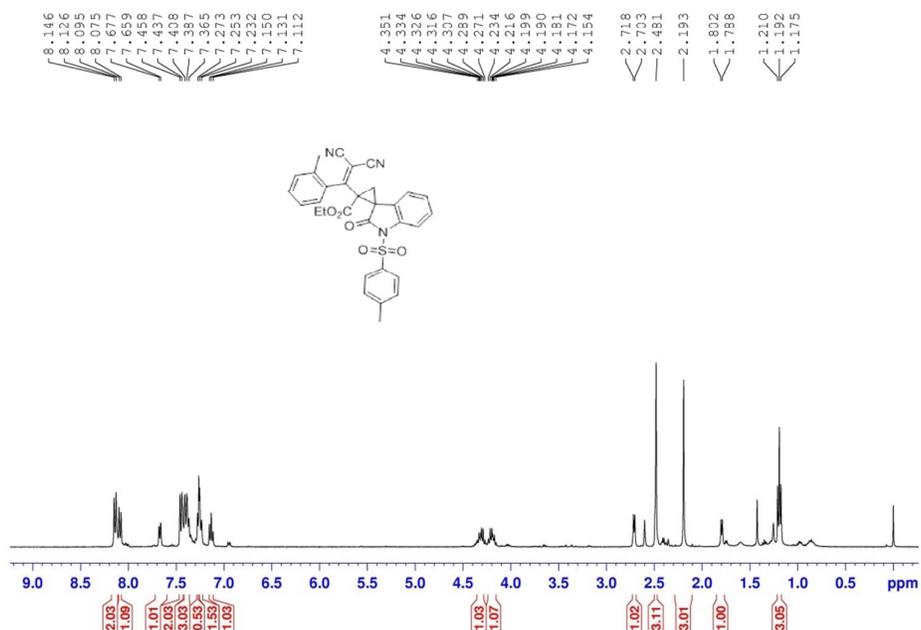
### 3. <sup>1</sup>H NMR and <sup>13</sup>C NMR spectra of products

Ethyl

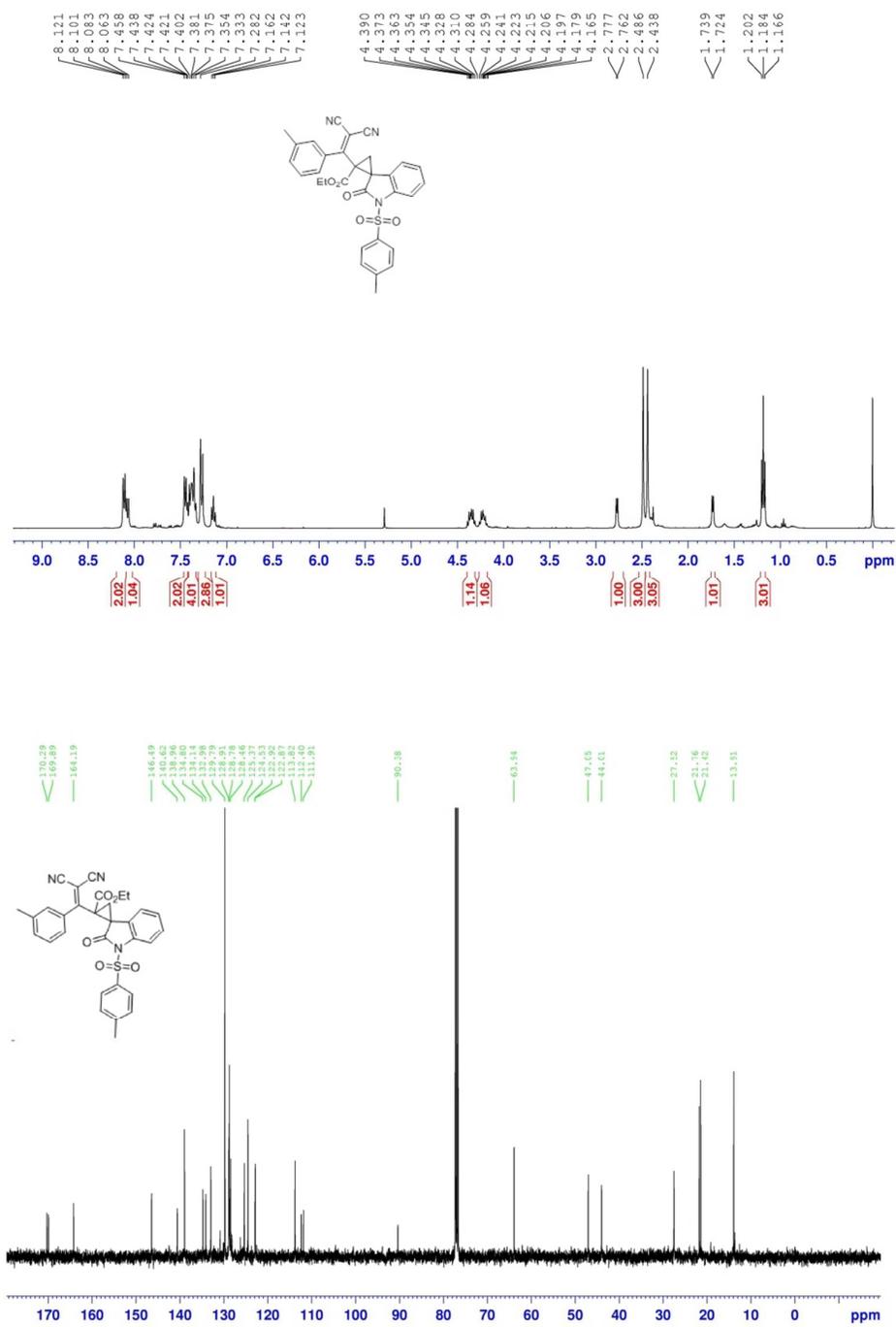
2-(2,2-dicyano-1-phenylvinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate **3a**



**Ethyl 2-(2, 2-dicyano-1-(o-tolyl)vinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3b**

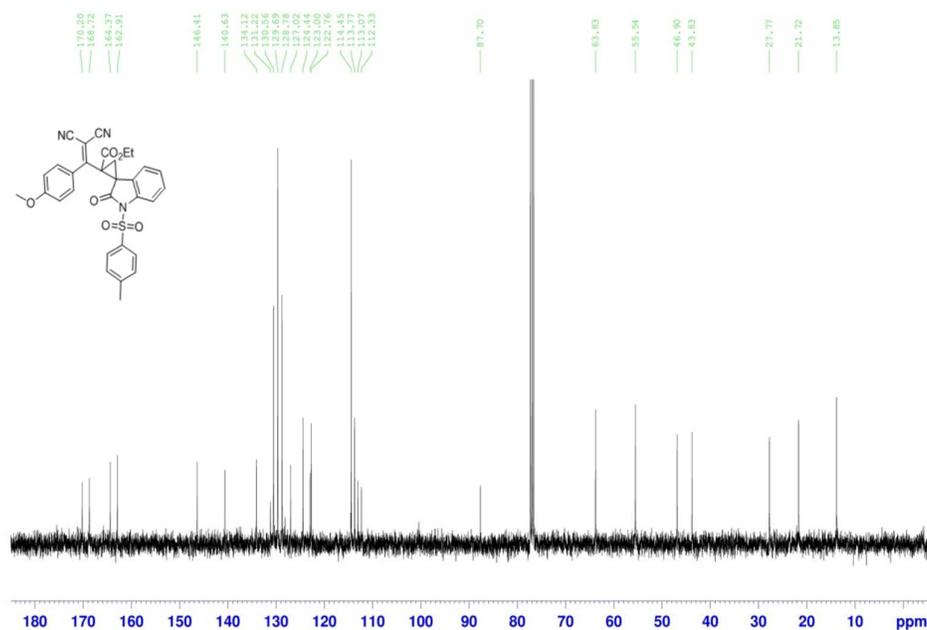
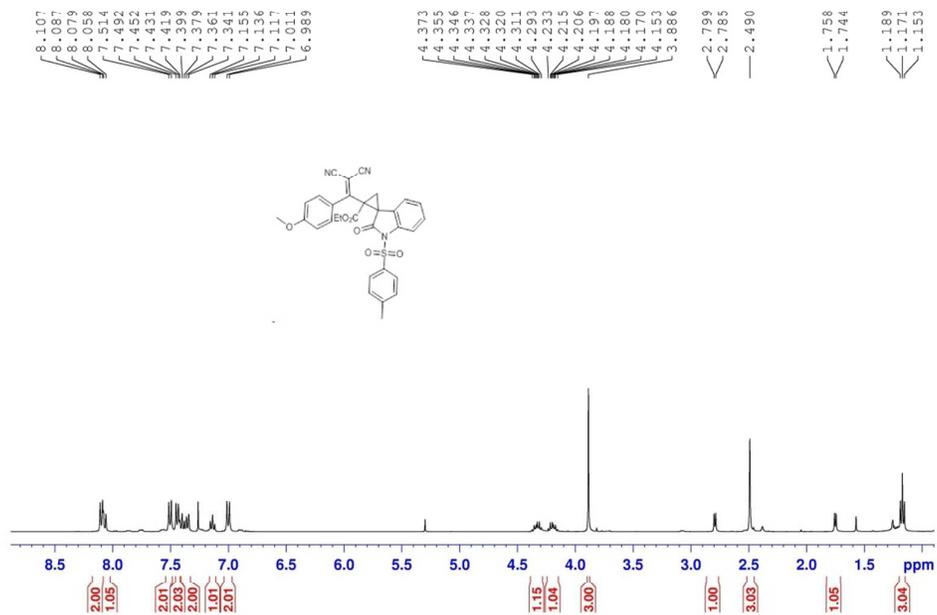


**Ethyl 2-(2, 2-dicyano-1-(m-tolyl)vinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3c**

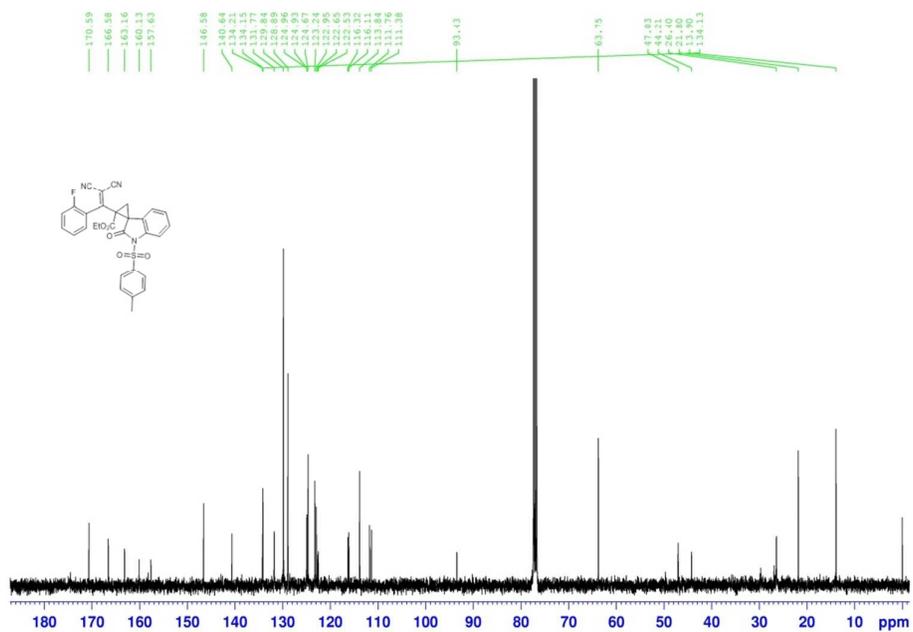
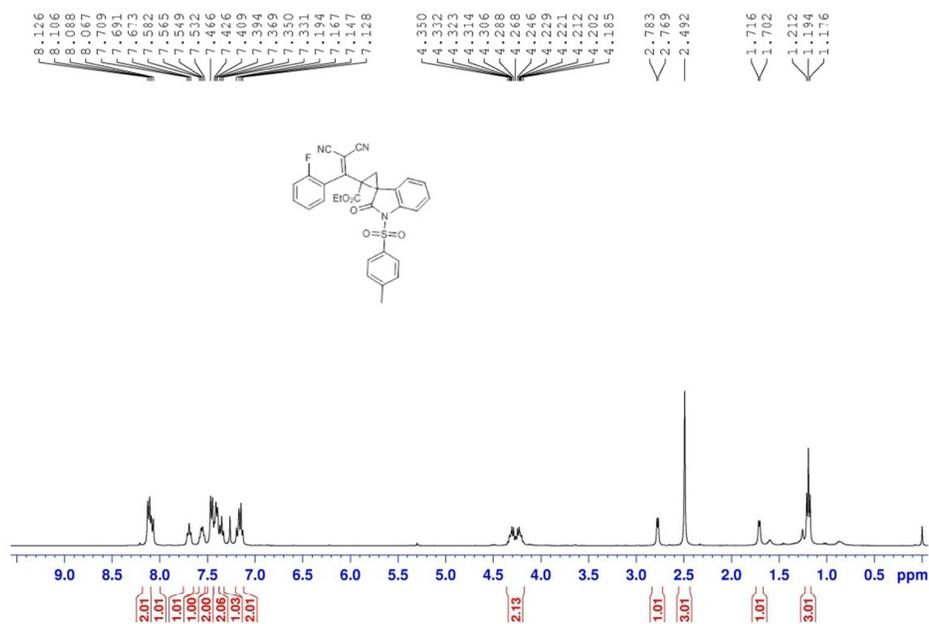




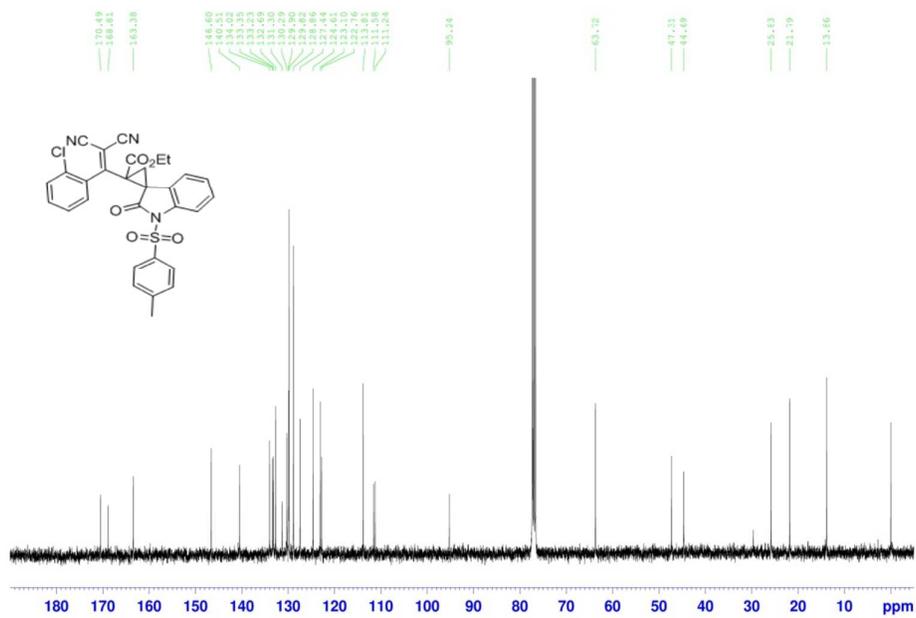
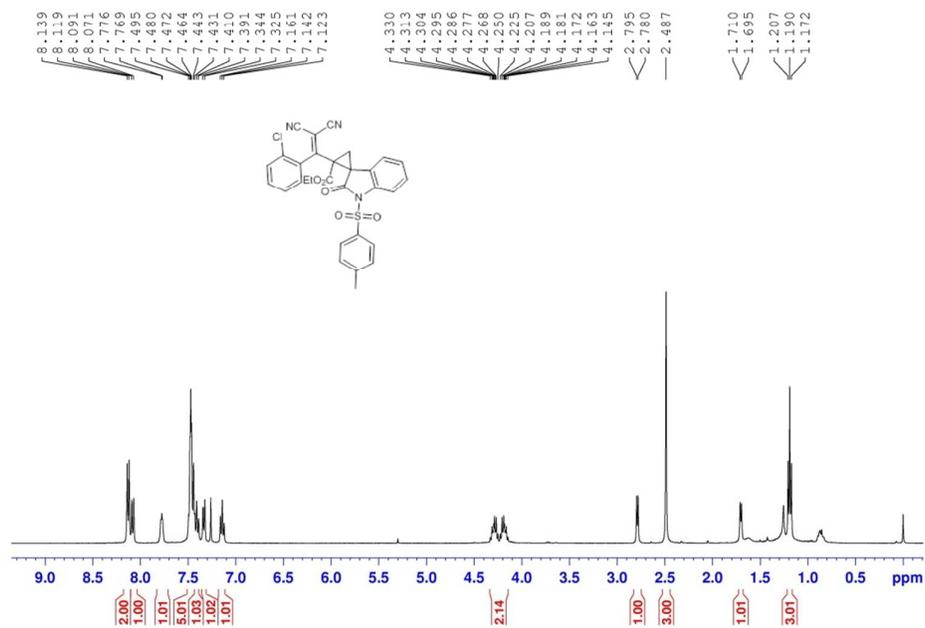
**Ethyl 2-(2,2-dicyano-1-(4-methoxyphenyl)vinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3e**



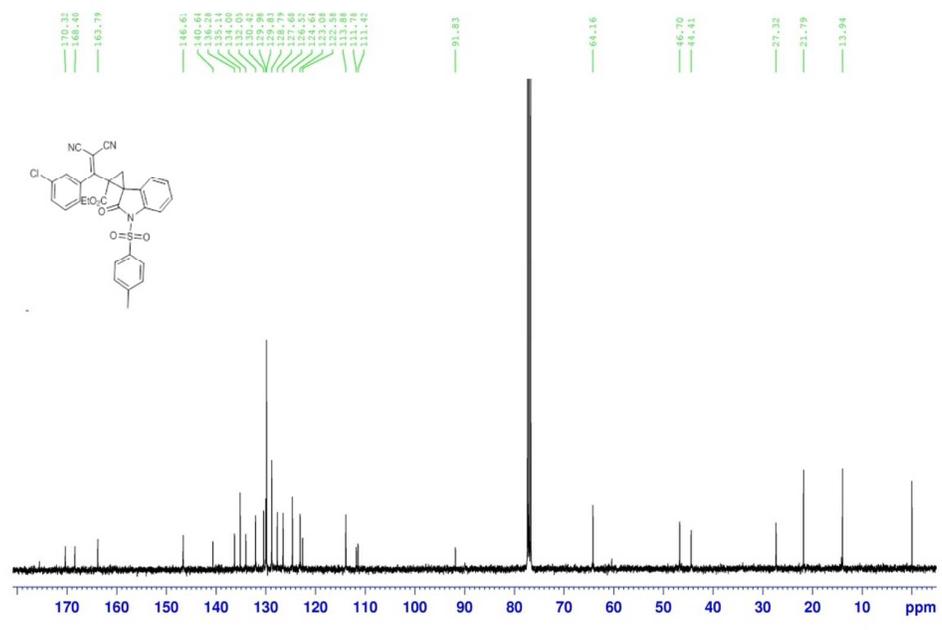
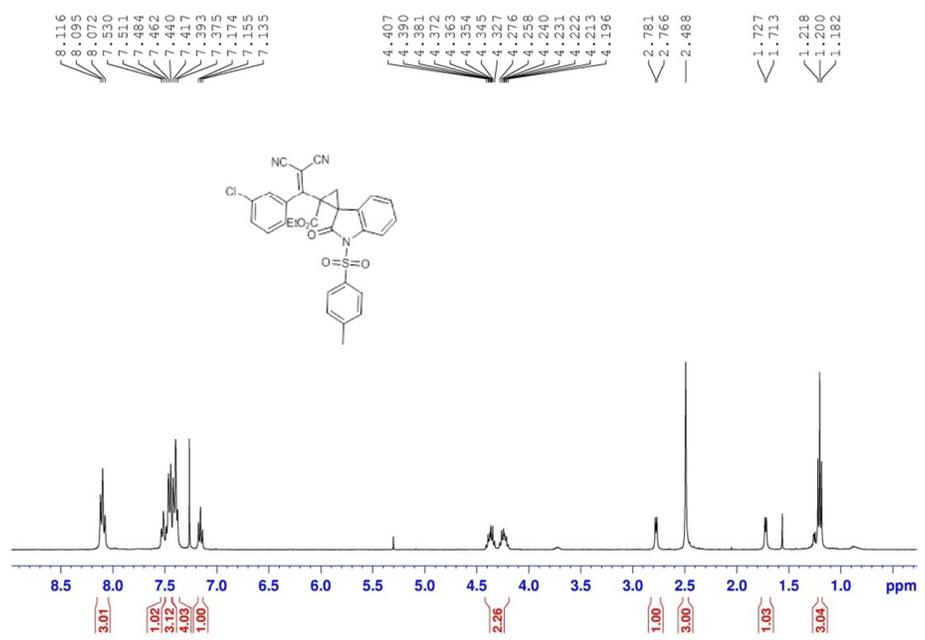
**Ethyl 2-(2,2-dicyano-1-(2-fluorophenyl)vinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3f**



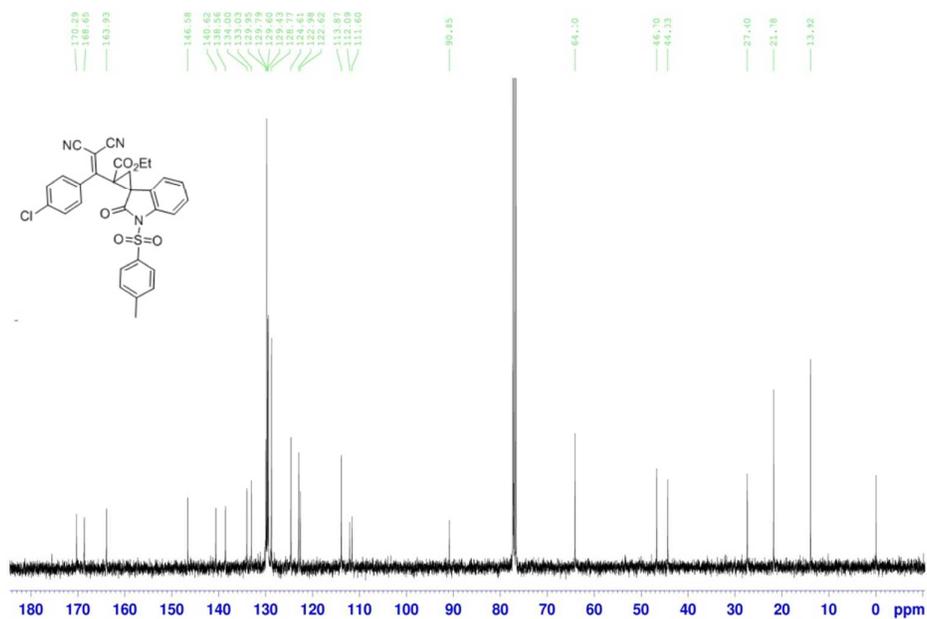
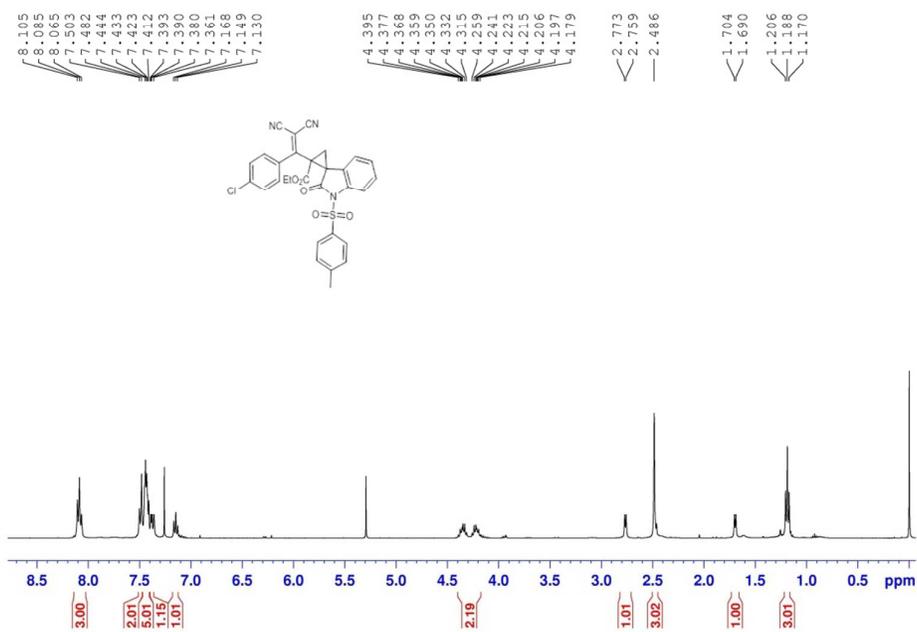
**Ethyl 2-(1-(2-chlorophenyl)-2,2-dicyanovinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3g**



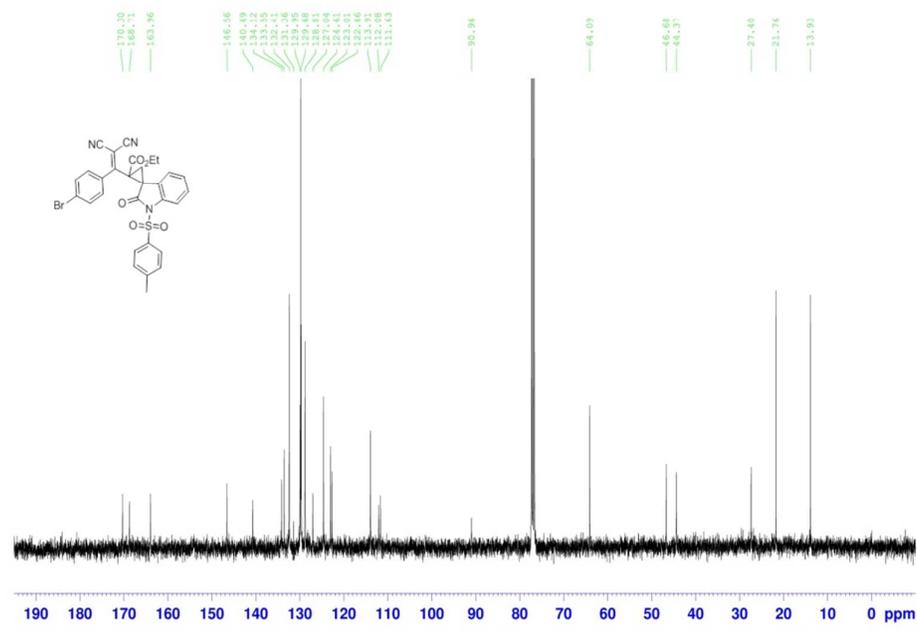
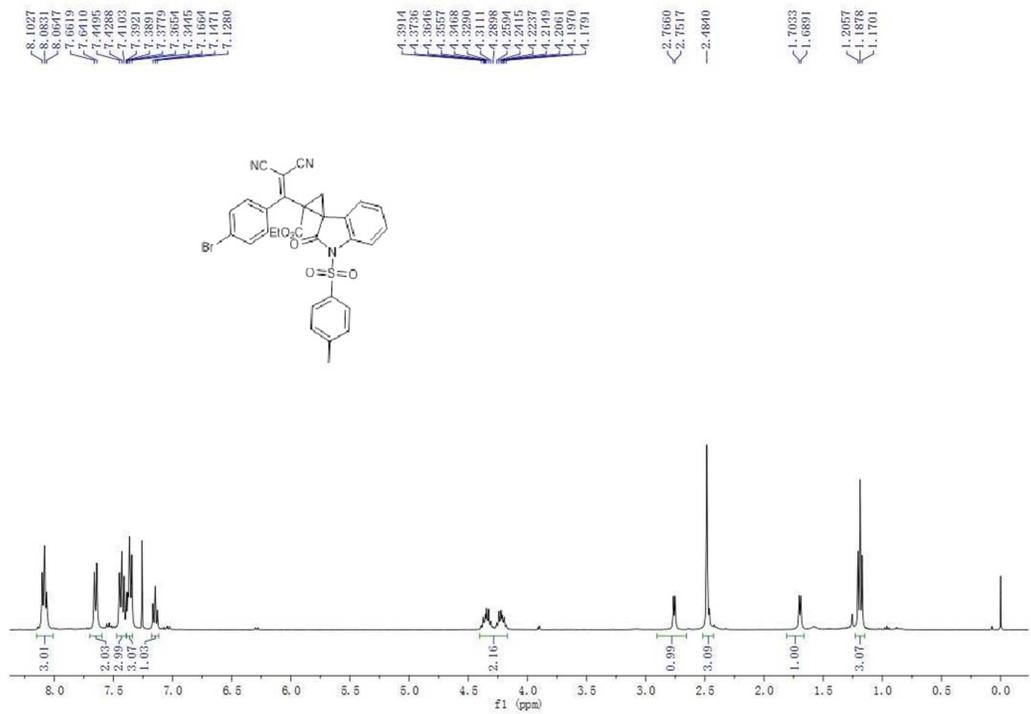
**Ethyl 2-(1-(3-chlorophenyl)-2,2-dicyanovinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3h**



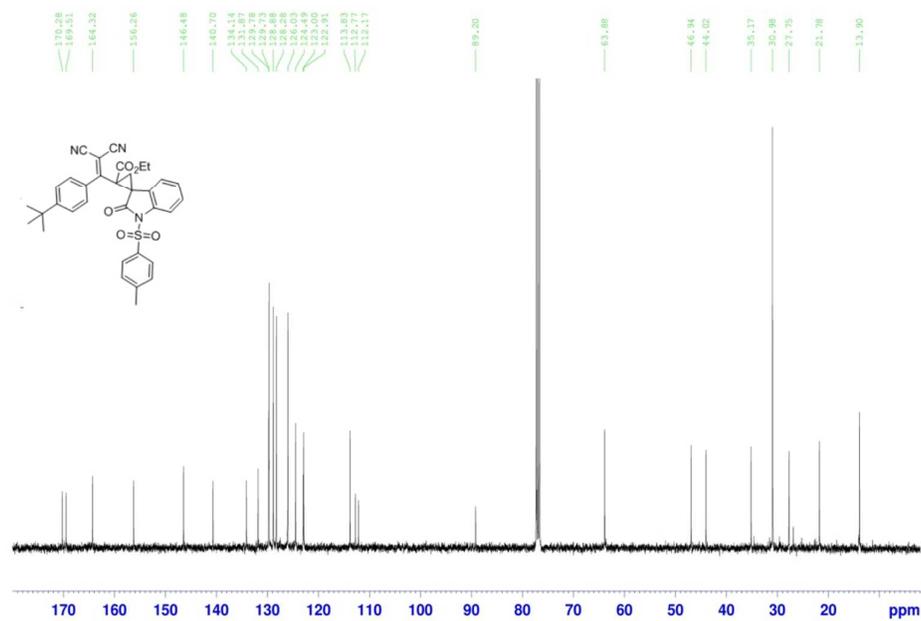
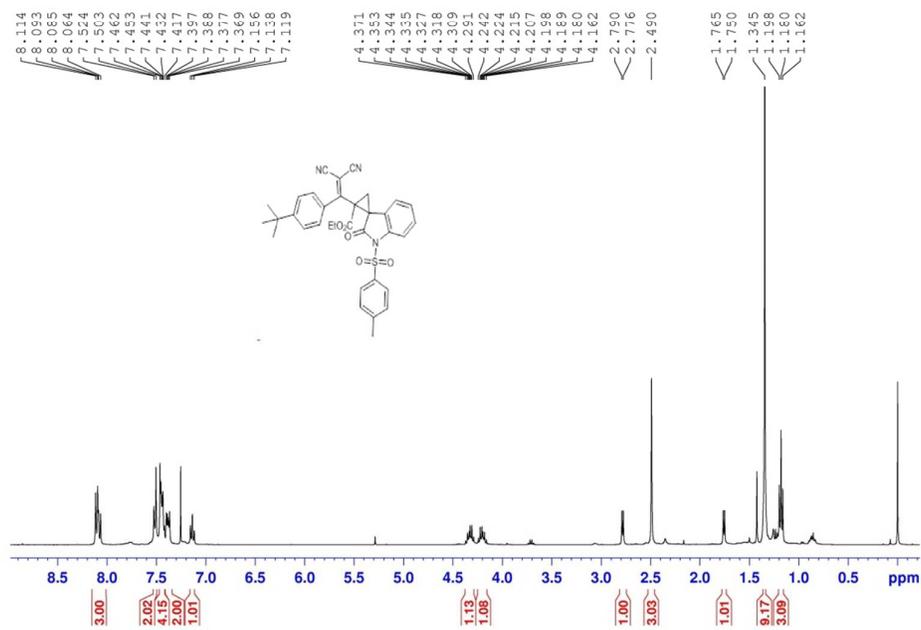
**Ethyl 2-(1-(4-chlorophenyl)-2,2-dicyanovinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-Carboxylate 3i**



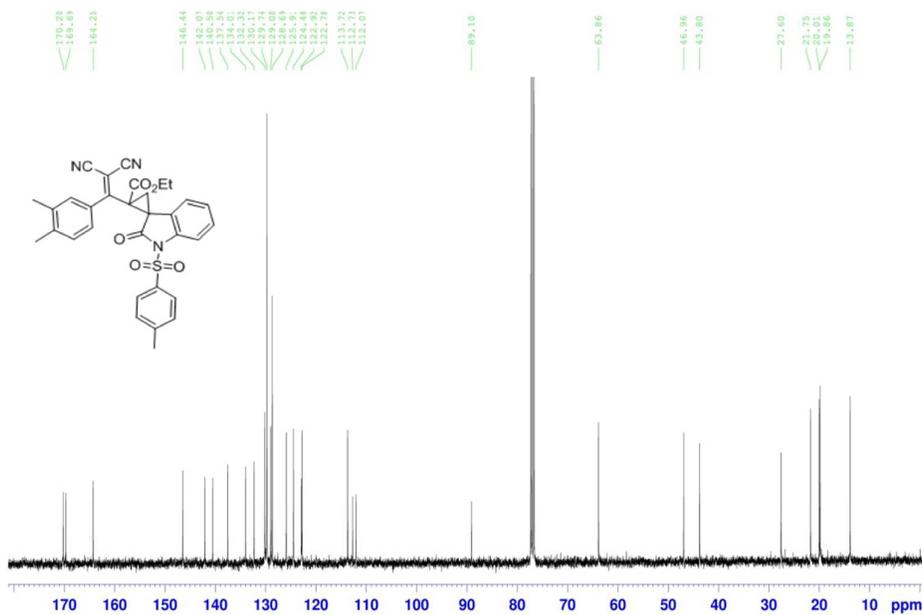
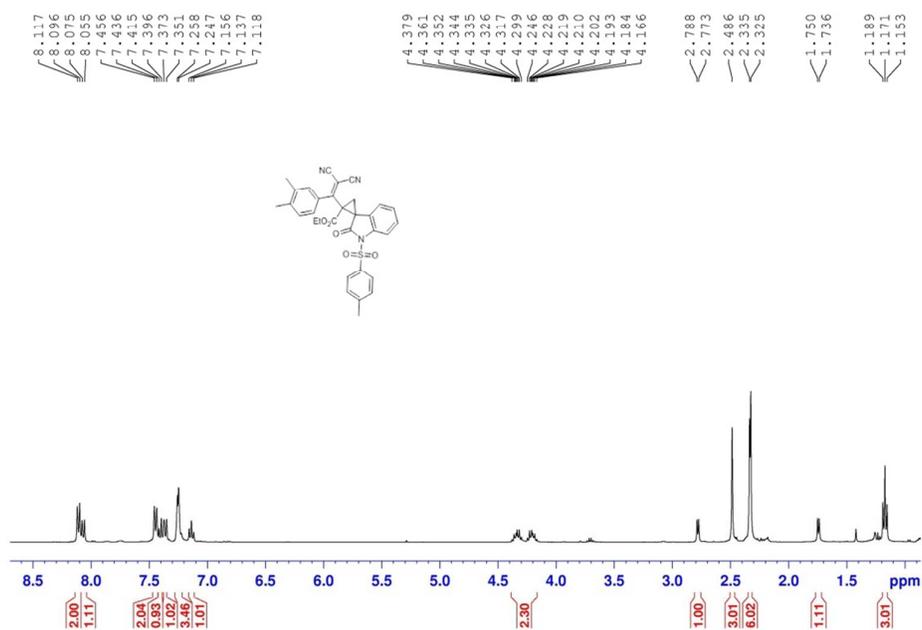
**Ethyl 2-(1-(4-bromophenyl)-2,2-dicyanovinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3j**



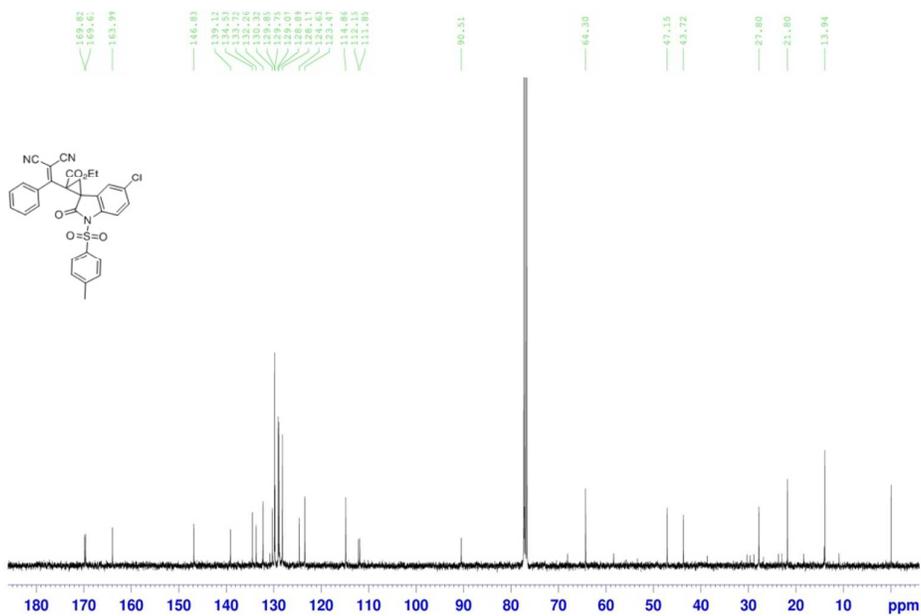
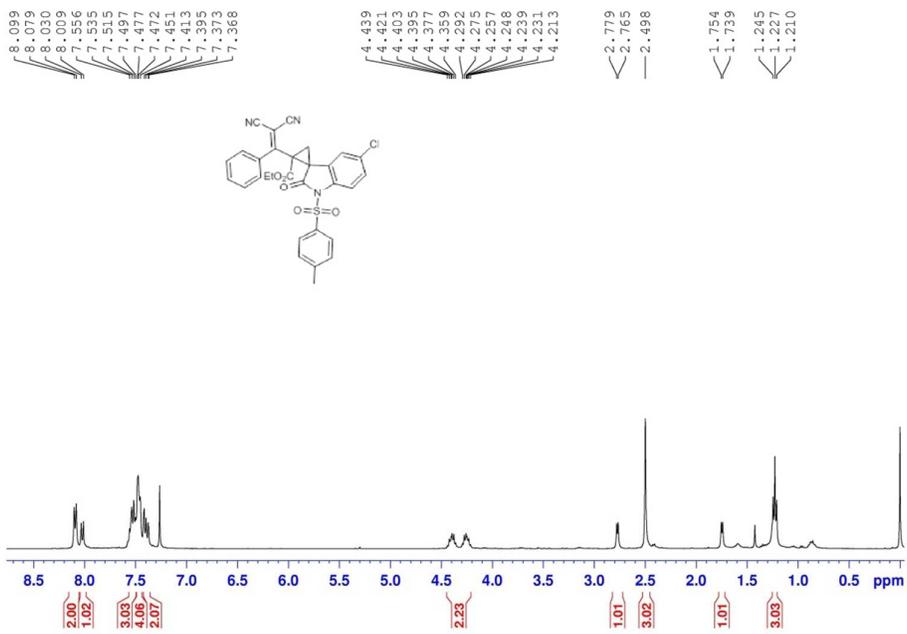
**Ethyl 2-(1-(4-(tert-butyl)phenyl)-2,2-dicyanovinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3k**



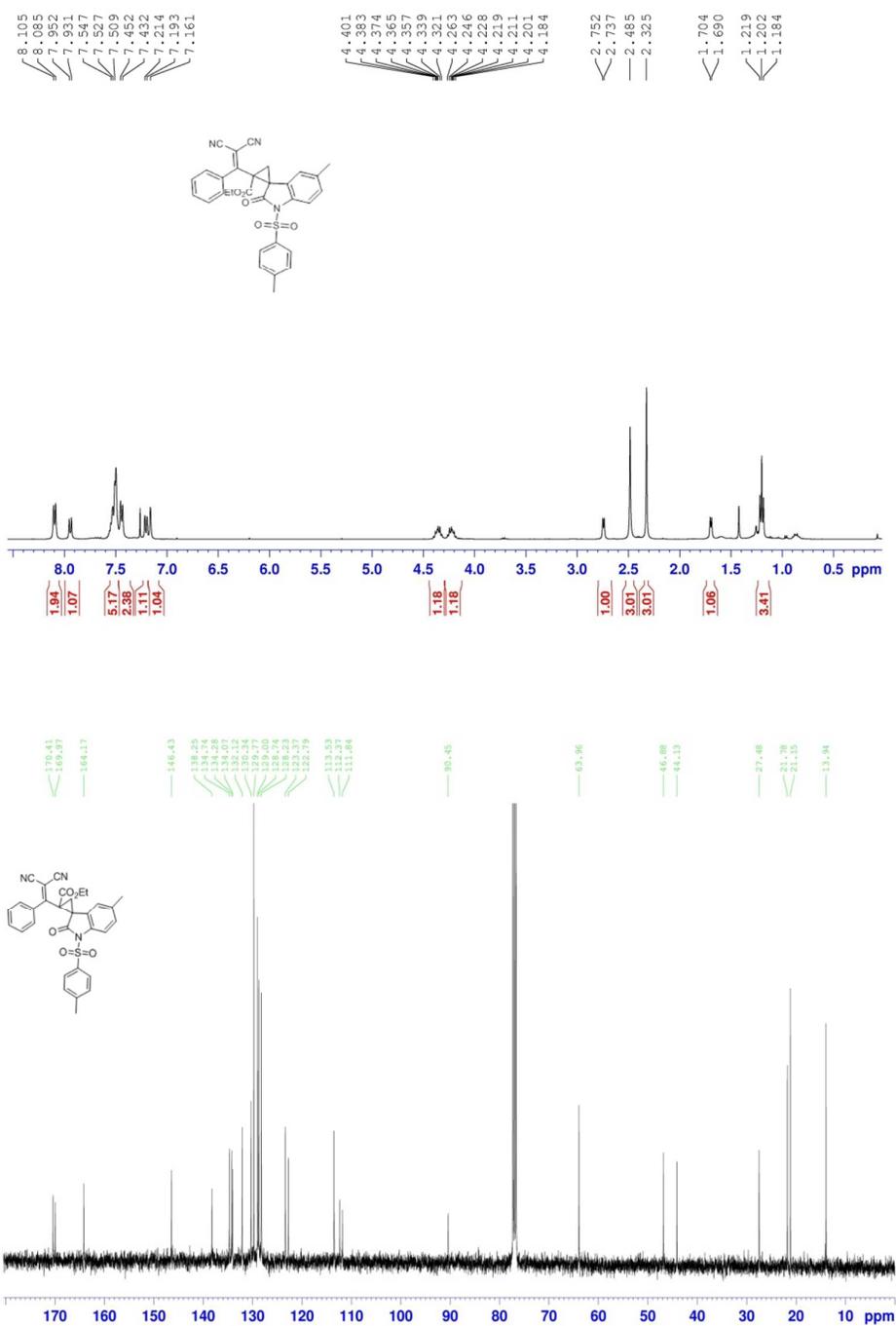
**Ethyl 2-(2,2-dicyano-1-(3,4-dimethylphenyl)vinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3l**



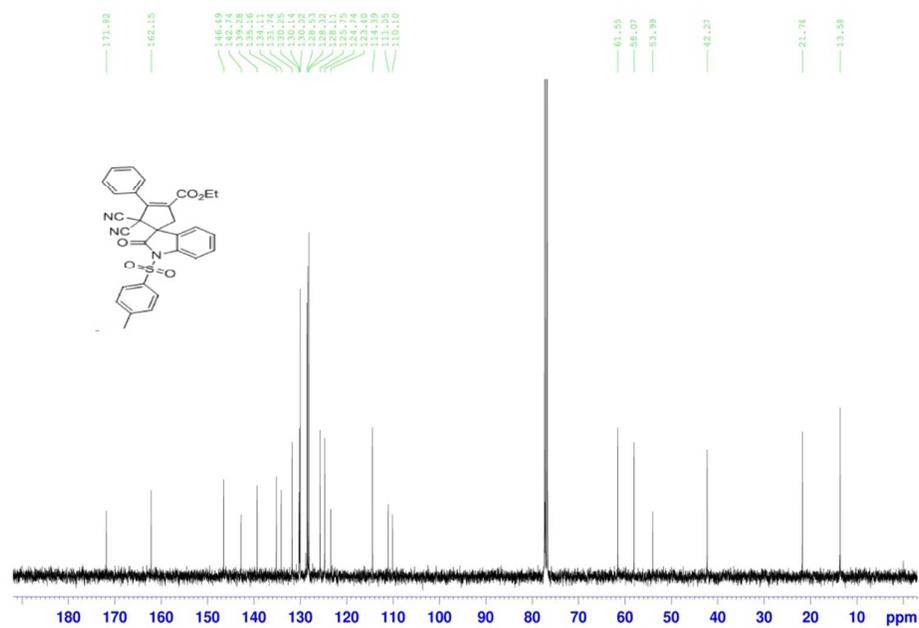
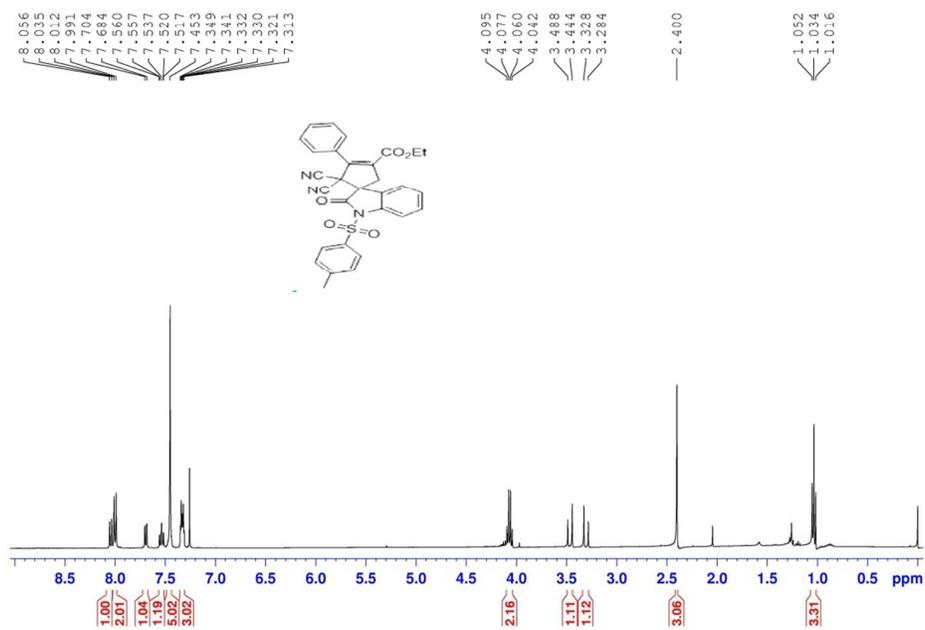
**Ethyl 5'-chloro-2-(2,2-dicyano-1-phenylvinyl)-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3m**



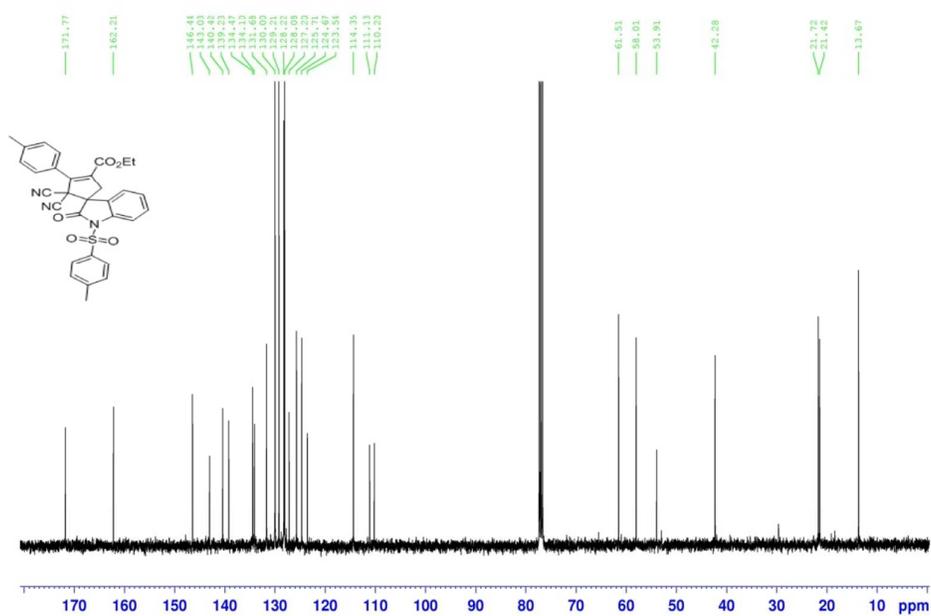
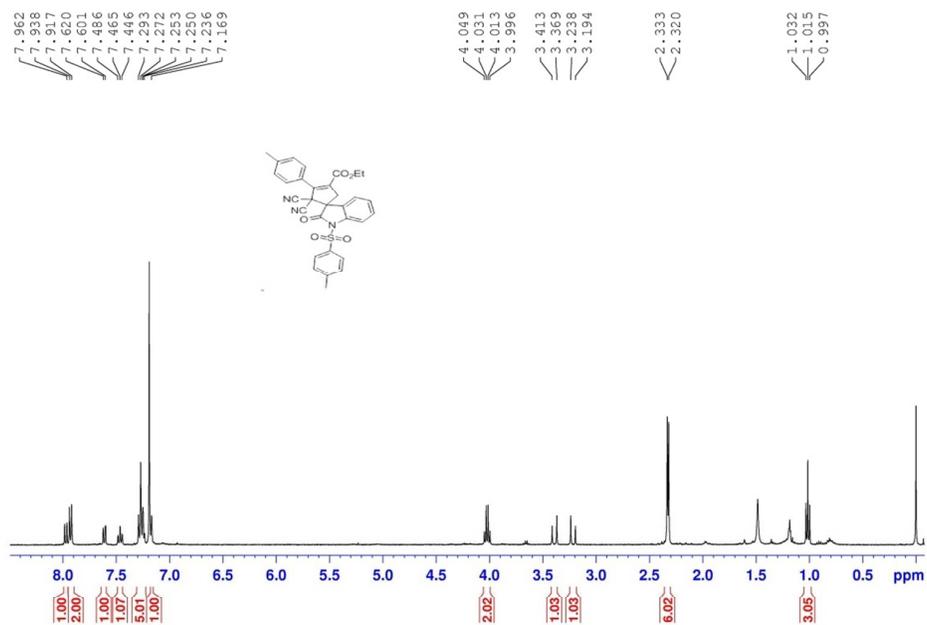
**Ethyl 2-(2,2-dicyano-1-phenylvinyl)-5'-methyl-2'-oxo-1'-tosylspiro[cyclopropane-1,3'-indoline]-2-carboxylate 3n**



**Ethyl 2,2-dicyano-2'-oxo-3-phenyl-1'-tosylspiro[cyclopent[3]ene-1,3'-indoline]-4-carboxylate 4a**

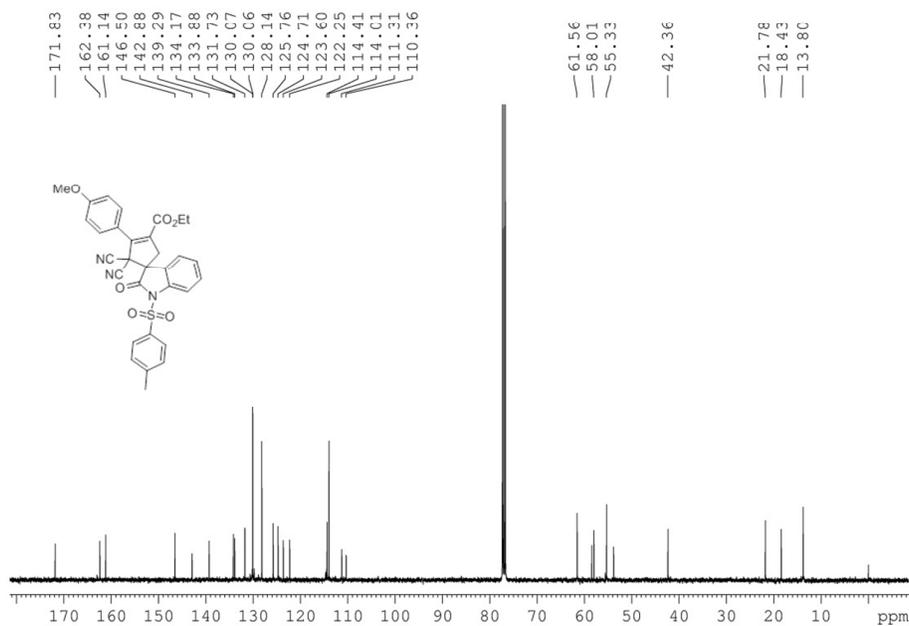
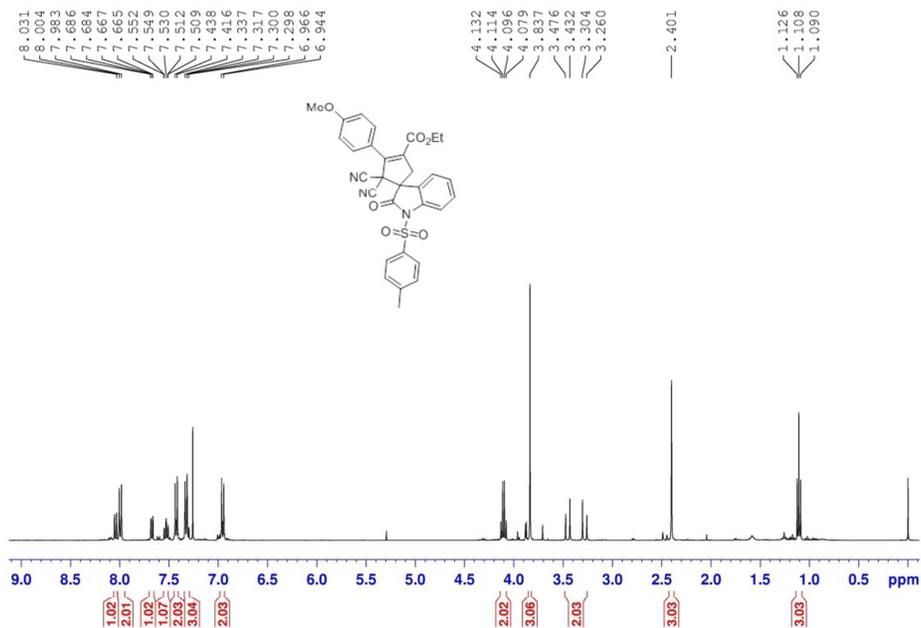


**Ethyl 2,2-dicyano-2'-oxo-3-(p-tolyl)-1'-tosylspiro[cyclop[3]ene-1,3'-indoline]-4-carboxylate 4d**



## Ethyl

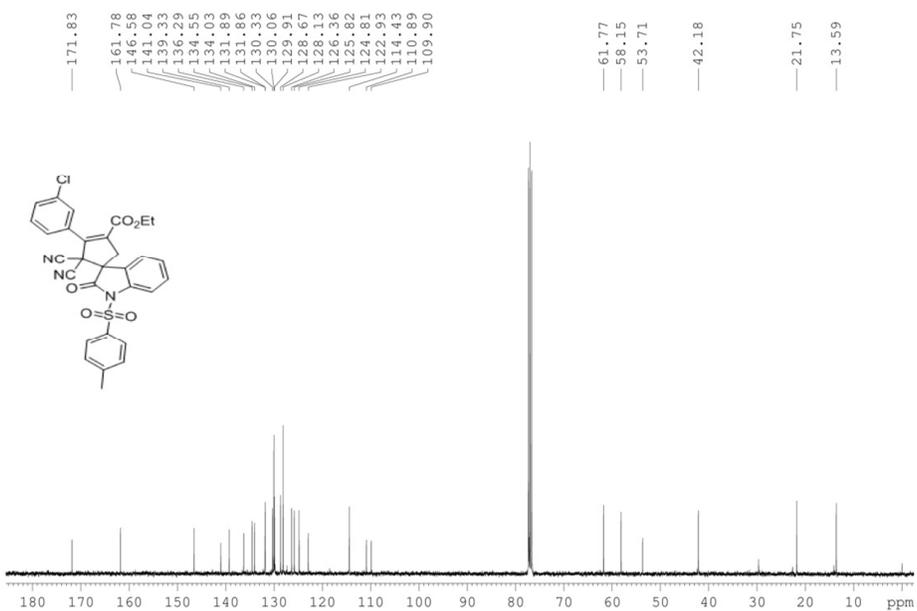
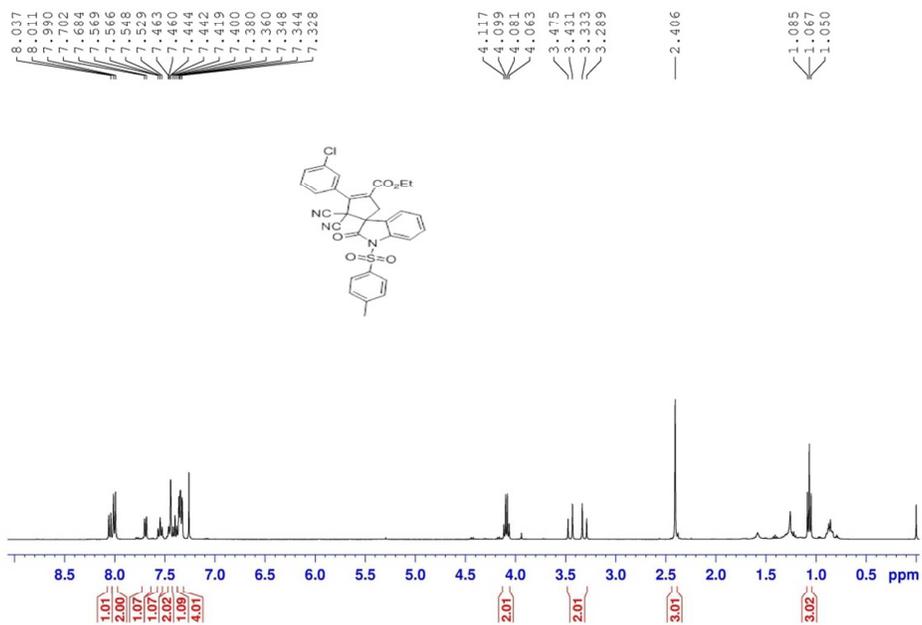
### 2,2-dicyano-3-(4-methoxyphenyl)-2'-oxo-1'-tosylspiro[cyclopent[3]ene-1,3'-indoline]-4-carboxylate 4e



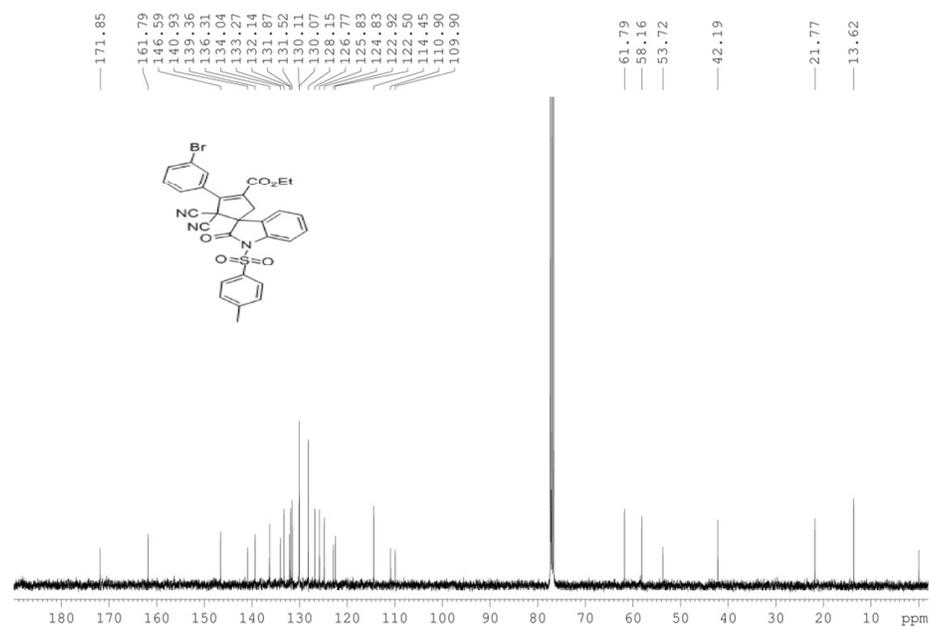
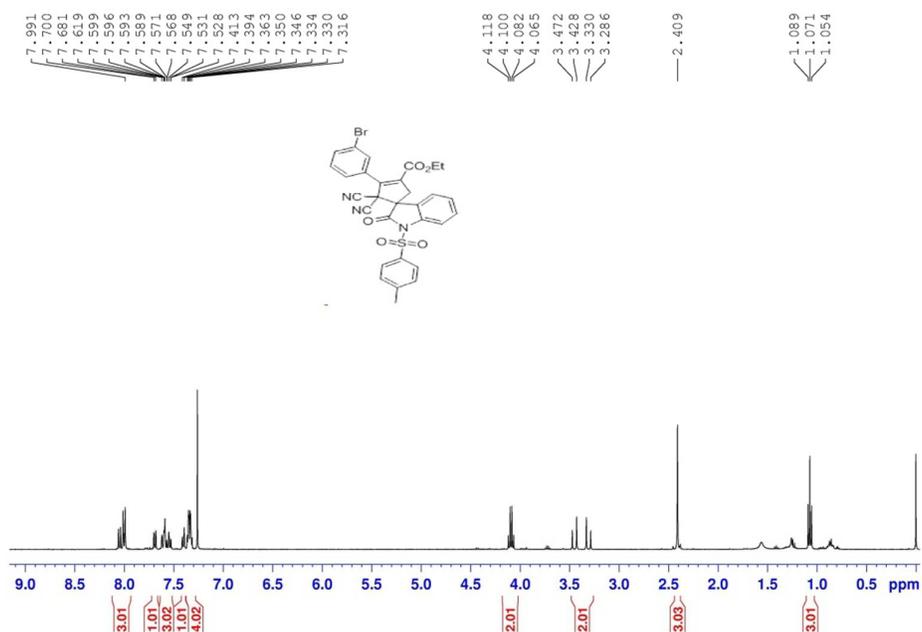
Ethyl

3-(3-chlorophenyl)-2,2-dicyano-2'-oxo-1'-tosylspiro[cyclopent[3]ene-1,3'-indoline]-4-carboxylate

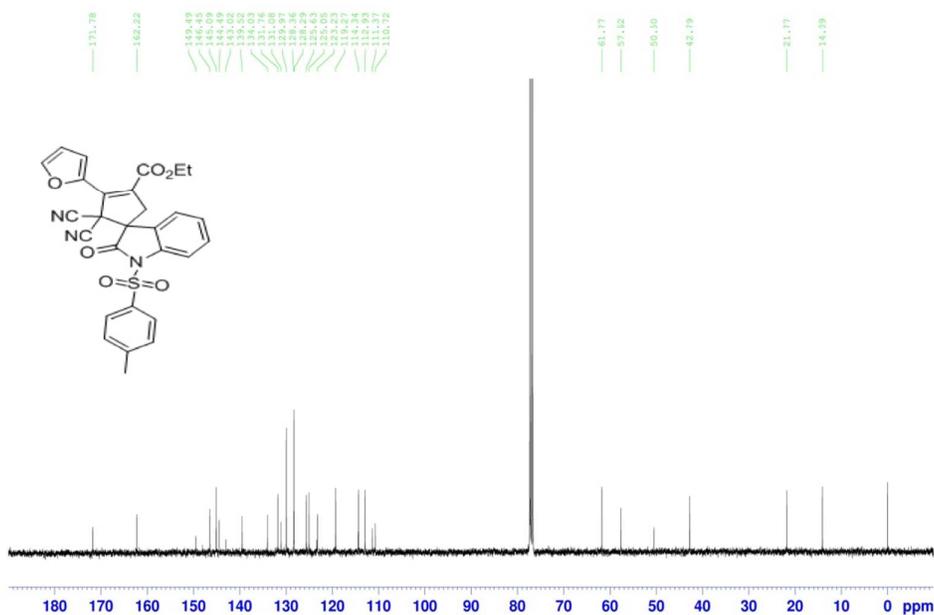
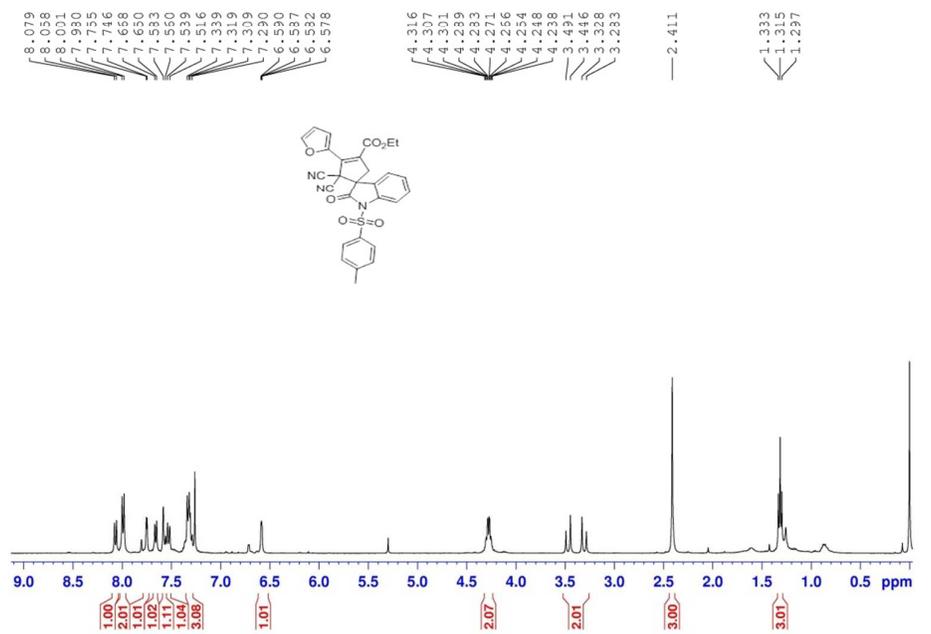
4h



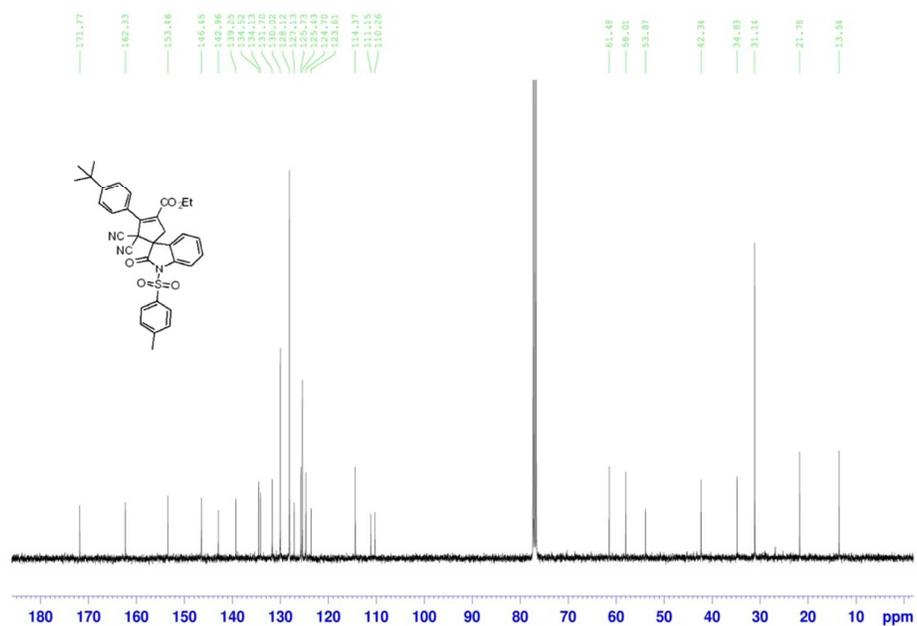
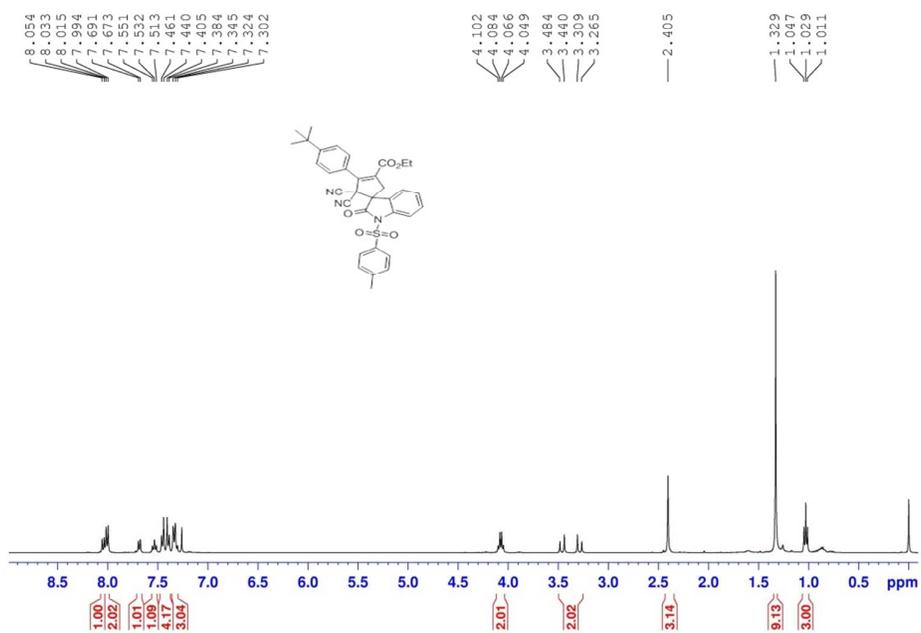
**Ethyl 3-(3-bromophenyl)-2,2-dicyano-2'-oxo-1'-tosylspiro[cyclopent[3]ene-1,3'-indoline]-4-carboxylate 4o**



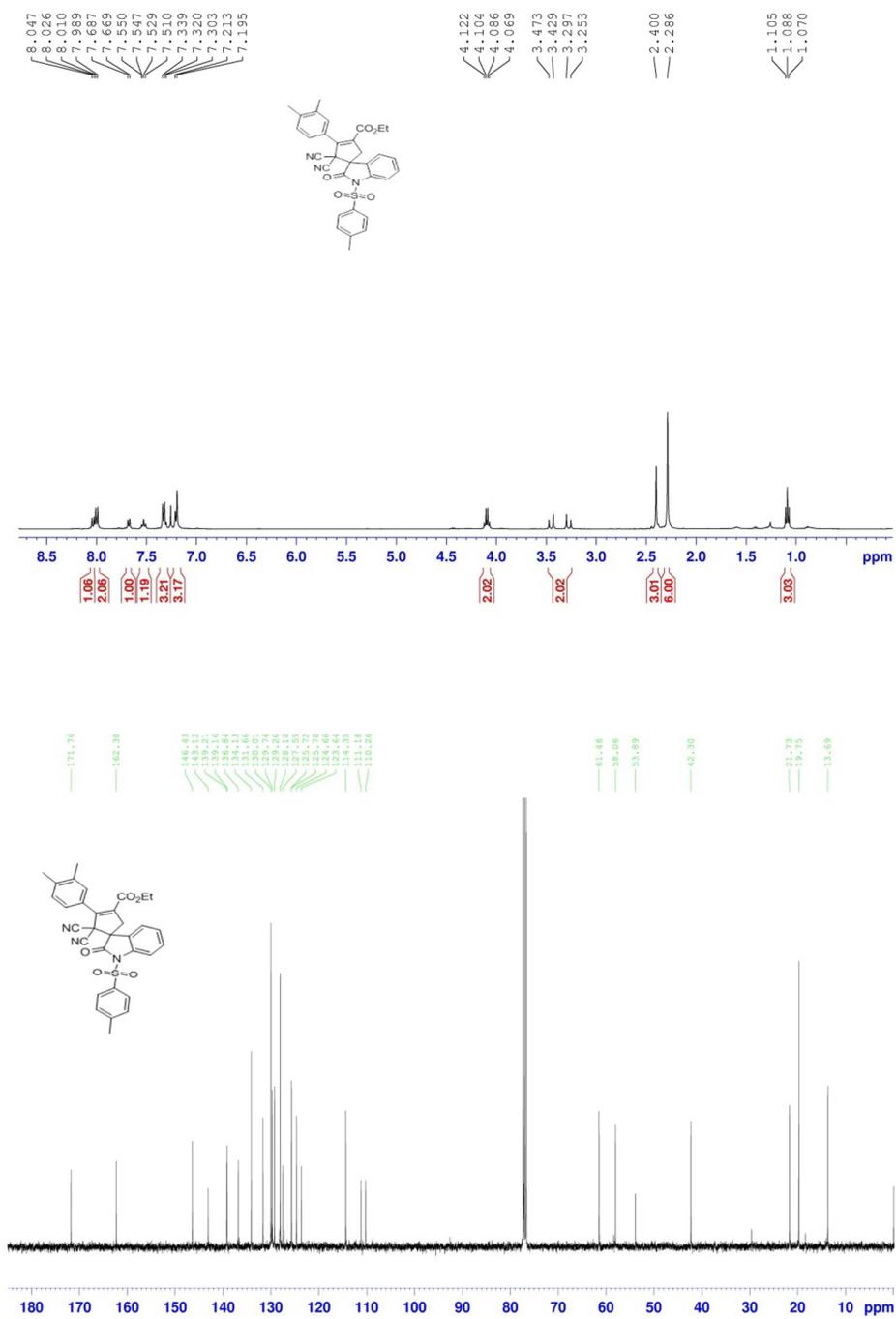
**Ethyl 2,2-dicyano-3-(furan-2-yl)-2'-oxo-1'-tosylspiro[cyclopent[3]ene-1,3'-indoline]-4-carboxylate  
4p**



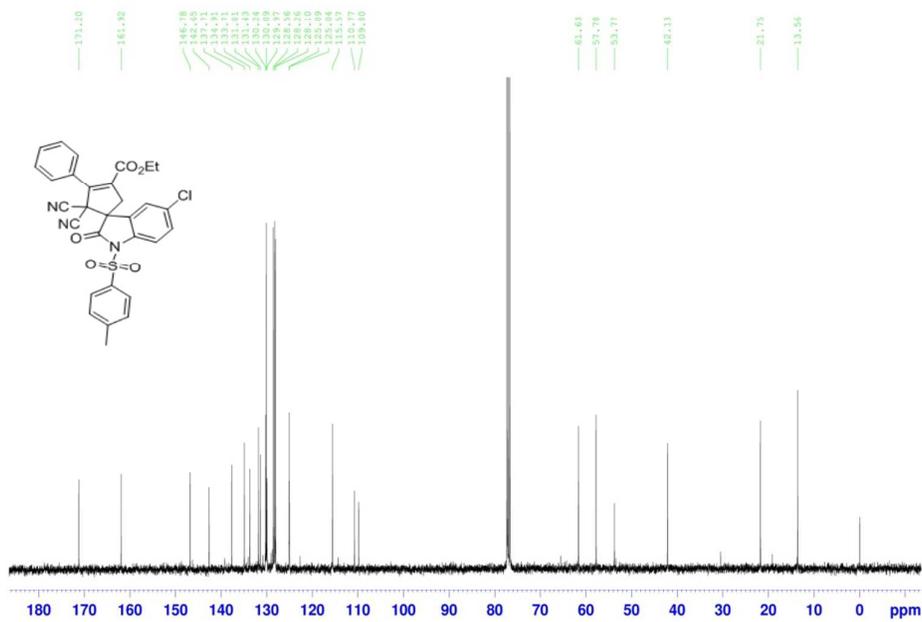
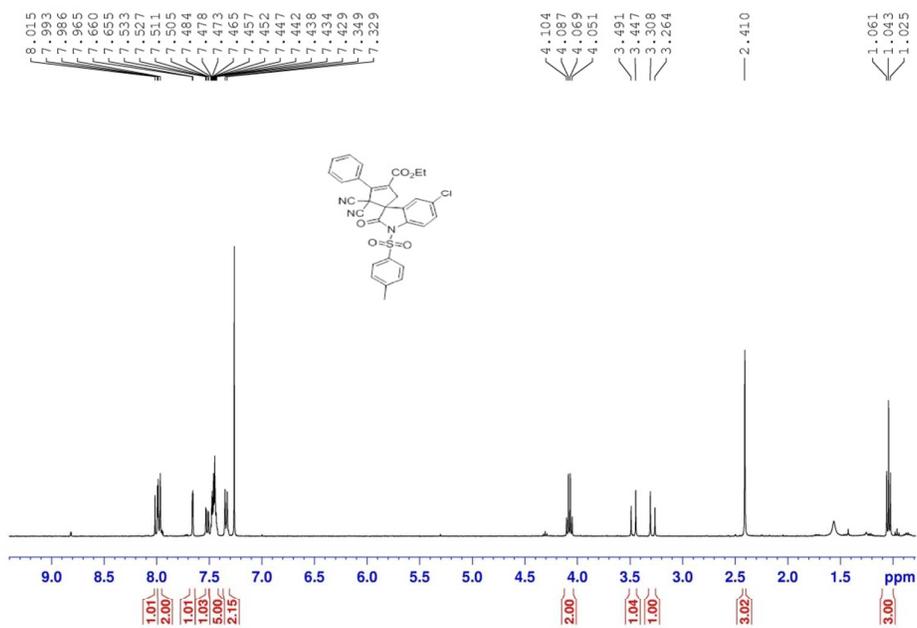
**Ethyl 3-(4-(tert-butyl)phenyl)-2,2-dicyano-2'-oxo-1'-tosylspiro[cyclopent[3]ene-1,3'-indoline]-4-carboxylate 4k**



**Ethyl 2,2-dicyano-3-(3,4-dimethylphenyl)-2'-oxo-1'-tosylspiro[cyclopent[3]ene-1,3'-indoline]-4-carboxylate 4l**



**Ethyl 5'-chloro-2,2-dicyano-2'-oxo-3-phenyl-1'-tosylspiro[cyclopent[3]ene-1,3'-indoline]-4-carboxylate 4m**



**Ethyl 2,2-dicyano-5'-methyl-2'-oxo-3-phenyl-1'-tosylspiro[cyclopent[3]ene-1,3'-indoline]-4-carboxylate 4n**

