

# Derivatives Incorporating Acridine, Pyrrole, and Thiazolidine Rings as Promising Antitumor Agents

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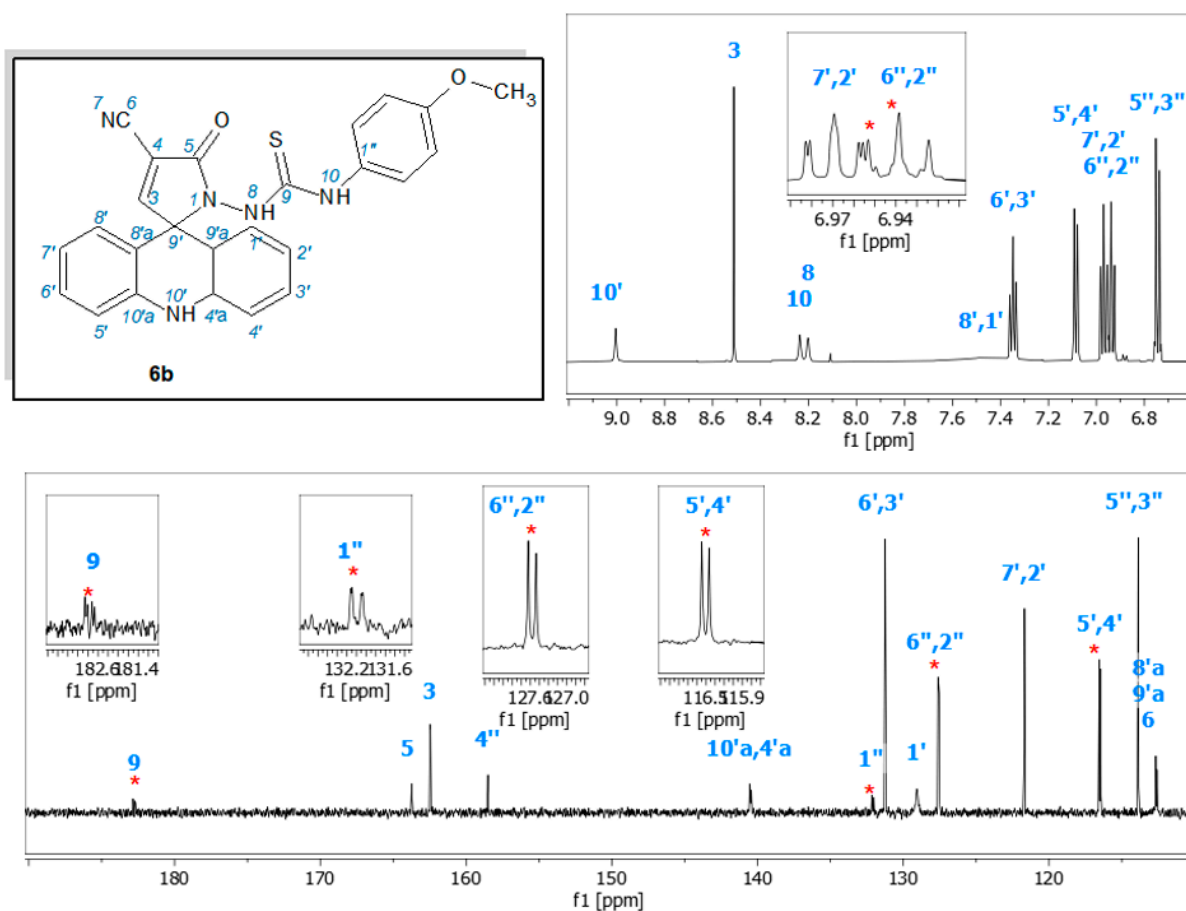
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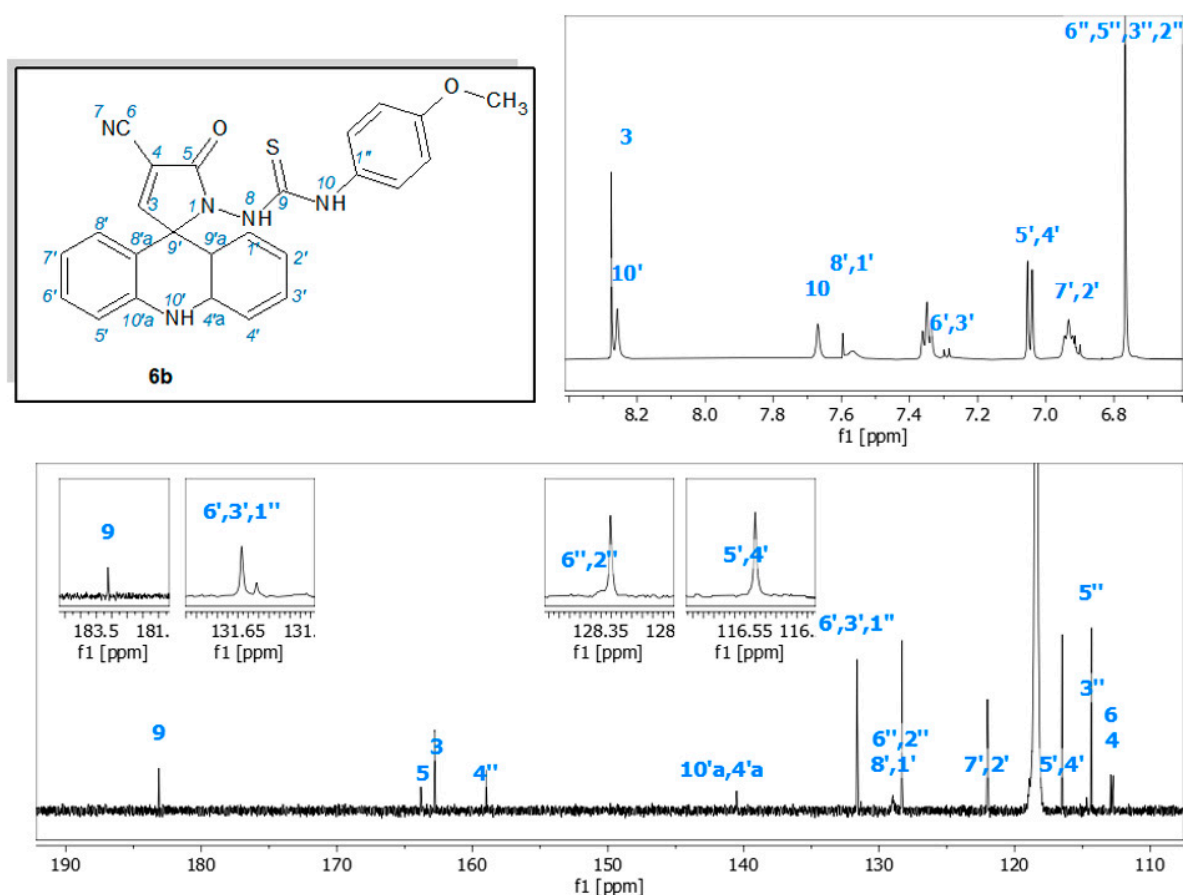
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# 1 Figures and Tables related to the Results and Discussion section



**Figure S1.** <sup>1</sup>H (600 MHz, acetone-d<sub>6</sub>) and <sup>13</sup>C NMR (150 MHz, acetone-d<sub>6</sub>) spectra of derivative **6b**. Red stars indicate doubled signals.



**Figure S2.**  $^1\text{H}$  (600 MHz, acetonitrile- $\text{d}_3$ ) and  $^{13}\text{C}$  NMR (150 MHz, acetonitrile- $\text{d}_3$ ) spectra of derivative **6b**.

**Table S1.** Reaction times and yields of reactions of spiro compounds **6a–e** with bifunctional reagents.

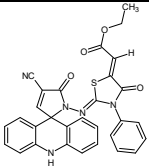
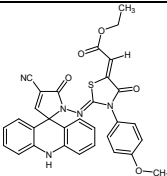
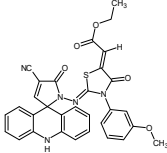
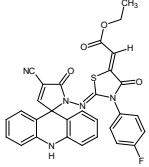
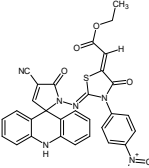
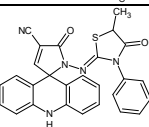
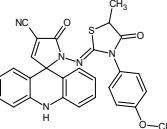
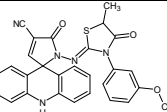
Product	R	R <sup>1</sup>	Reagent	Yield [%]	Reaction time [h]
<b>7a</b>	Ph	H	MBA	79	2
<b>7b</b>	(4-OMe)Ph	H	MBA	66	2,5
<b>7c</b>	(3-OMe)Ph	H	MBA	83	2,5
<b>7d</b>	(4-F)Ph	H	MBA	70	2
<b>7e</b>	(4-NO <sub>2</sub> )Ph	H	MBA	41	3
<b>8a</b>	Ph	=CH-COOEt	DEAD	75	7
<b>8b</b>	(4-OMe)Ph	=CH-COOEt	DEAD	57	7
<b>8c</b>	(3-OMe)Ph	=CH-COOEt	DEAD	66	7
<b>8d</b>	(4-F)Ph	=CH-COOEt	DEAD	60	7
<b>8e</b>	(4-NO <sub>2</sub> )Ph	=CH-COOEt	DEAD	60	7
<b>9a</b>	Ph	Me	EBP	77	3,5
<b>9b</b>	(4-OMe)Ph	Me	EBP	64	3
<b>9c</b>	(3-OMe)Ph	Me	EBP	64	2,5
<b>9d</b>	(4-F)Ph	Me	EBP	73	2
<b>9e</b>	(4-NO <sub>2</sub> )Ph	Me	EBP	38	4
<b>10a</b>	Ph	Pr	EBV	69	24
<b>10b</b>	(4-OMe)Ph	Pr	EBV	46	48
<b>10c</b>	(3-OMe)Ph	Pr	EBV	71	24
<b>10d</b>	(4-F)Ph	Pr	EBV	46	48



<b>10e</b>	(4-NO <sub>2</sub> )Ph	Pr	EBV	60	48
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**Table S2.** HR MS data for compounds **6a–e**, **7a–e**, **8a–e**, **9a–e** and **10a–e**.

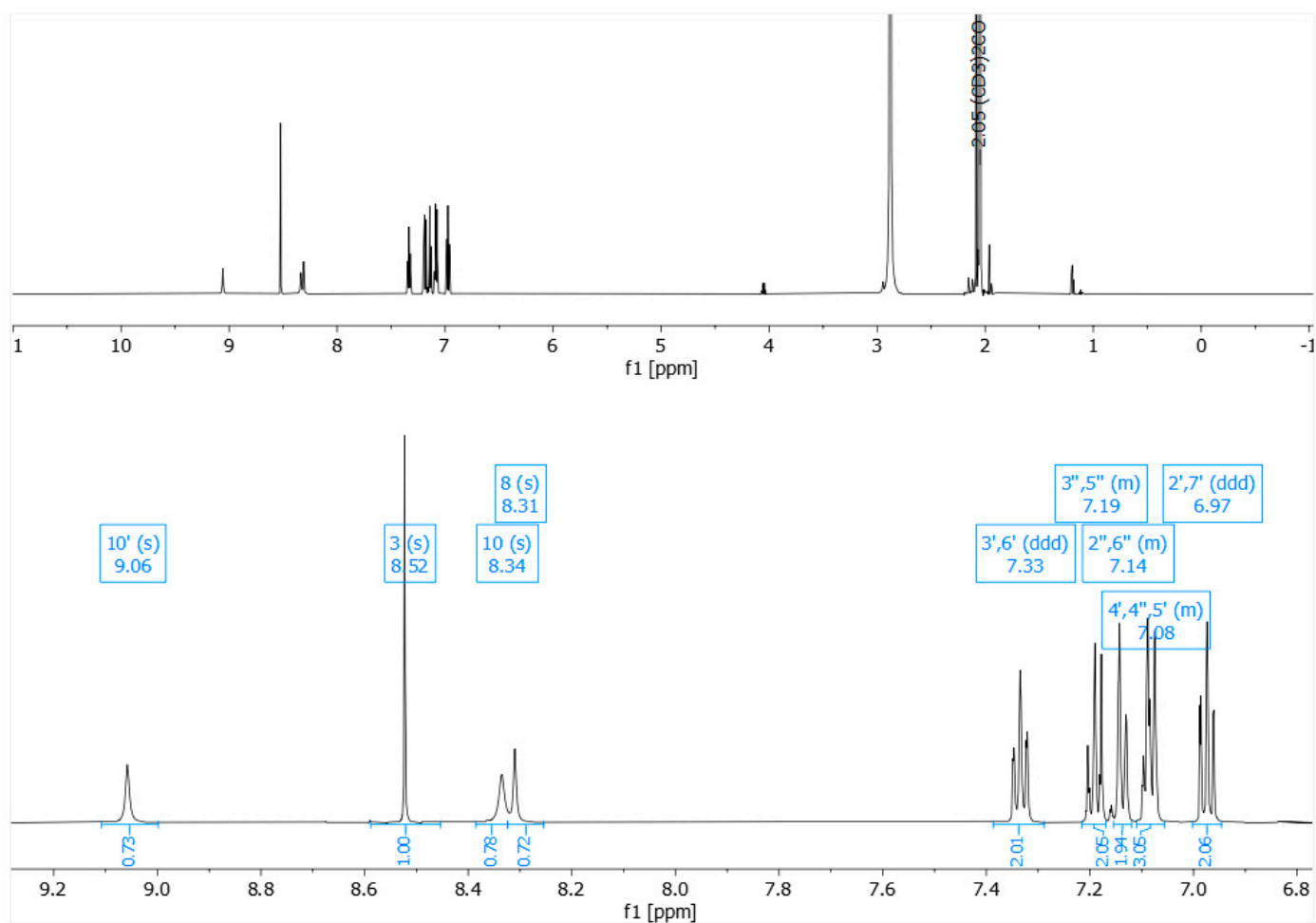
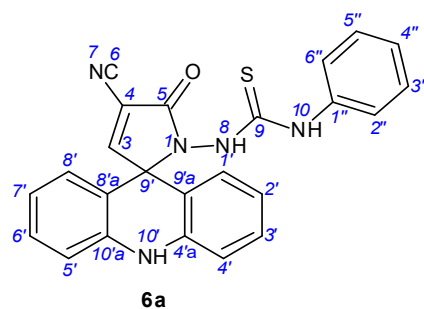
		Name	Formula	Exact mass [g.mol <sup>-1</sup> ]	Measured mass [g.mol <sup>-1</sup> ]	m/z unit	Mass error [ppm]
<b>6a</b>		3-{4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}-1-phenylthiourea	C <sub>24</sub> H <sub>17</sub> N <sub>5</sub> OS	424.12266	424.12300	3.40 × 10 <sup>-4</sup>	0.80165
<b>6b</b>		3-{4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}-1-(4-methoxyphenyl)thiourea	C <sub>25</sub> H <sub>19</sub> N <sub>5</sub> O <sub>2</sub> S	454.13322	454.13420	9.80 × 10 <sup>-4</sup>	2.15796
<b>6c</b>		3-{4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}-1-(3-methoxyphenyl)thiourea	C <sub>25</sub> H <sub>19</sub> N <sub>5</sub> O <sub>2</sub> S	454.13322	454.13390	6.80 × 10 <sup>-4</sup>	1.49736
<b>6d</b>		3-{4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}-1-(4-fluorophenyl)thiourea	C <sub>24</sub> H <sub>16</sub> FN <sub>5</sub> OS	442.11324	442.11340	1.60 × 10 <sup>-4</sup>	0.36190
<b>6e</b>		3-{4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}-1-(4-nitrophenyl)thiourea	C <sub>24</sub> H <sub>16</sub> N <sub>6</sub> O <sub>3</sub> S	469.10774	469.10790	1.60 × 10 <sup>-4</sup>	0.34107
<b>7a</b>		5'-oxo-1'-{[(2Z)-4-oxo-3-phenyl-1,3-thiazolidin-2-ylidene]amino}-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile	C <sub>26</sub> H <sub>17</sub> N <sub>5</sub> O <sub>2</sub> S	464.11757	464.11790	3.30 × 10 <sup>-4</sup>	0.71103
<b>7b</b>		1'-{[(2Z)-3-(4-methoxyphenyl)-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile	C <sub>27</sub> H <sub>19</sub> N <sub>5</sub> O <sub>3</sub> S	494.12814	494.12880	6.60 × 10 <sup>-4</sup>	1.33569
<b>7c</b>		1'-{[(2Z)-3-(3-methoxyphenyl)-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile	C <sub>27</sub> H <sub>19</sub> N <sub>5</sub> O <sub>3</sub> S	494.12814	494.12880	6.60 × 10 <sup>-4</sup>	1.33569
<b>7d</b>		1'-{[(2Z)-3-(4-fluorophenyl)-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile	C <sub>26</sub> H <sub>16</sub> FN <sub>5</sub> O <sub>2</sub> S	482.10815	482.10870	5.50 × 10 <sup>-4</sup>	1.14082
<b>7e</b>		1'-{[(2Z)-3-(4-nitrophenyl)-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile	C <sub>26</sub> H <sub>16</sub> N <sub>6</sub> O <sub>4</sub> S	509.10265	509.10330	6.50 × 10 <sup>-4</sup>	1.27676

<b>8a</b>		<i>ethyl 2-[(2Z,5Z)-2-({4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}imino)-4-oxo-3-phenyl-1,3-thiazolidin-5-ylidene]acetate</i>	C <sub>30</sub> H <sub>21</sub> N <sub>5</sub> O <sub>4</sub> S	548.13870	548.13920	5.00 × 10 <sup>-4</sup>	0.91218
<b>8b</b>		<i>ethyl 2-[(2Z,5Z)-2-({4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}imino)-3-(4-methoxyphenyl)-4-oxo-1,3-thiazolidin-5-ylidene]acetate</i>	C <sub>31</sub> H <sub>23</sub> N <sub>5</sub> O <sub>5</sub> S	578.14927	578.15000	7.30 × 10 <sup>-4</sup>	1.26265
<b>8c</b>		<i>ethyl 2-[(2Z,5Z)-2-({4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}imino)-3-(3-methoxyphenyl)-4-oxo-1,3-thiazolidin-5-ylidene]acetate</i>	C <sub>31</sub> H <sub>23</sub> N <sub>5</sub> O <sub>5</sub> S	578.14927	578.15000	7.30 × 10 <sup>-4</sup>	1.26265
<b>8d</b>		<i>ethyl 2-[(2Z,5Z)-2-({4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}imino)-3-(4-fluorophenyl)-4-oxo-1,3-thiazolidin-5-ylidene]acetate</i>	C <sub>30</sub> H <sub>20</sub> FN <sub>5</sub> O <sub>4</sub> S	566.12928	566.13000	7.20 × 10 <sup>-4</sup>	1.27179
<b>8e</b>		<i>ethyl 2-[(2Z,5Z)-2-({4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}imino)-3-(4-nitrophenyl)-4-oxo-1,3-thiazolidin-5-ylidene]acetate</i>	C <sub>30</sub> H <sub>20</sub> N <sub>6</sub> O <sub>6</sub> S	593.12378	593.12410	3.20 × 10 <sup>-4</sup>	0.53952
<b>9a</b>		<i>1'-{[(2Z)-5-methyl-4-oxo-3-phenyl-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile</i>	C <sub>27</sub> H <sub>19</sub> N <sub>5</sub> O <sub>2</sub> S	478.13322	478.13410	8.80 × 10 <sup>-4</sup>	1.84049
<b>9b</b>		<i>1'-{[(2Z)-3-(4-methoxyphenyl)-5-methyl-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile</i>	C <sub>28</sub> H <sub>21</sub> N <sub>5</sub> O <sub>3</sub> S	508.14379	508.14420	4.10 × 10 <sup>-4</sup>	0.80686
<b>9c</b>		<i>1'-{[(2Z)-3-(3-methoxyphenyl)-5-methyl-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile</i>	C <sub>28</sub> H <sub>21</sub> N <sub>5</sub> O <sub>3</sub> S	508.14379	508.14450	7.10 × 10 <sup>-4</sup>	1.39724

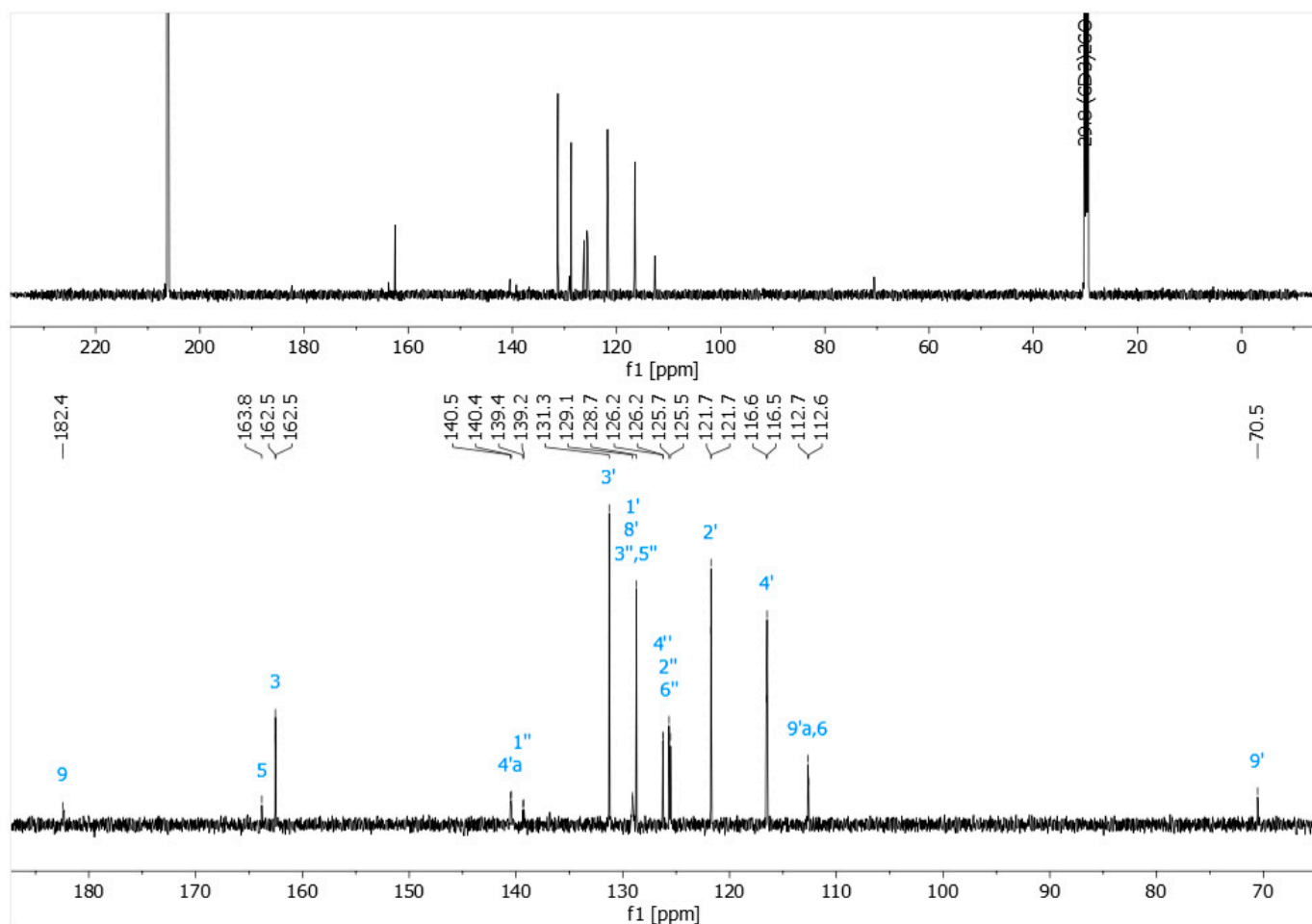
<b>9d</b>		<i>1'-{[(2Z)-3-(4-fluorophenyl)-5-methyl-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile</i>	C <sub>27</sub> H <sub>18</sub> FN <sub>5</sub> O <sub>2</sub> S	496.12380	496.12470	9.00 × 10 <sup>-4</sup>	1.81406
<b>9e</b>		<i>1'-{[(2Z)-5-methyl-3-(4-nitrophenyl)-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile</i>	C <sub>27</sub> H <sub>18</sub> N <sub>6</sub> O <sub>4</sub> S	523.11830	523.11880	5.00 × 10 <sup>-4</sup>	0.95581
<b>10a</b>		<i>5'-oxo-1'-{[(2Z)-4-oxo-3-phenyl-5-propyl-1,3-thiazolidin-2-ylidene]amino}-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile</i>	C <sub>29</sub> H <sub>23</sub> N <sub>5</sub> O <sub>2</sub> S	506.16452	506.16510	5.80 × 10 <sup>-4</sup>	1.14587
<b>10b</b>		<i>1'-{[(2Z)-3-(4-methoxyphenyl)-4-oxo-5-propyl-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile</i>	C <sub>30</sub> H <sub>25</sub> N <sub>5</sub> O <sub>3</sub> S	536.17509	536.17560	5.10 × 10 <sup>-4</sup>	0.95118
<b>10c</b>		<i>1'-{[(2Z)-3-(3-methoxyphenyl)-4-oxo-5-propyl-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile</i>	C <sub>30</sub> H <sub>25</sub> N <sub>5</sub> O <sub>3</sub> S	536.17509	536.17570	6.10 × 10 <sup>-4</sup>	1.13769
<b>10d</b>		<i>1'-{[(2Z)-3-(4-fluorophenyl)-4-oxo-5-propyl-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile</i>	C <sub>29</sub> H <sub>22</sub> FN <sub>5</sub> O <sub>2</sub> S	524.15510	524.15610	1.00 × 10 <sup>-4</sup>	1.90783
<b>10e</b>		<i>1'-{[(2Z)-3-(4-nitrophenyl)-4-oxo-5-propyl-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile</i>	C <sub>29</sub> H <sub>22</sub> N <sub>6</sub> O <sub>4</sub> S	551.14960	551.15050	9.00 × 10 <sup>-4</sup>	1.63295

## 2 NMR, IR and MS spectra of synthesized derivatives

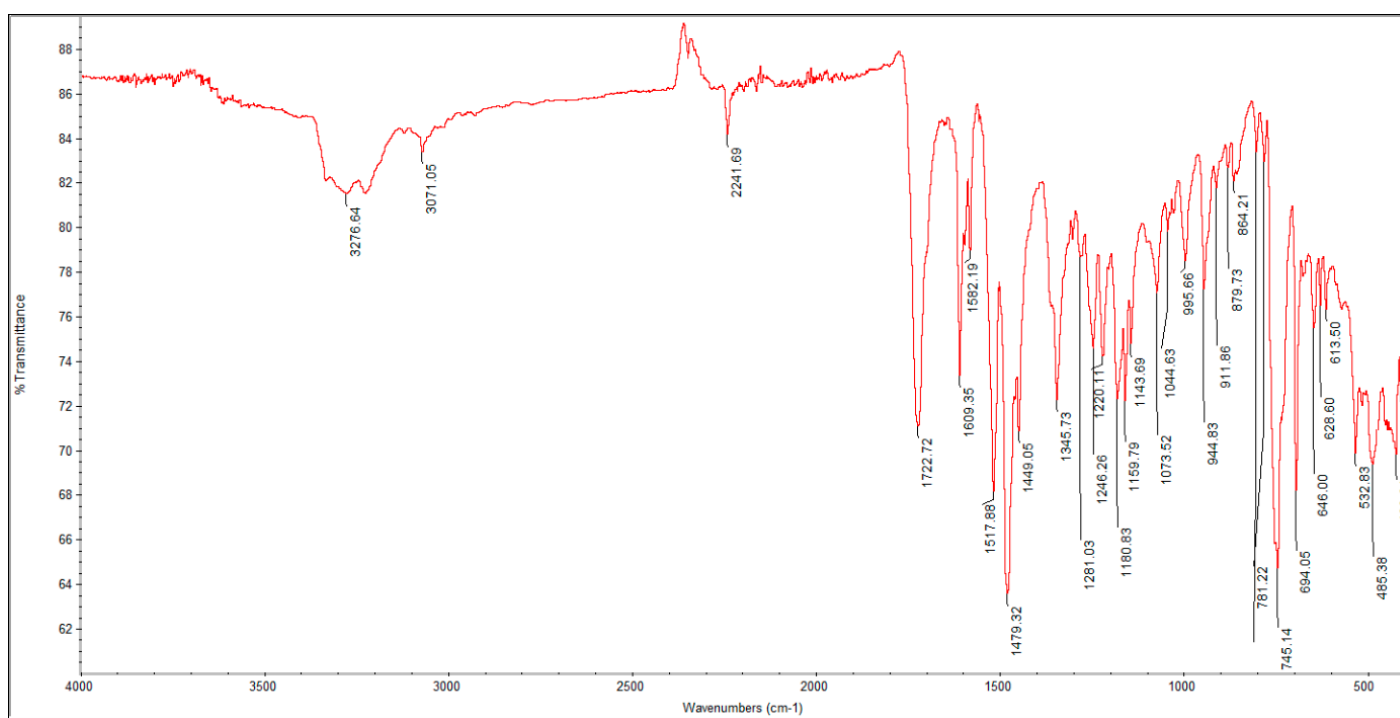
### 2.1 3-{4'-Cyano-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrol]-1'-yl}-1-phenylthiourea (**6a**)



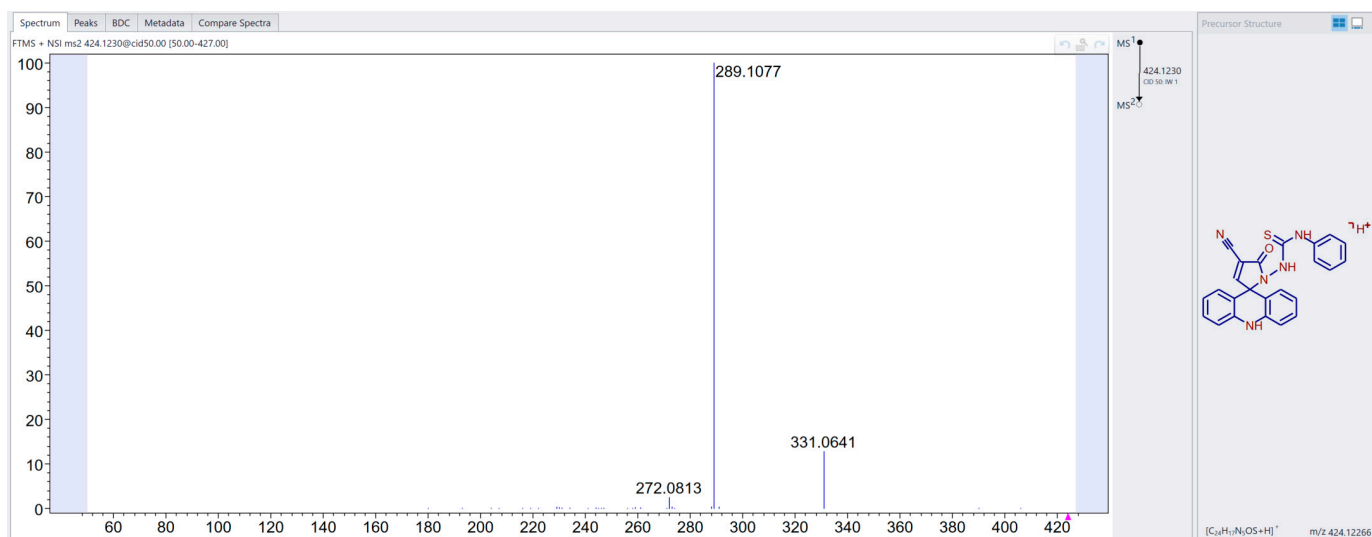
<sup>1</sup>H NMR (600 MHz, acetone-d<sub>6</sub>) spectrum of derivative **6a**.



<sup>13</sup>C NMR (150 MHz, acetone-d<sub>6</sub>) spectrum of derivative **6a**.

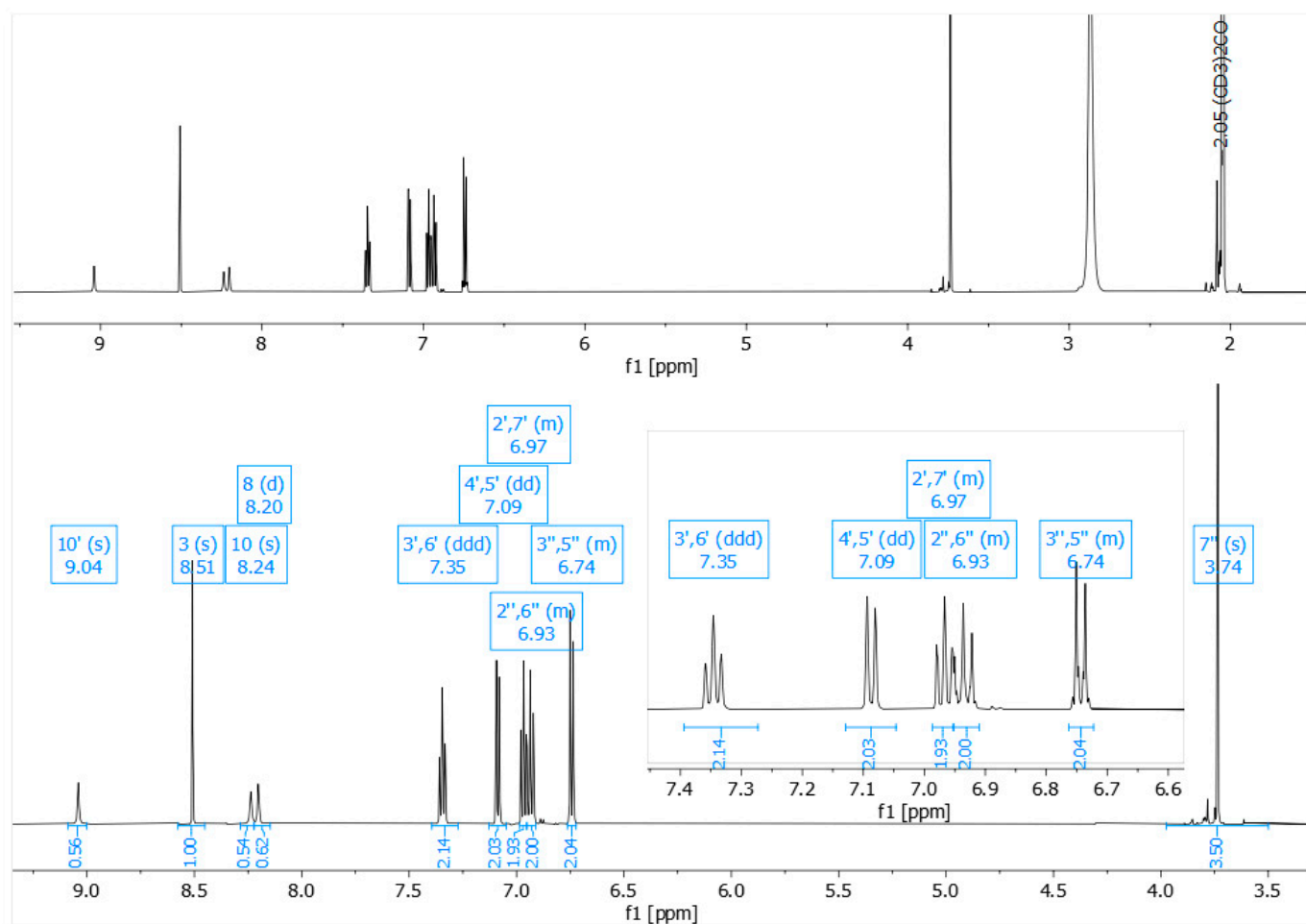
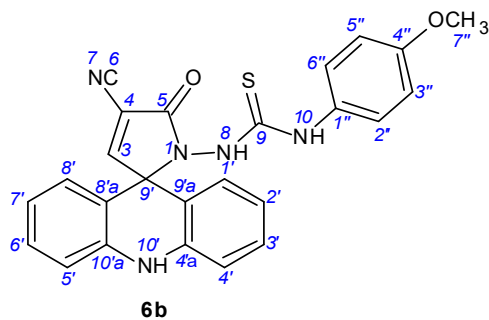


FTIR spectrum of derivative **6a**.



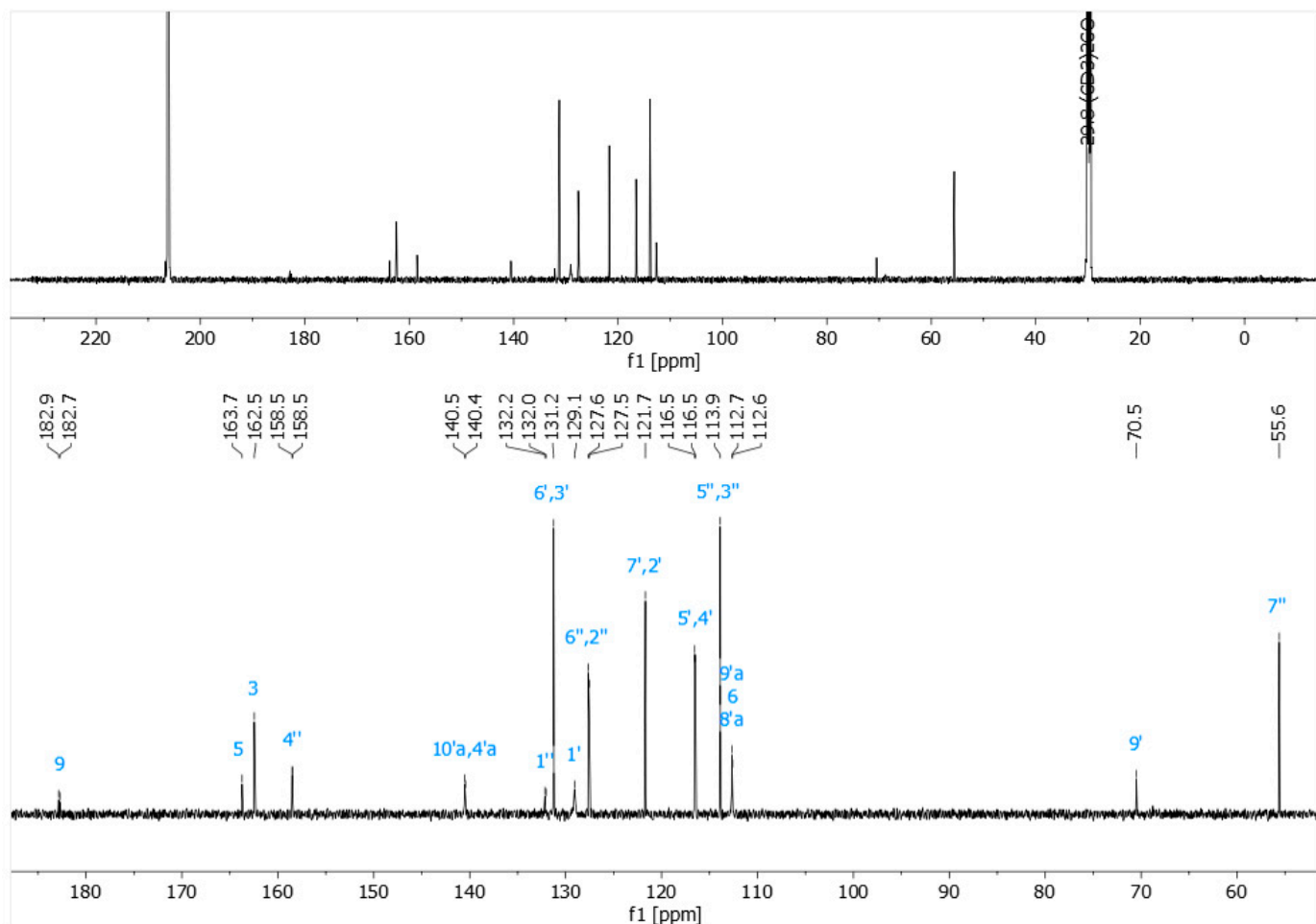
MS2 spectrum of derivative **6a**.

2.2 3-{4'-Cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}-1-(4-methoxyphenyl)thiourea (6b)

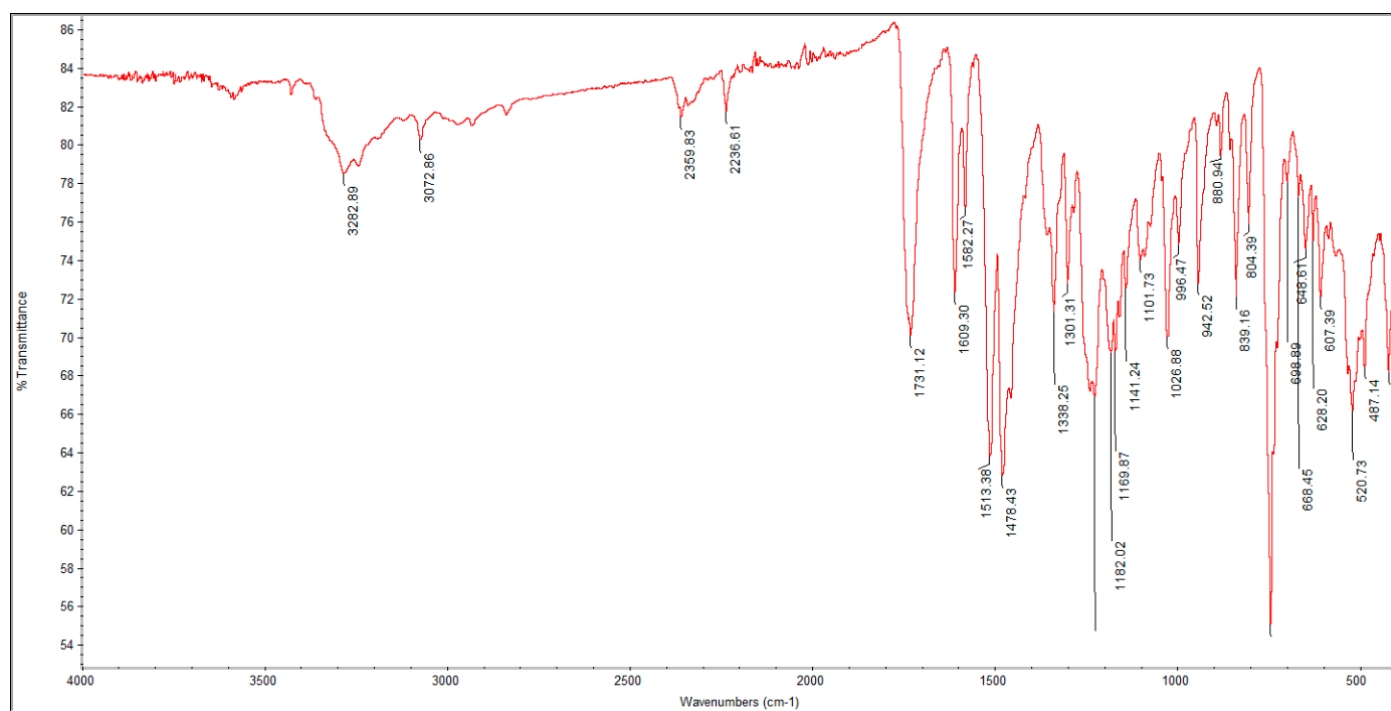


<sup>1</sup>H NMR (600 MHz, acetone-d<sub>6</sub>) spectrum of derivative **6b**.

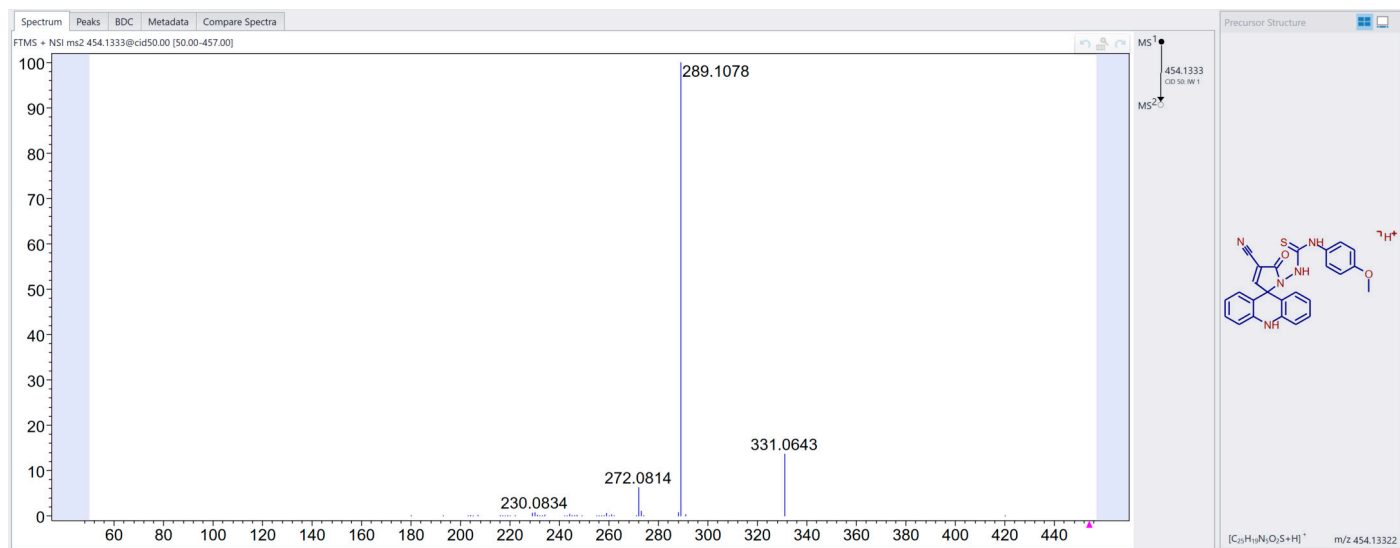




<sup>13</sup>C NMR (150 MHz, acetone-d<sub>6</sub>) spectrum of derivative **6b**.

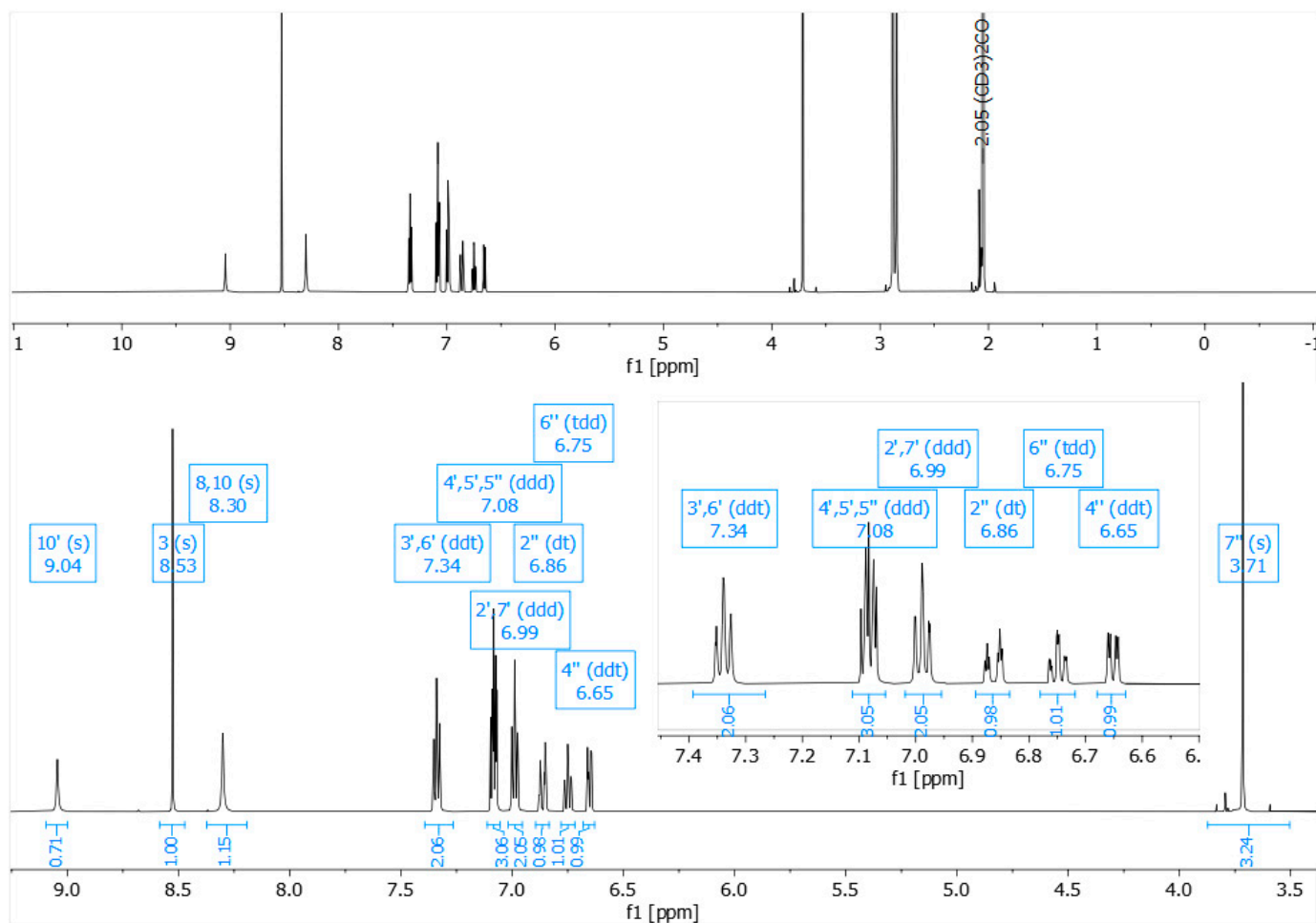
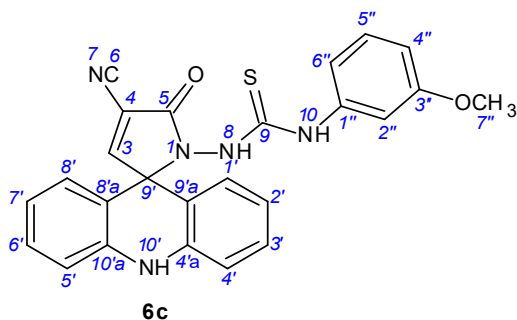


FTIR spectrum of derivative **6b**.

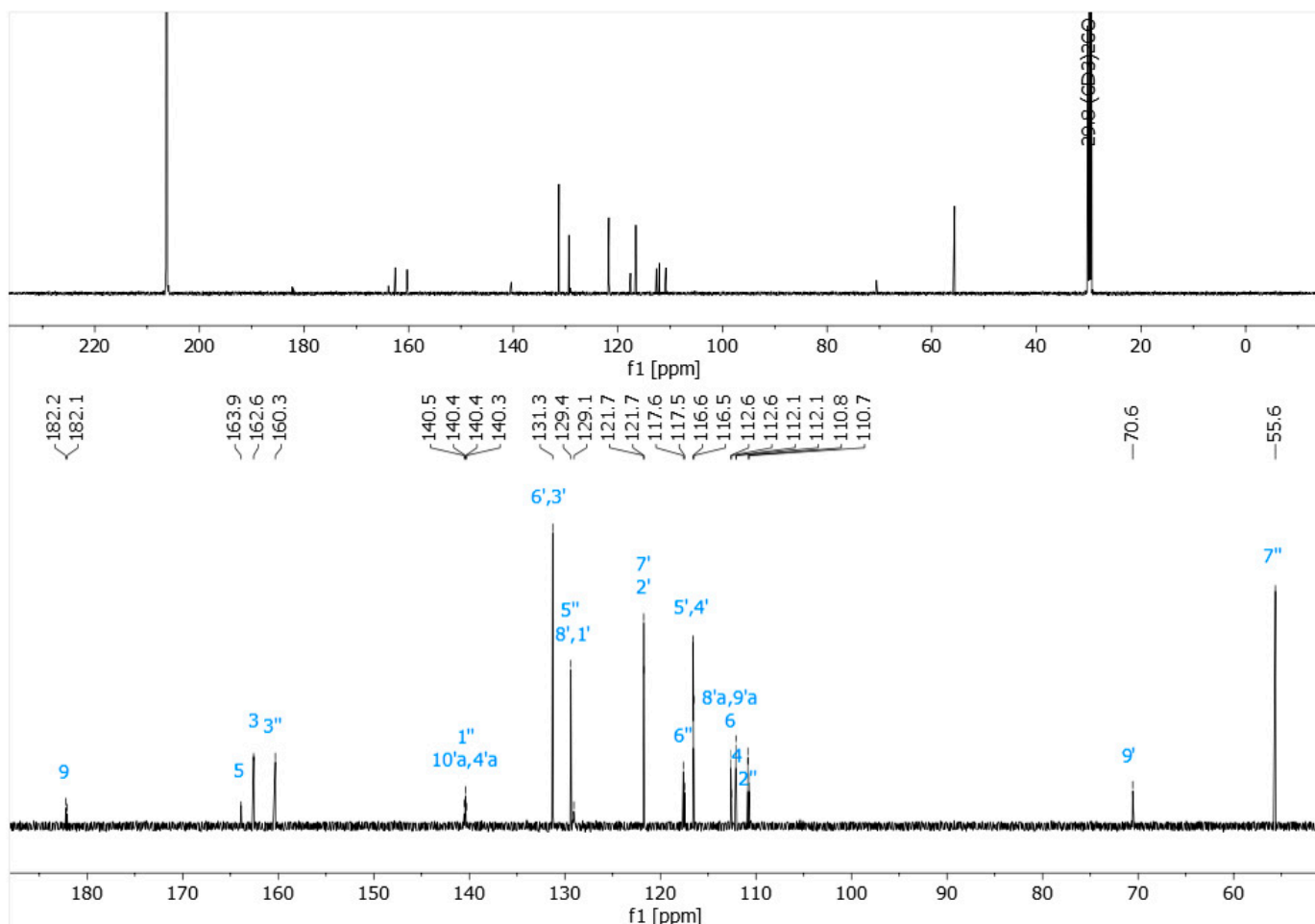


MS2 spectrum of derivative **6b**.

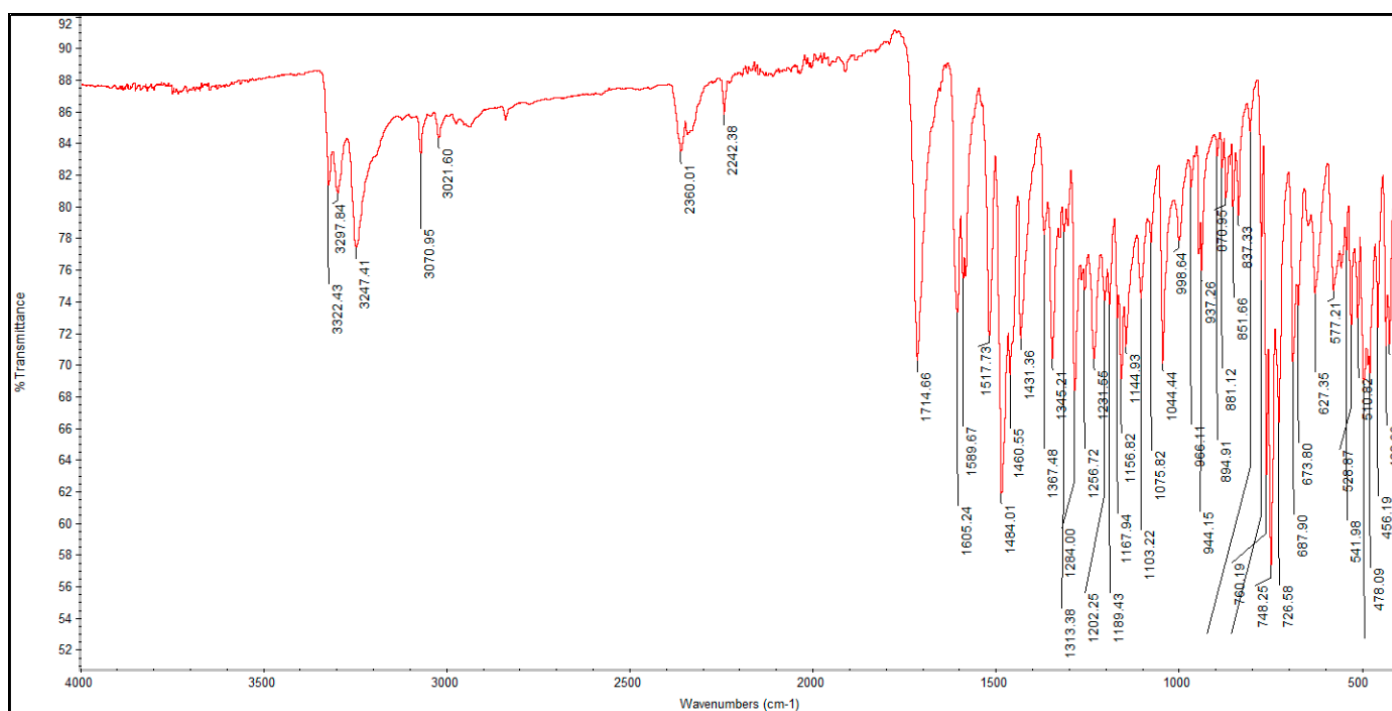
2.3 3-{4'-Cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl}-1-(3-methoxyphenyl)thiourea (6c)



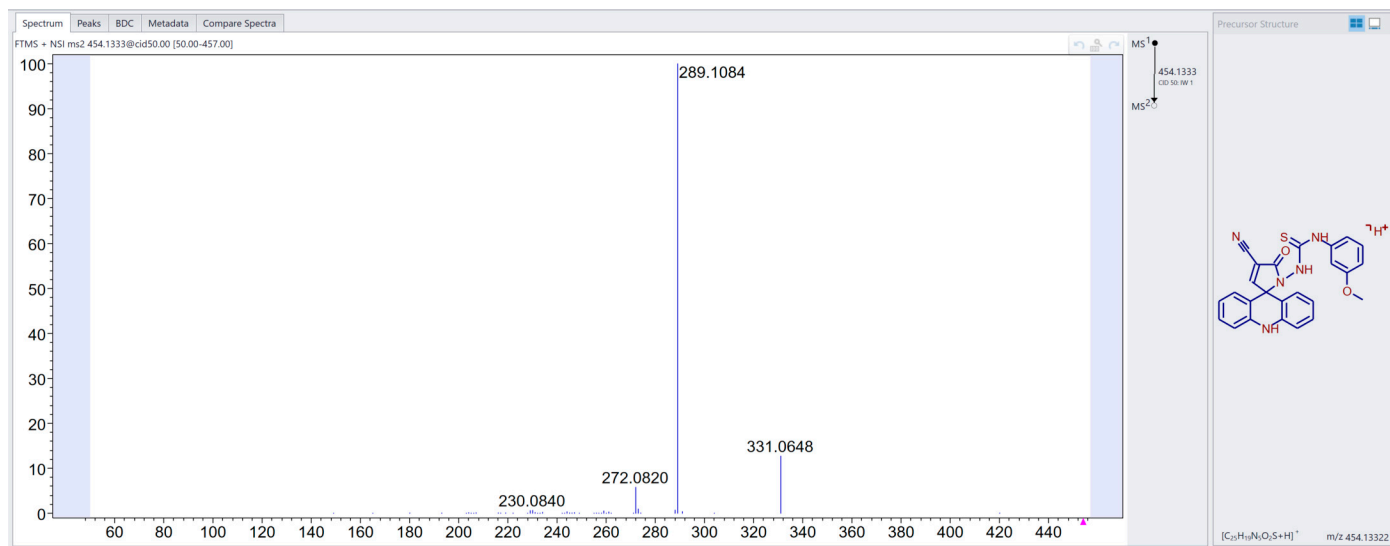
<sup>1</sup>H NMR (600 MHz, acetone-d<sub>6</sub>) spectrum of derivative **6c**.



<sup>13</sup>C NMR (150 MHz, acetone-d<sub>6</sub>) spectrum of derivative **6c**.

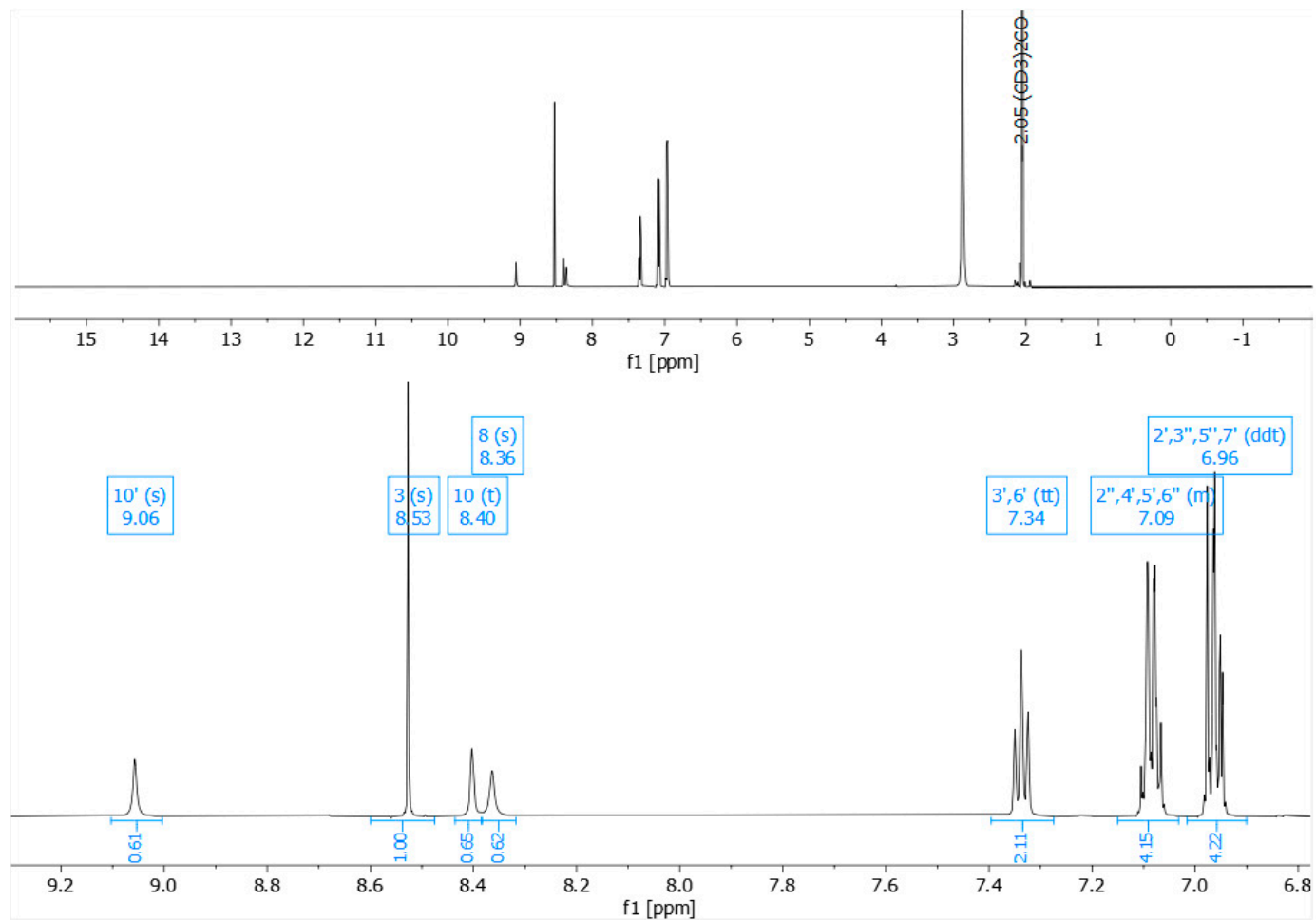
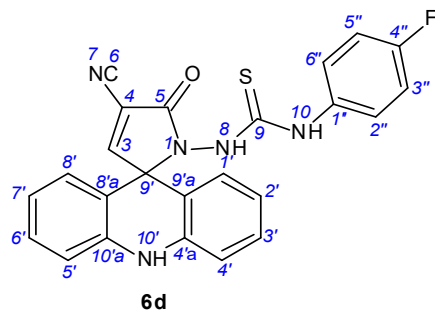


FTIR spectrum of derivative **6c**.

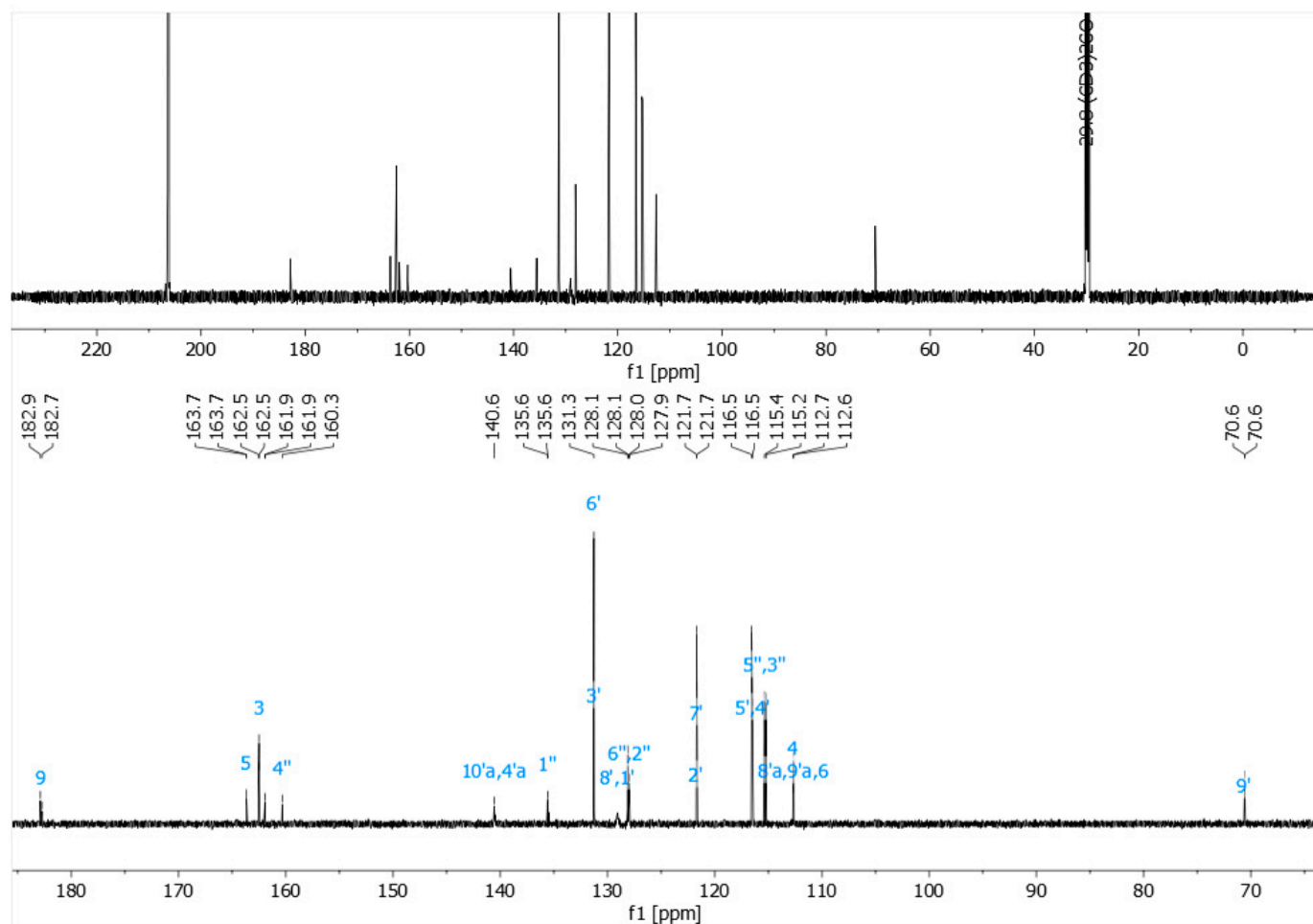


MS2 spectrum of derivative **6c**.

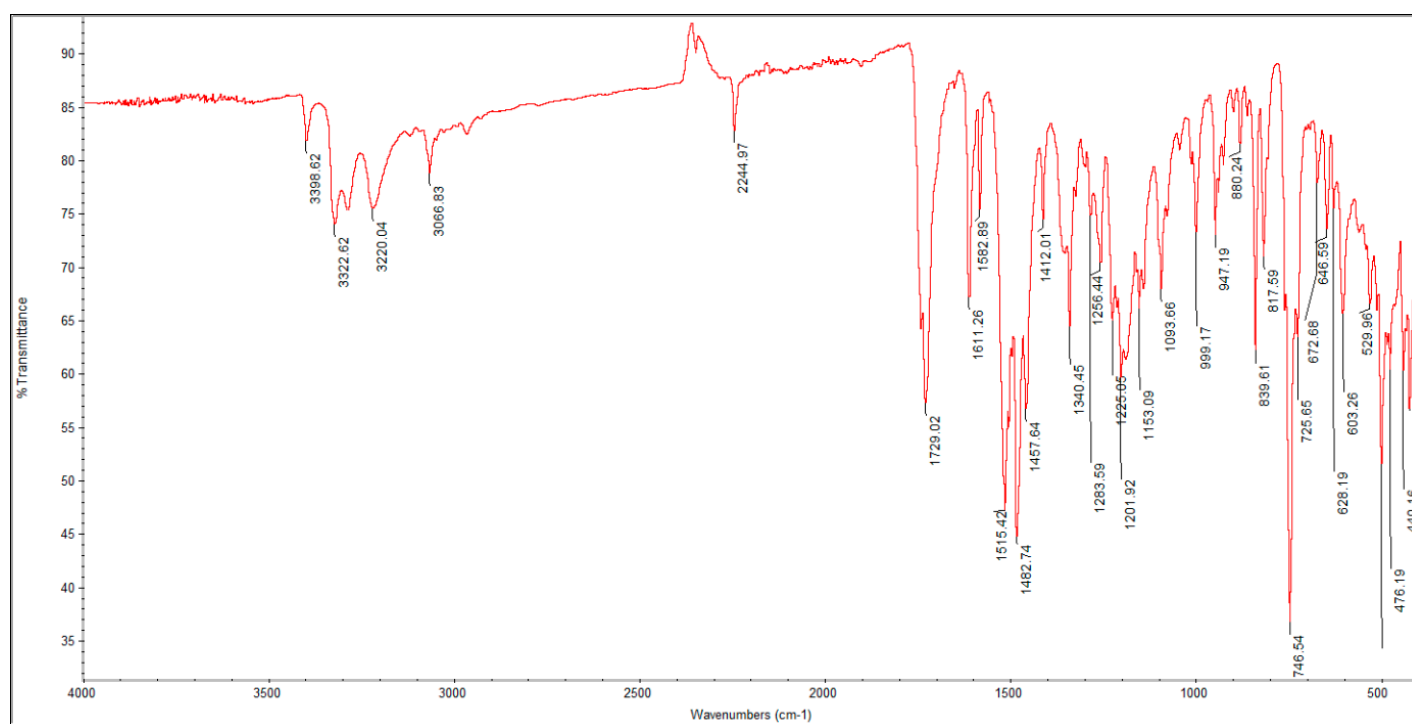
2.4 3-{4'-Cyano-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrol]-1'-yl}-1-(4-fluorophenyl)thiourea (**6d**)



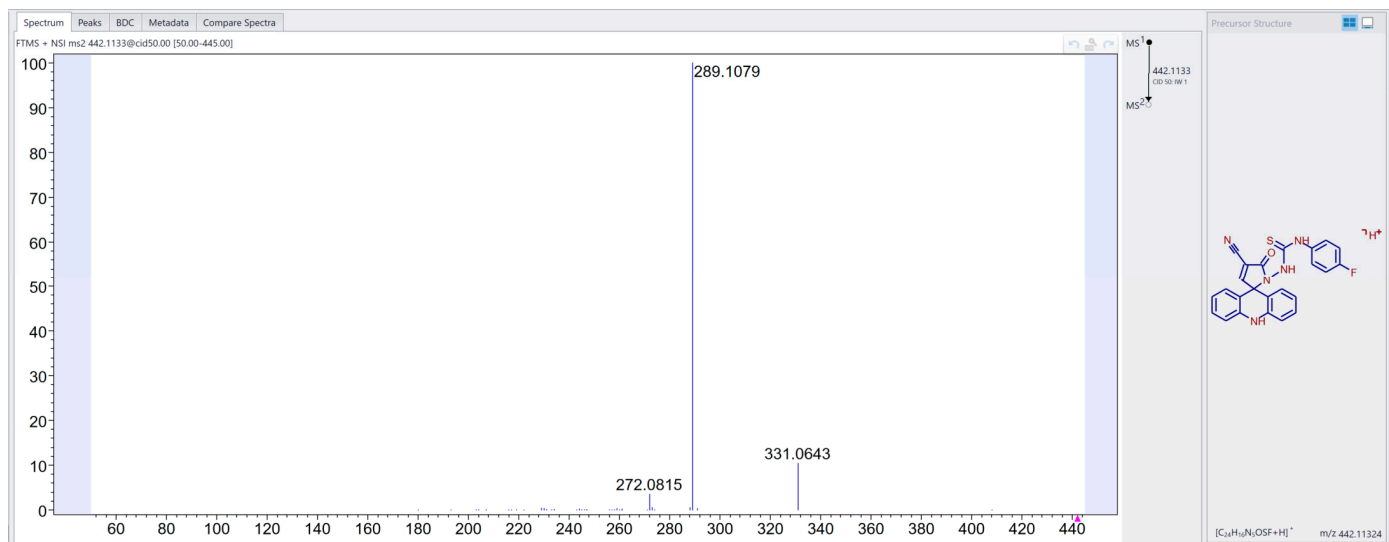
<sup>1</sup>H NMR (600 MHz, acetone-d<sub>6</sub>) spectrum of derivative **6d**.



<sup>13</sup>C NMR (150 MHz, acetone-d<sub>6</sub>) spectrum of derivative **6d**.



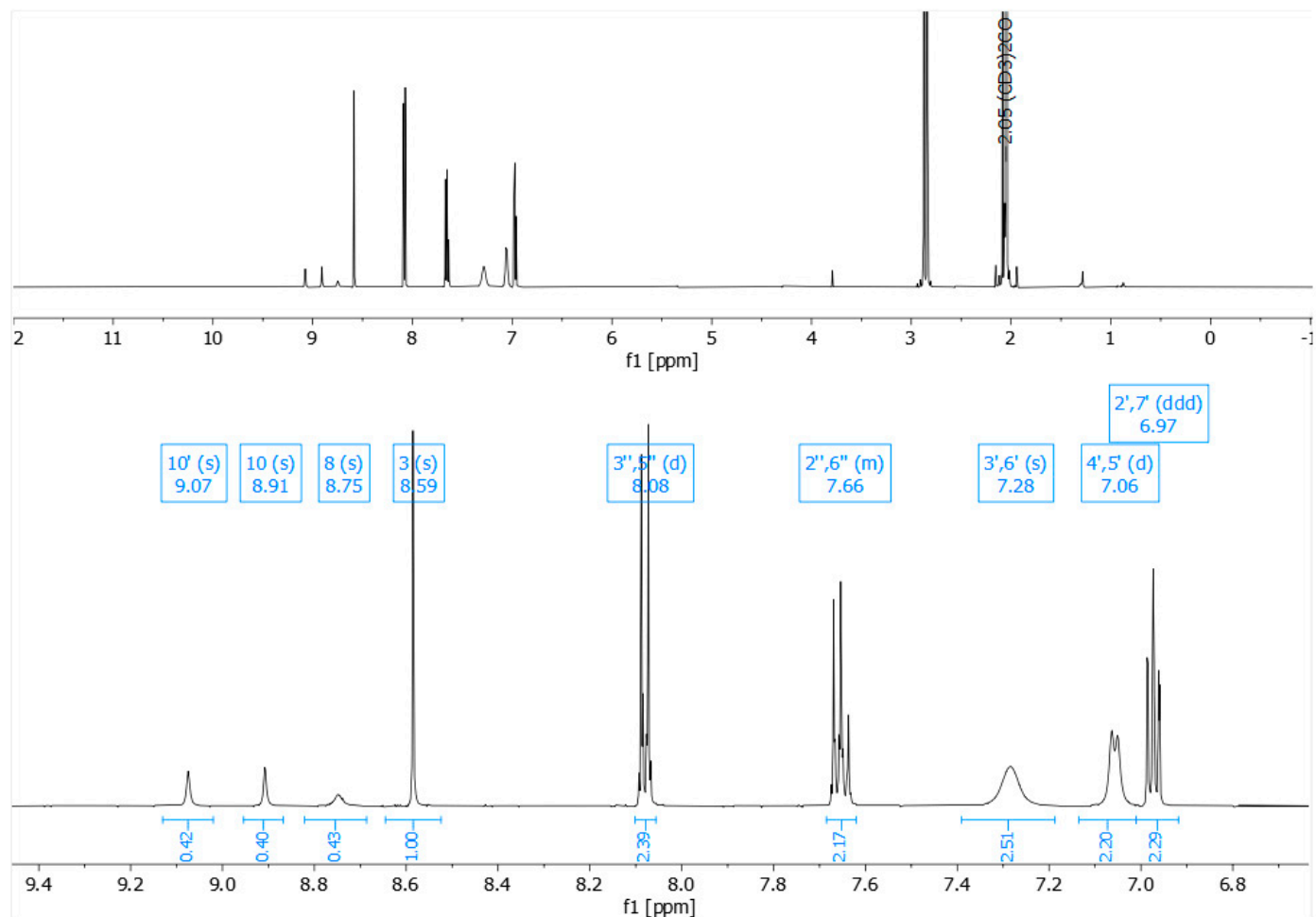
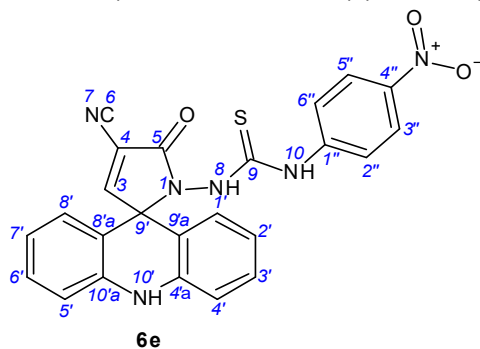
FTIR spectrum of derivative **6d**.



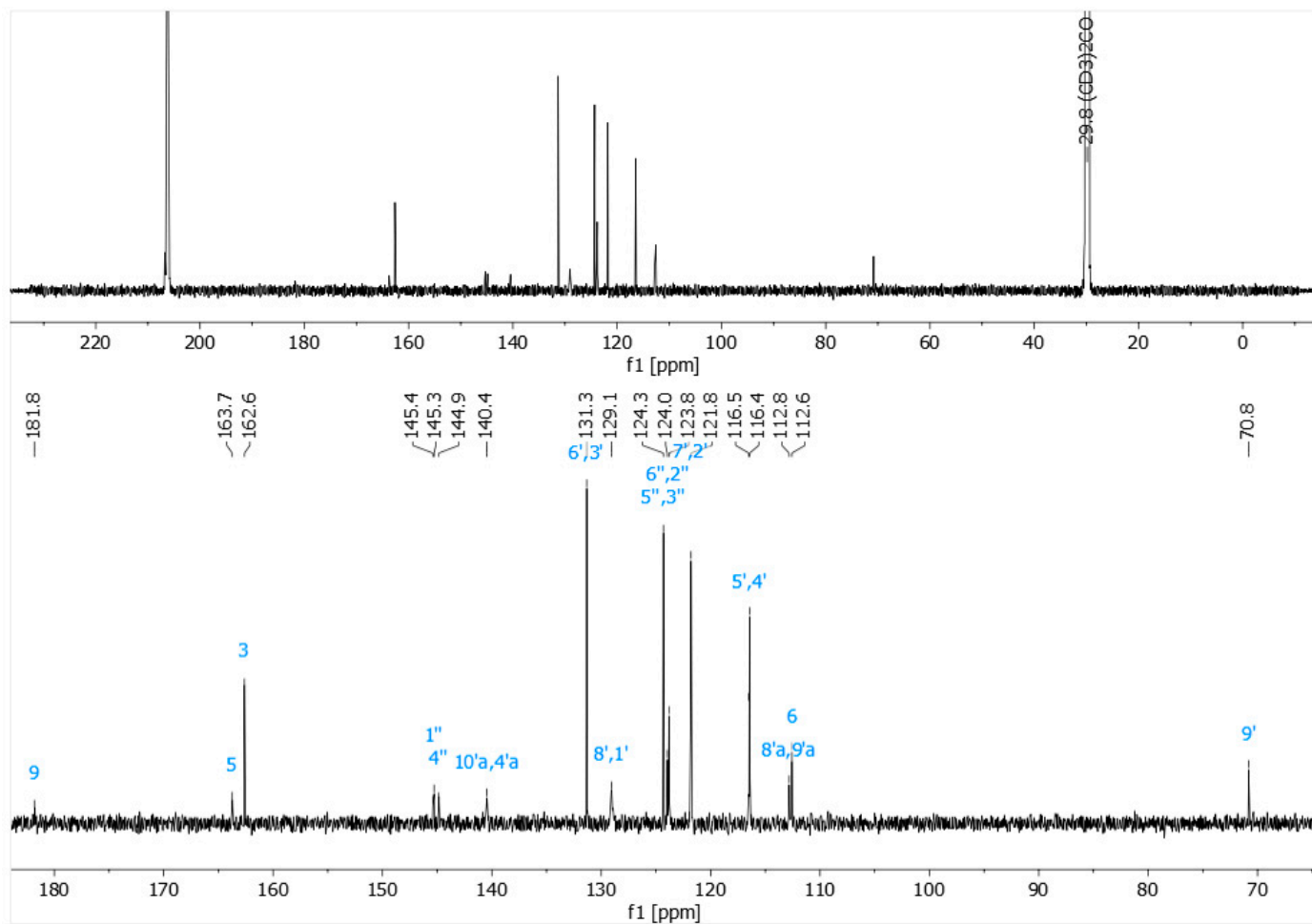
MS2 spectrum of derivative **6d**.



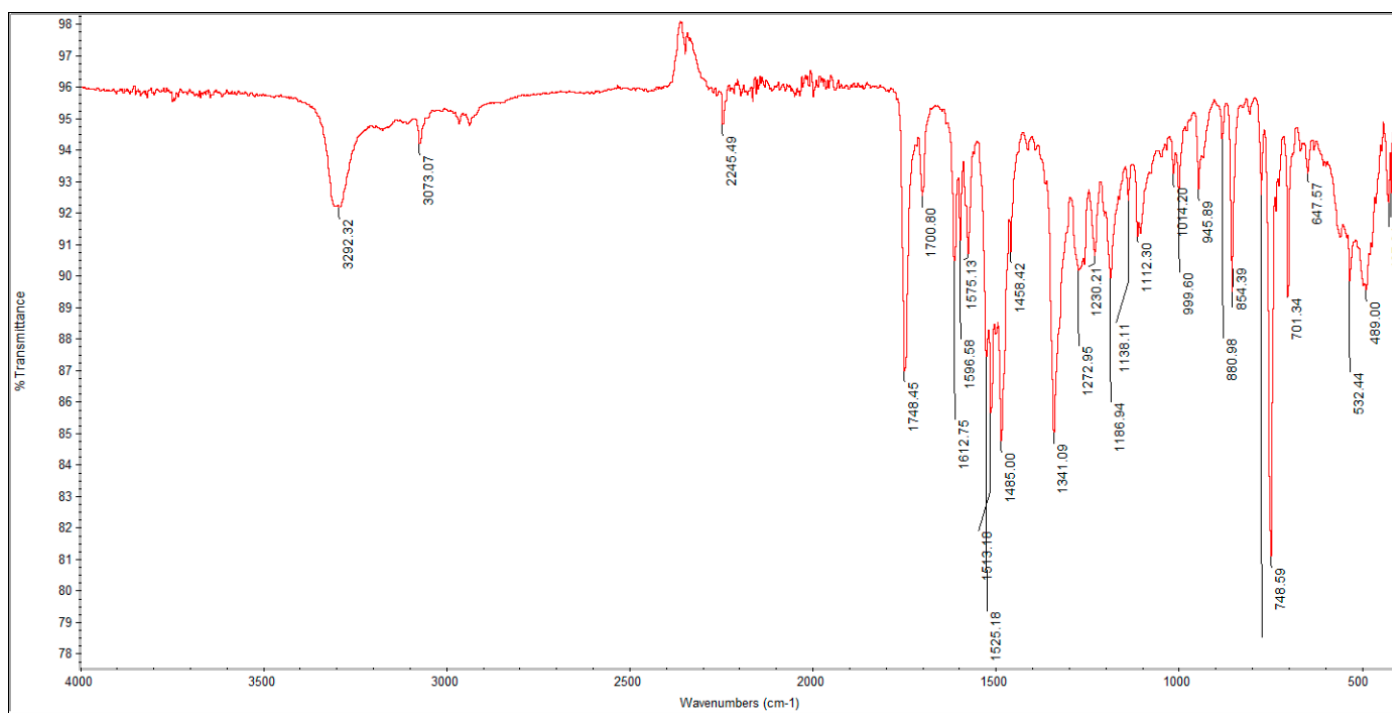
2.5 3-{4'-Cyano-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrol]-1'-yl}-1-(4-nitrophenyl)thiourea (**6e**)



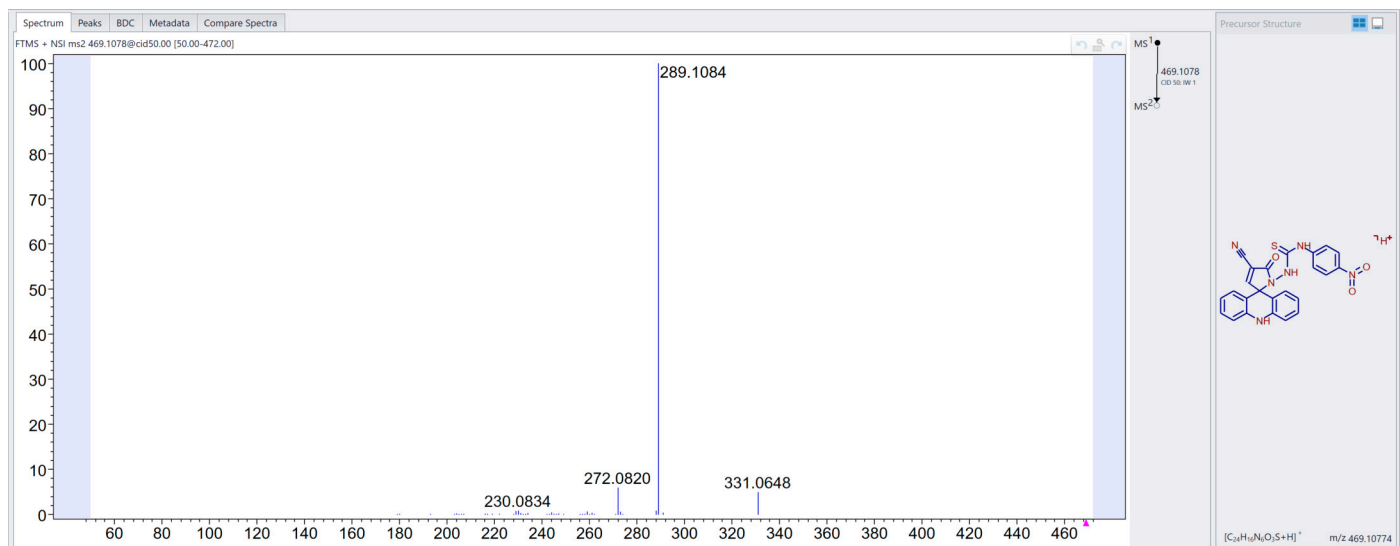
<sup>1</sup>H NMR (600 MHz, acetone-d<sub>6</sub>) spectrum of derivative **6e**.



<sup>13</sup>C NMR (150 MHz, acetone-d<sub>6</sub>) spectrum of derivative **6e**.

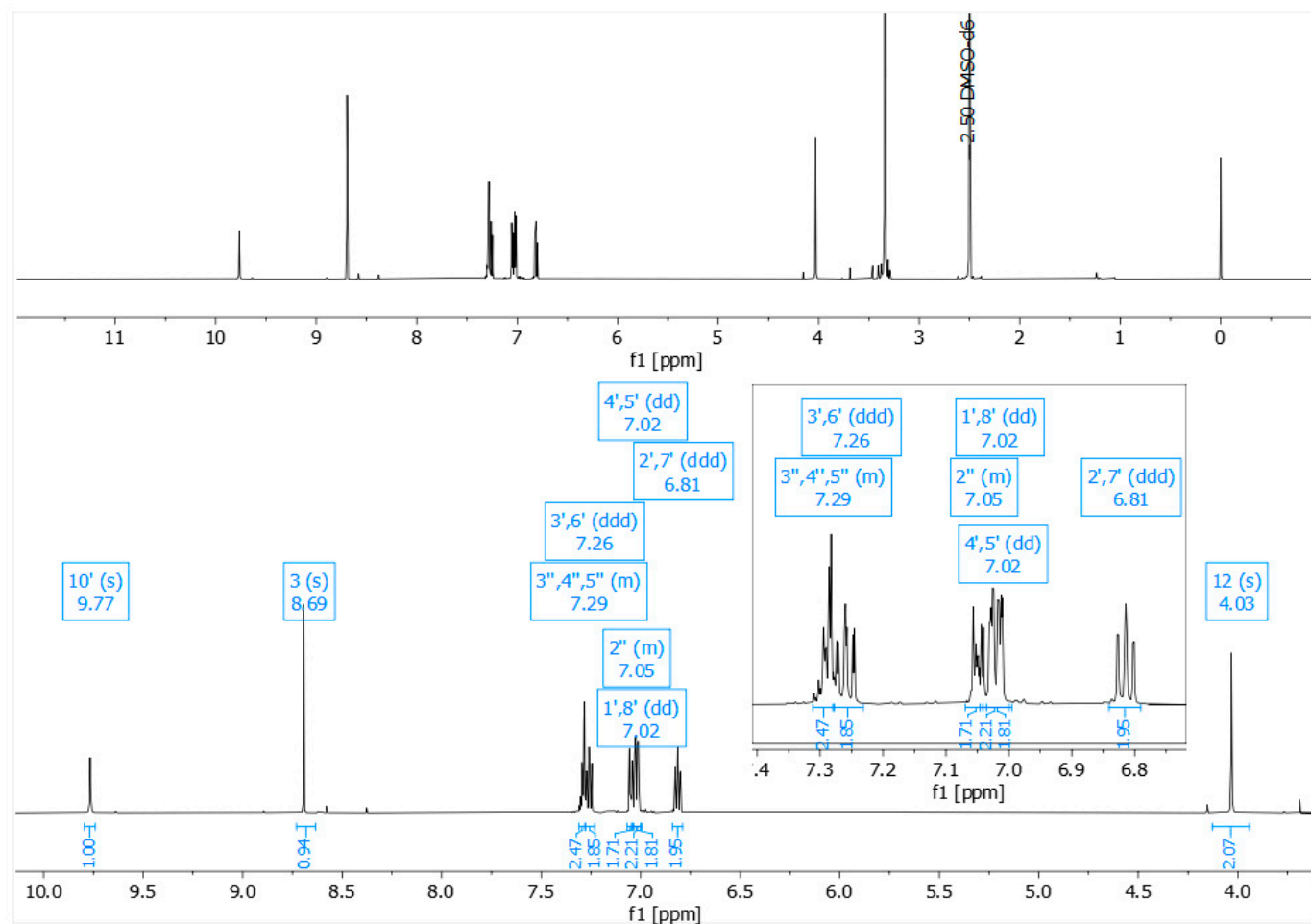
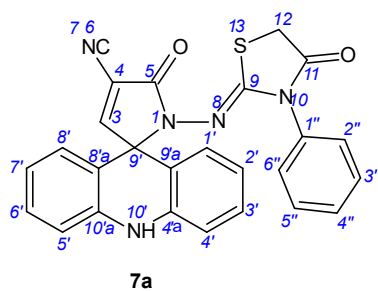


FTIR spectrum of derivative **6e**.

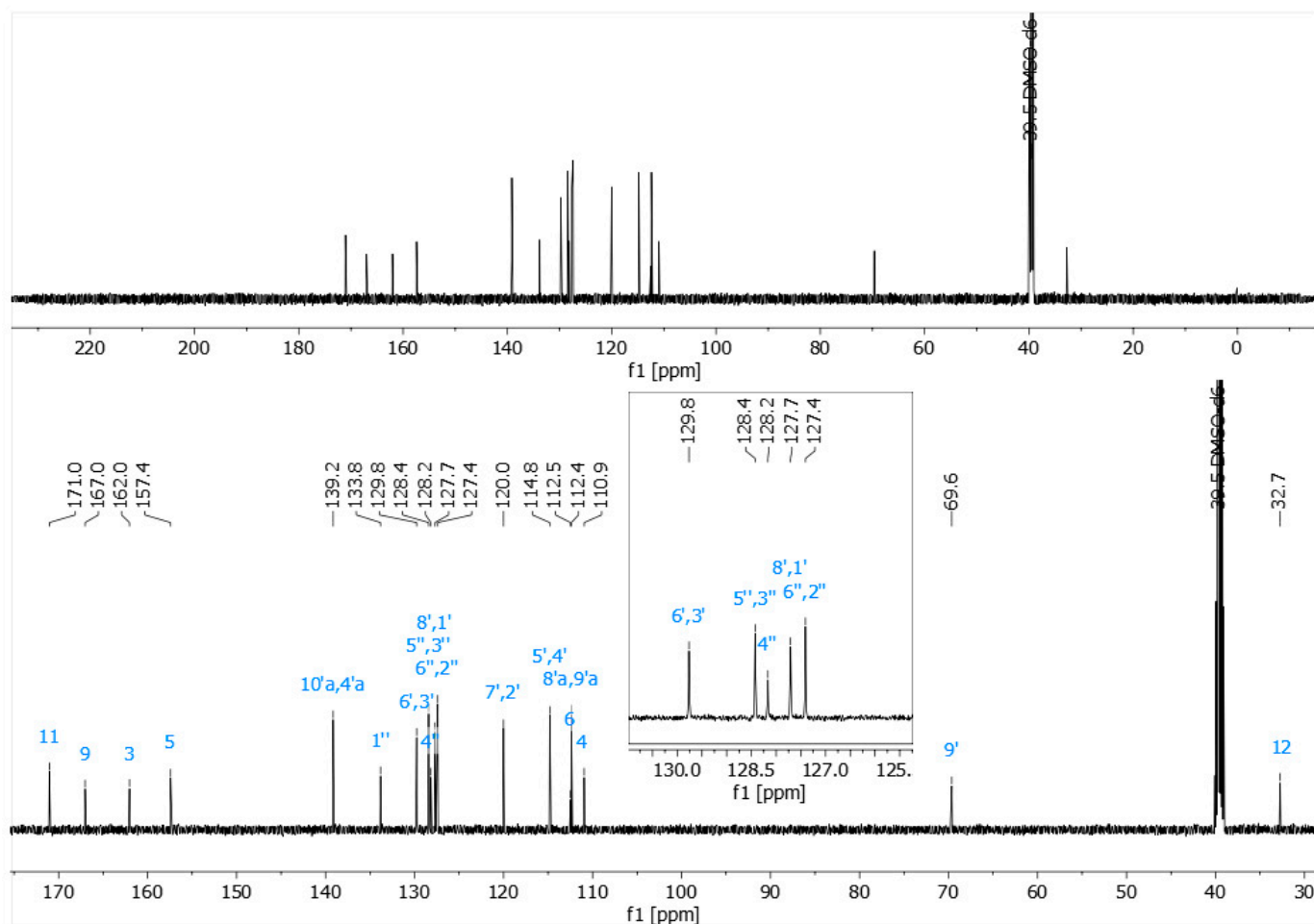


MS2 spectrum of derivative **6e**.

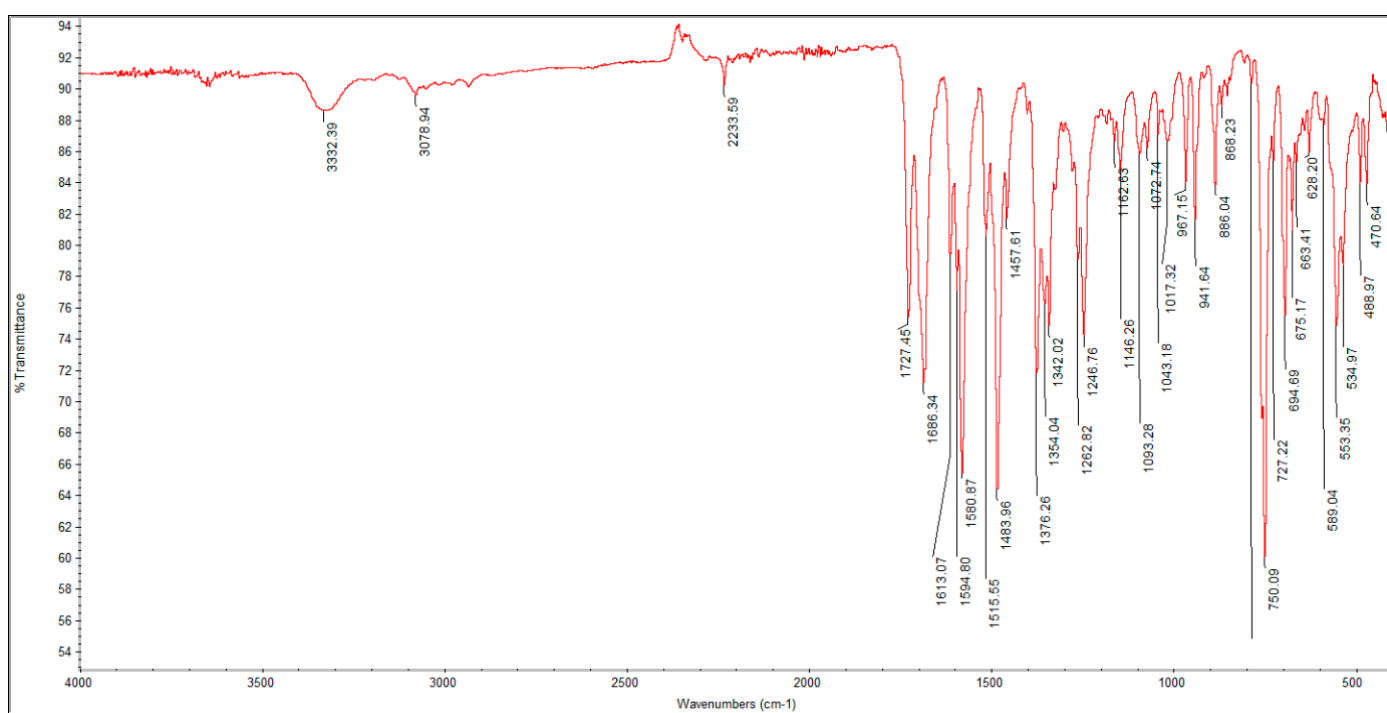
2.6 5'-Oxo-1'-{[(2Z)-4-oxo-3-phenyl-1,3-thiazolidin-2-ylidene]amino}-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**7a**)



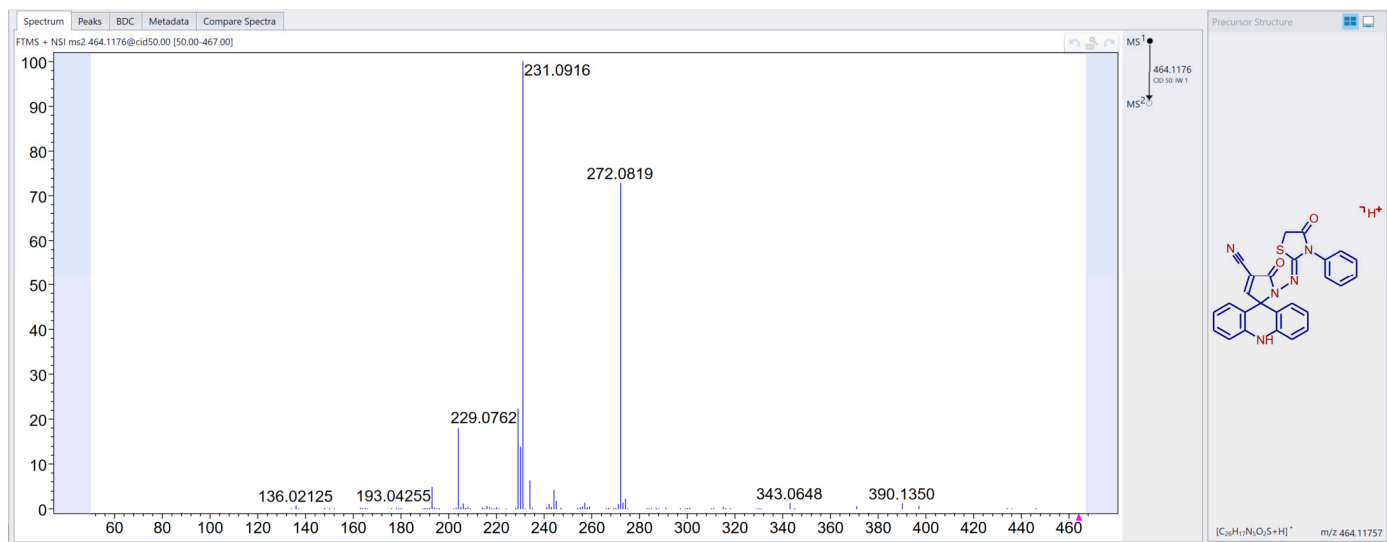
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **7a**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **7a**.

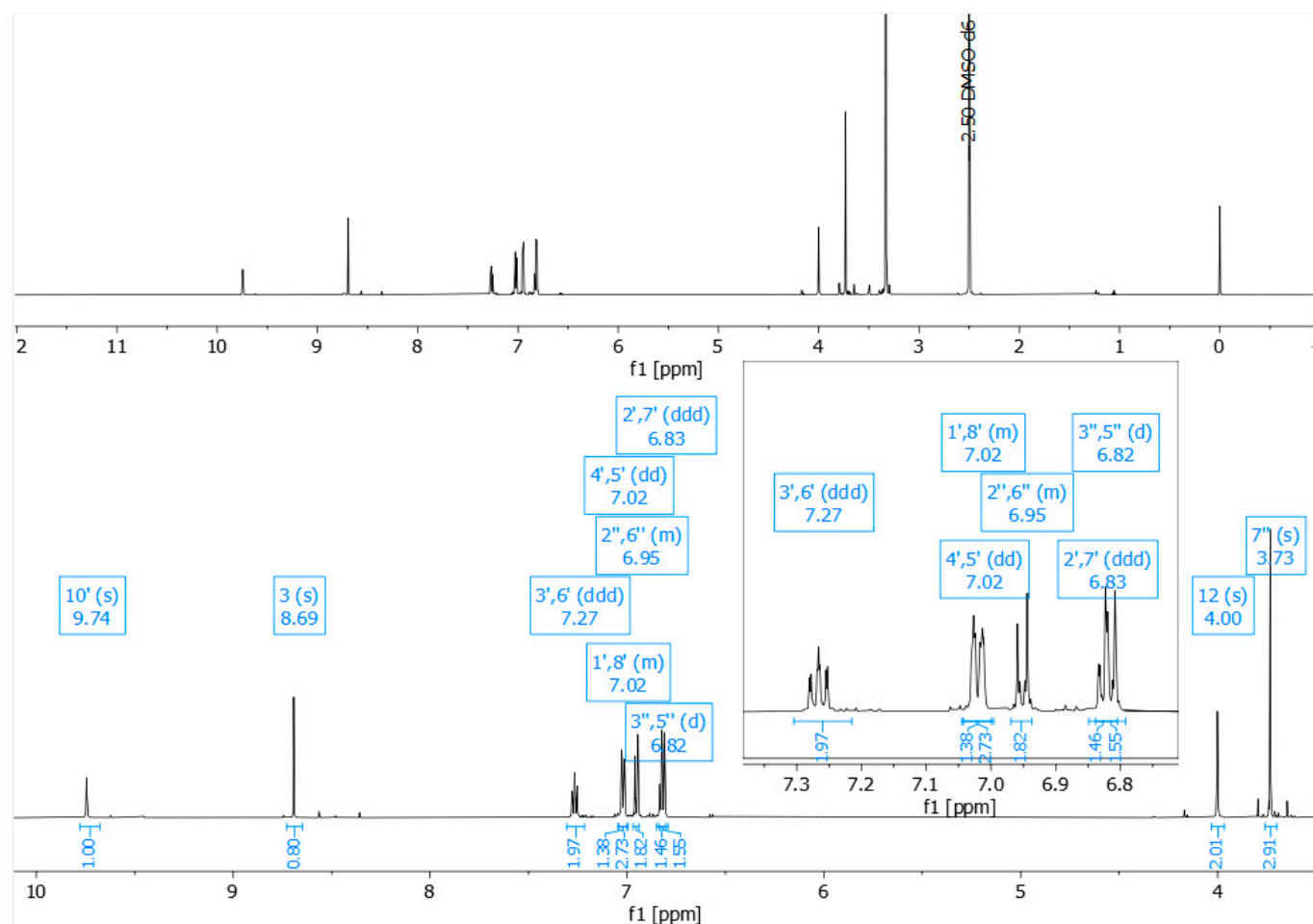
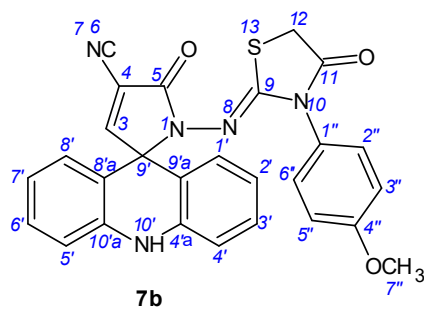


FTIR spectrum of derivative **7a**.

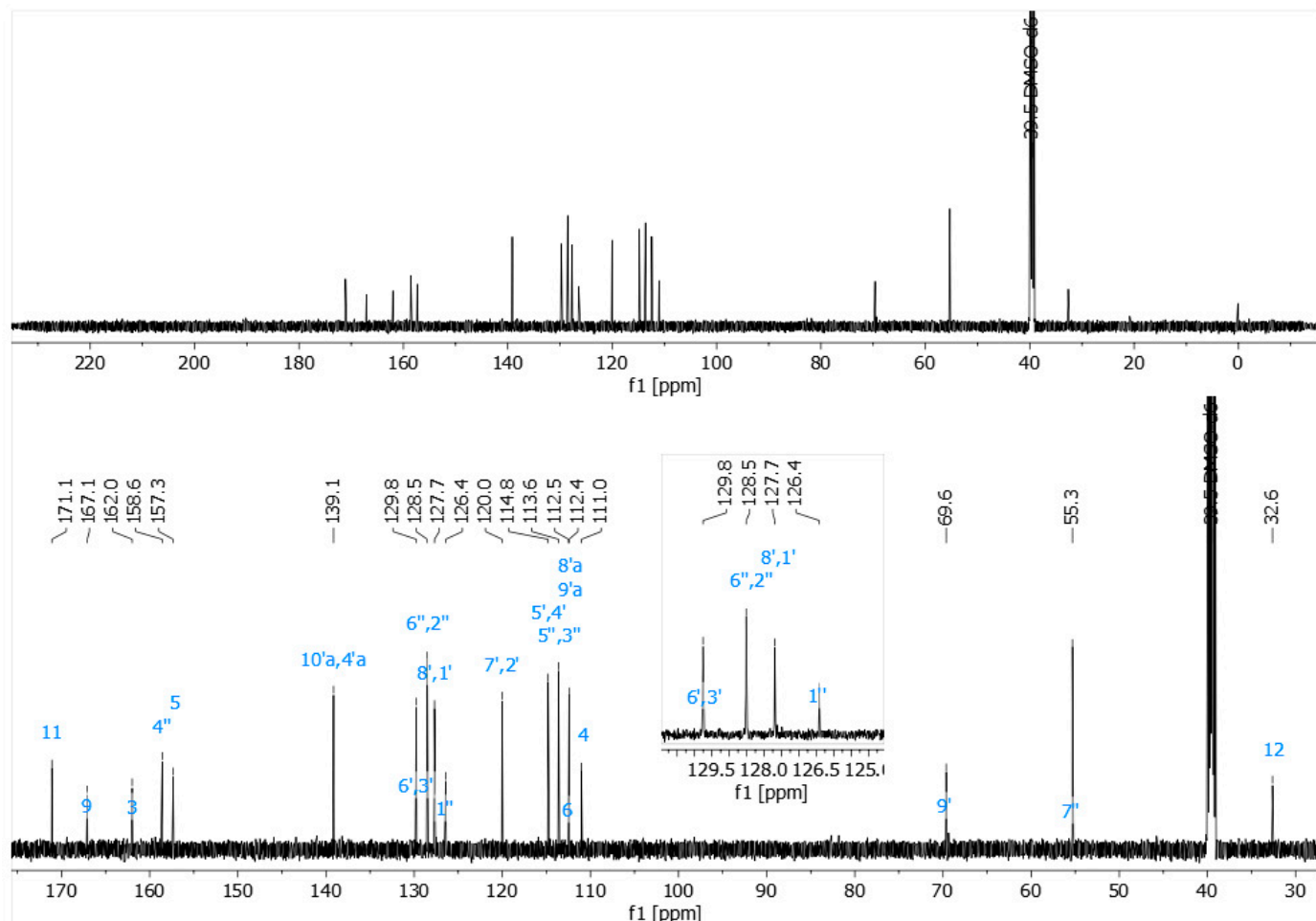


MS2 spectrum of derivative **7a**.

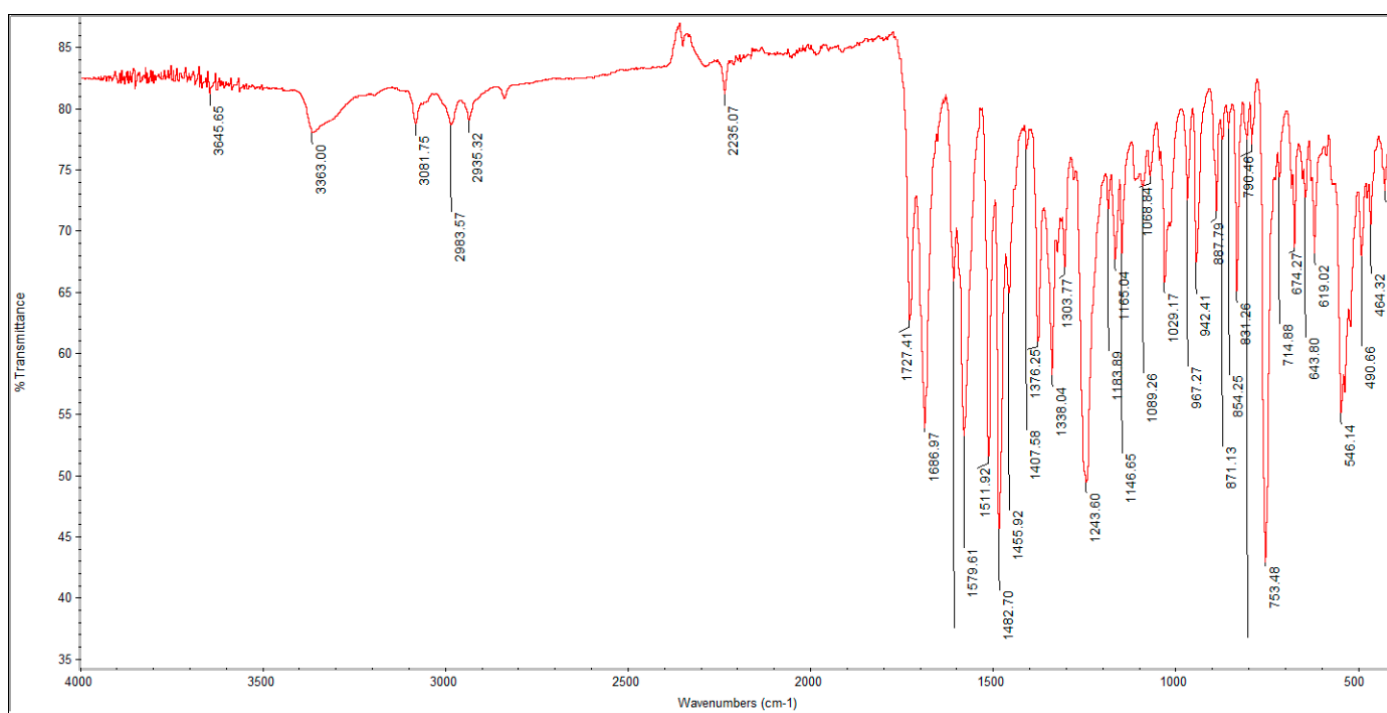
2.7 1'--{[(2Z)-3-(4-Methoxyphenyl)-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**7b**)



$^1\text{H}$  NMR (600 MHz, DMSO- $\text{d}_6$ ) spectrum of derivative **7b**.

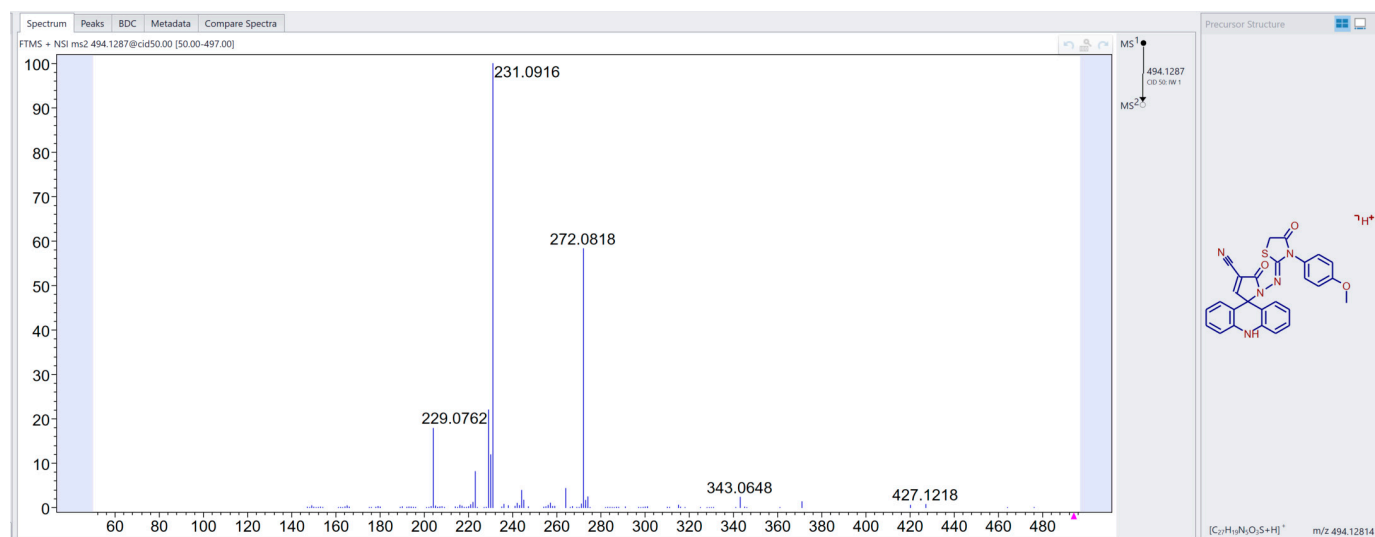


<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **7b**.



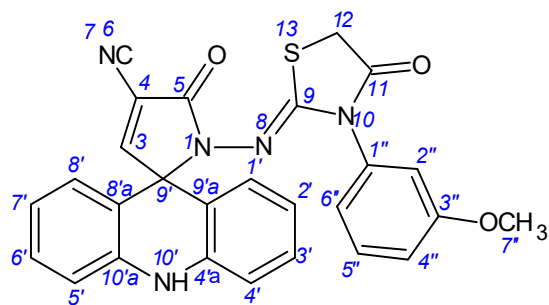
FTIR spectrum of derivative **7b**.



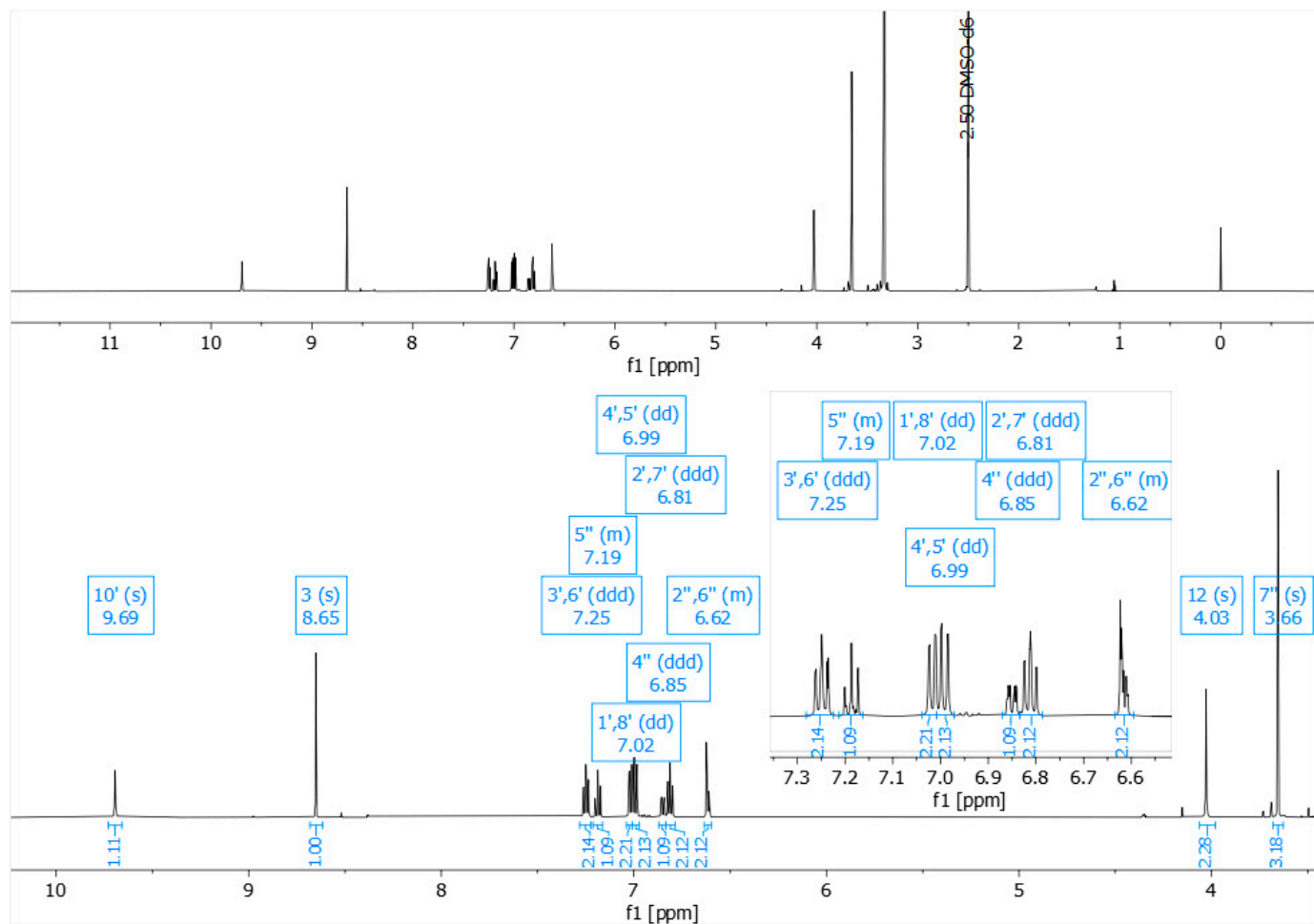


MS2 spectrum of derivative **7b**.

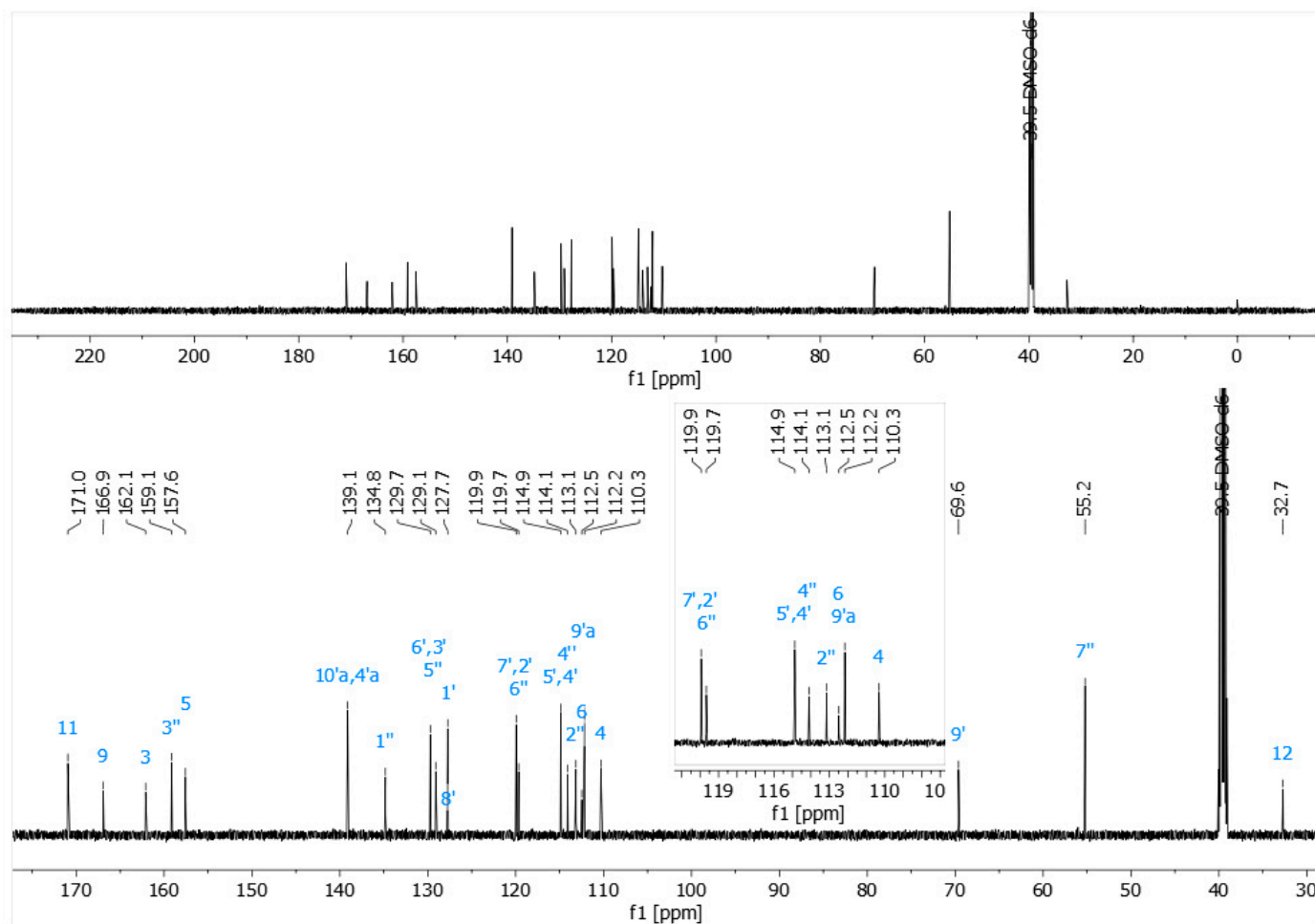
2.8 1'-{[(2Z)-3-(3-Methoxyphenyl)-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**7c**)



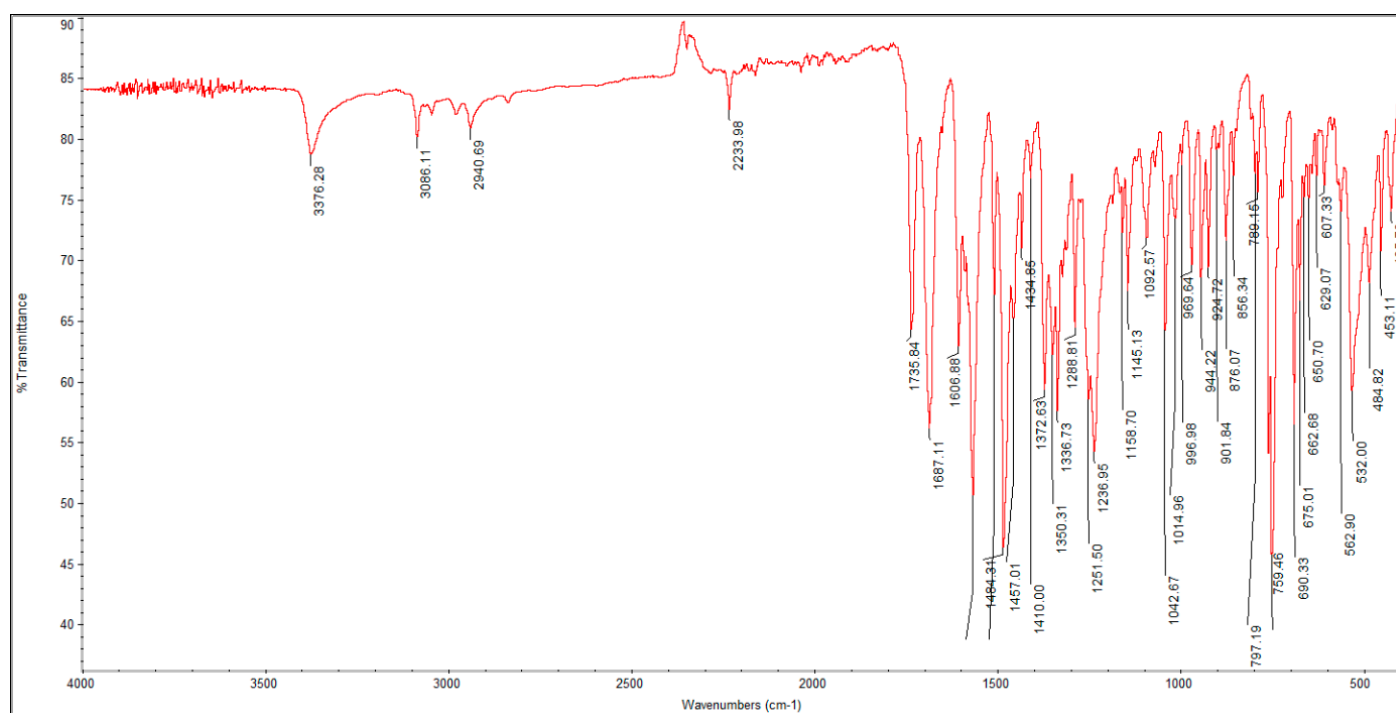
**7c**



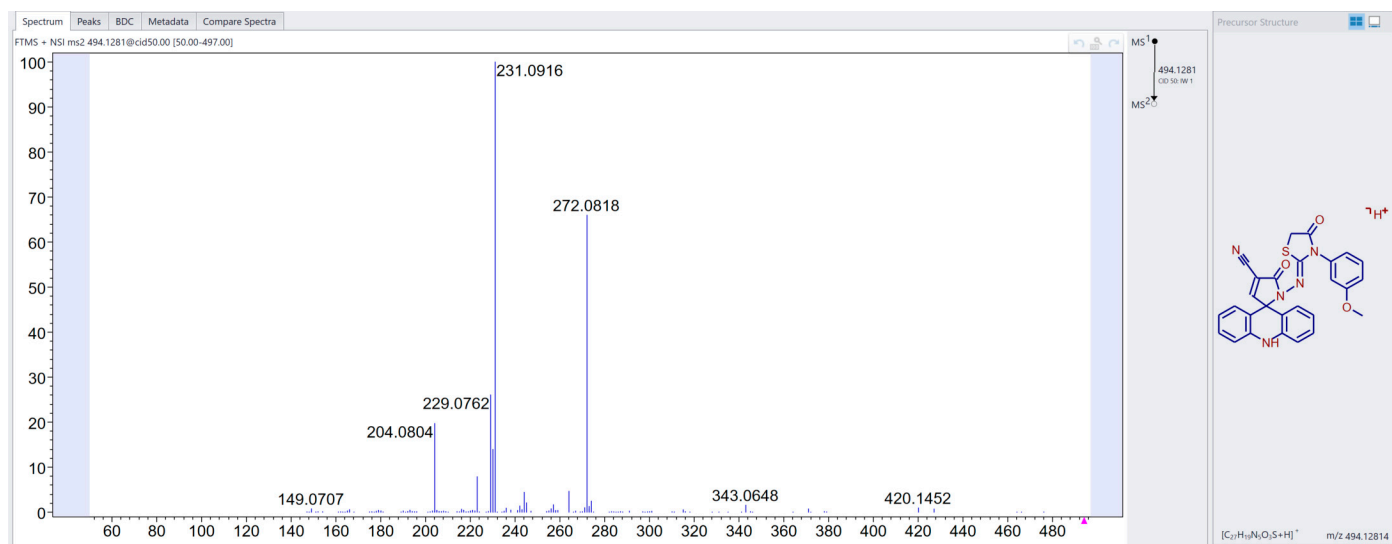
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **7c**.



**<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative 7c.**

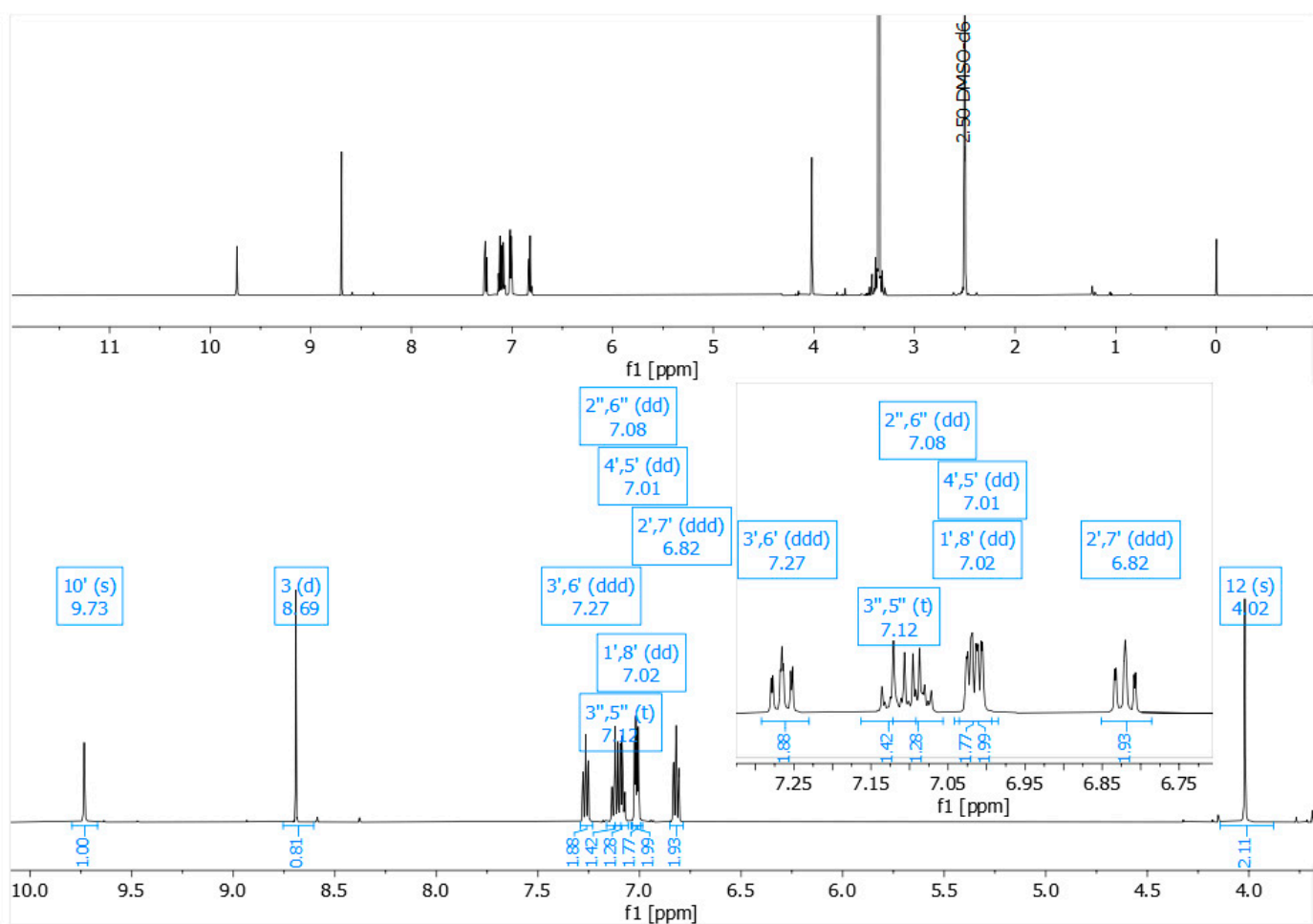
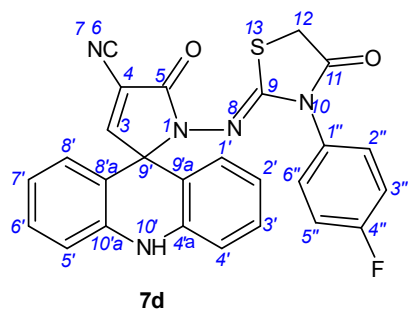


**FTIR spectrum of derivative 7c.**

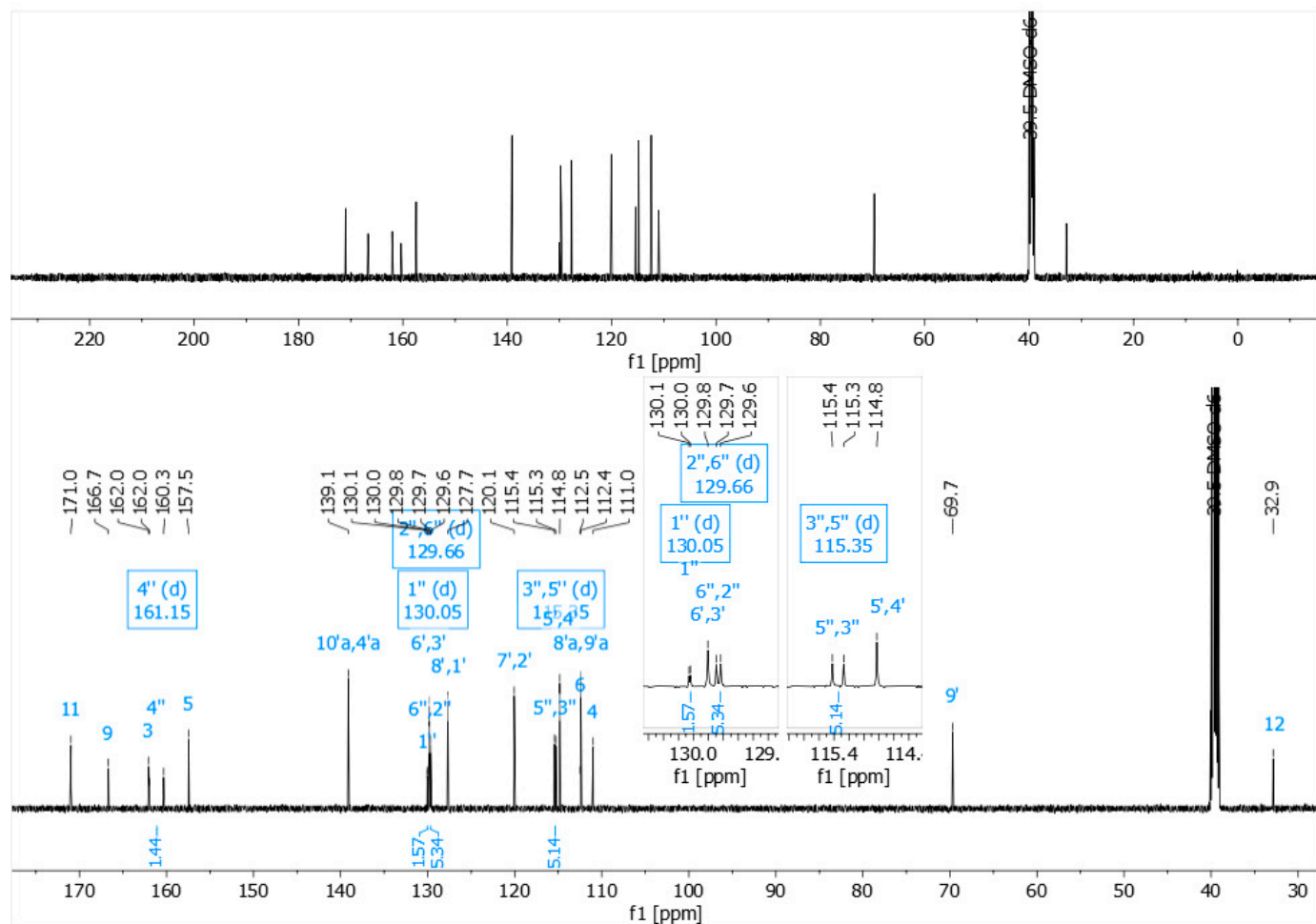


MS2 spectrum of derivative **7c**.

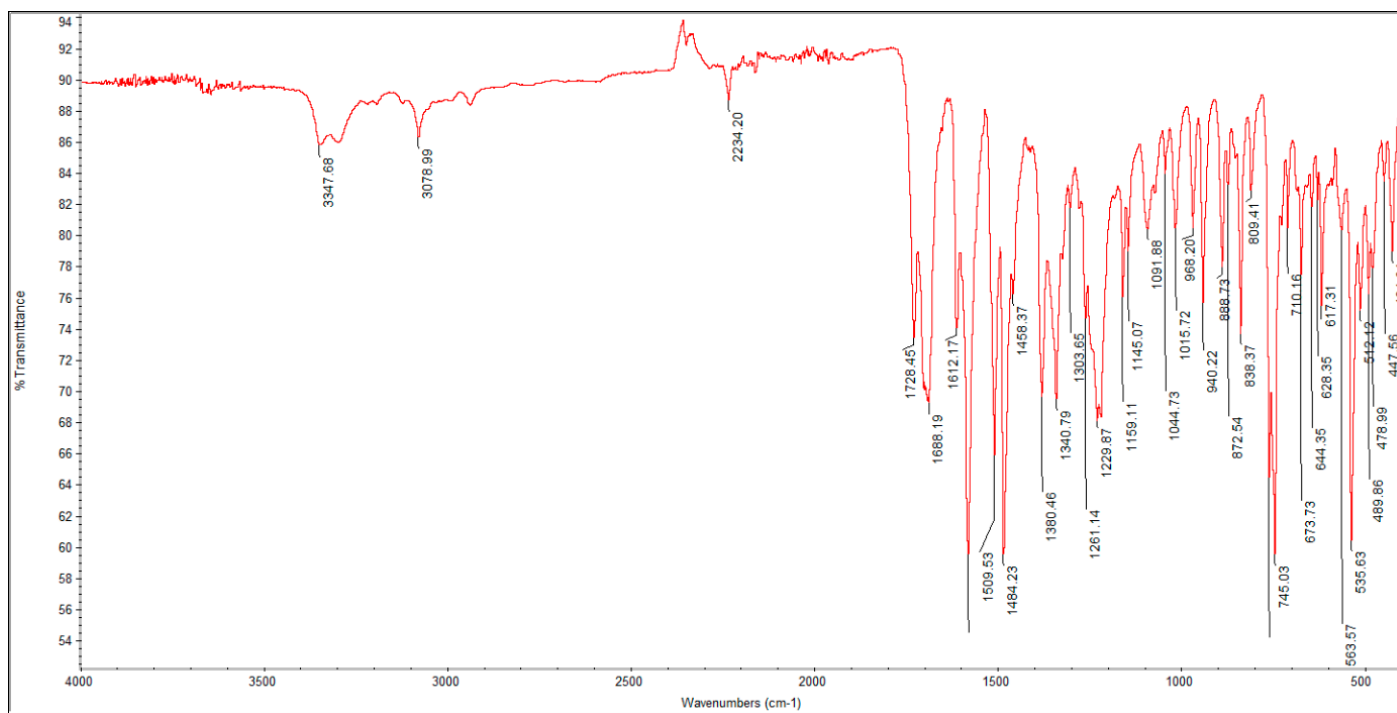
2.9 1'-{[(2Z)-3-(4-Fluorophenyl)-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**7d**)



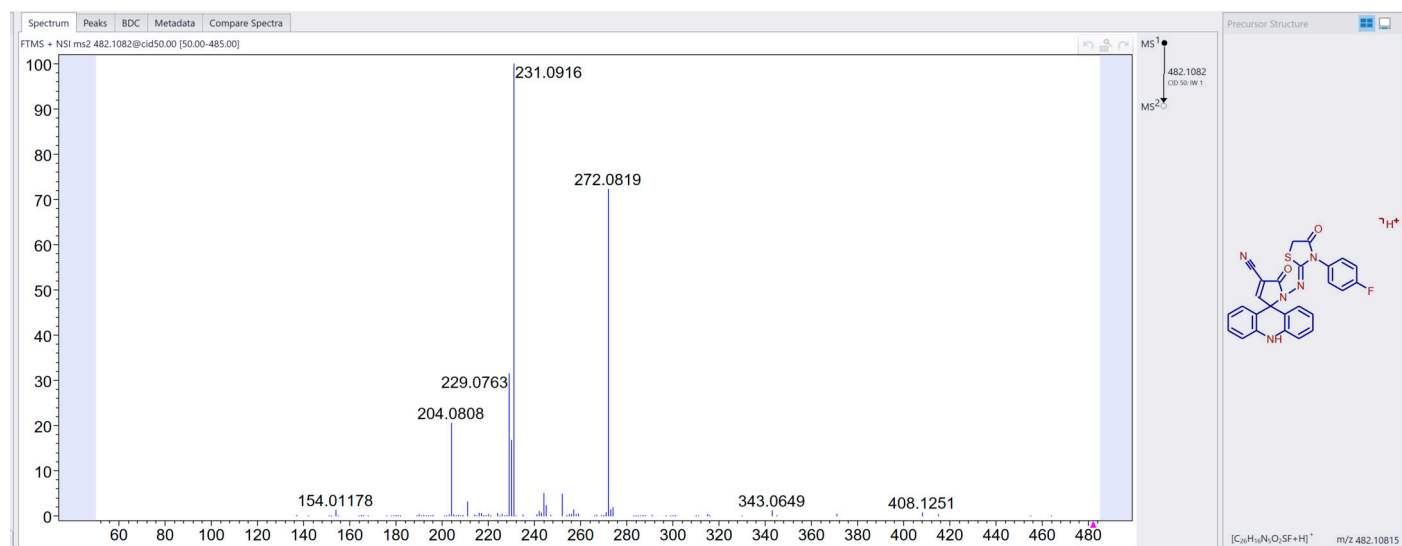
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **7d**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **7d**.

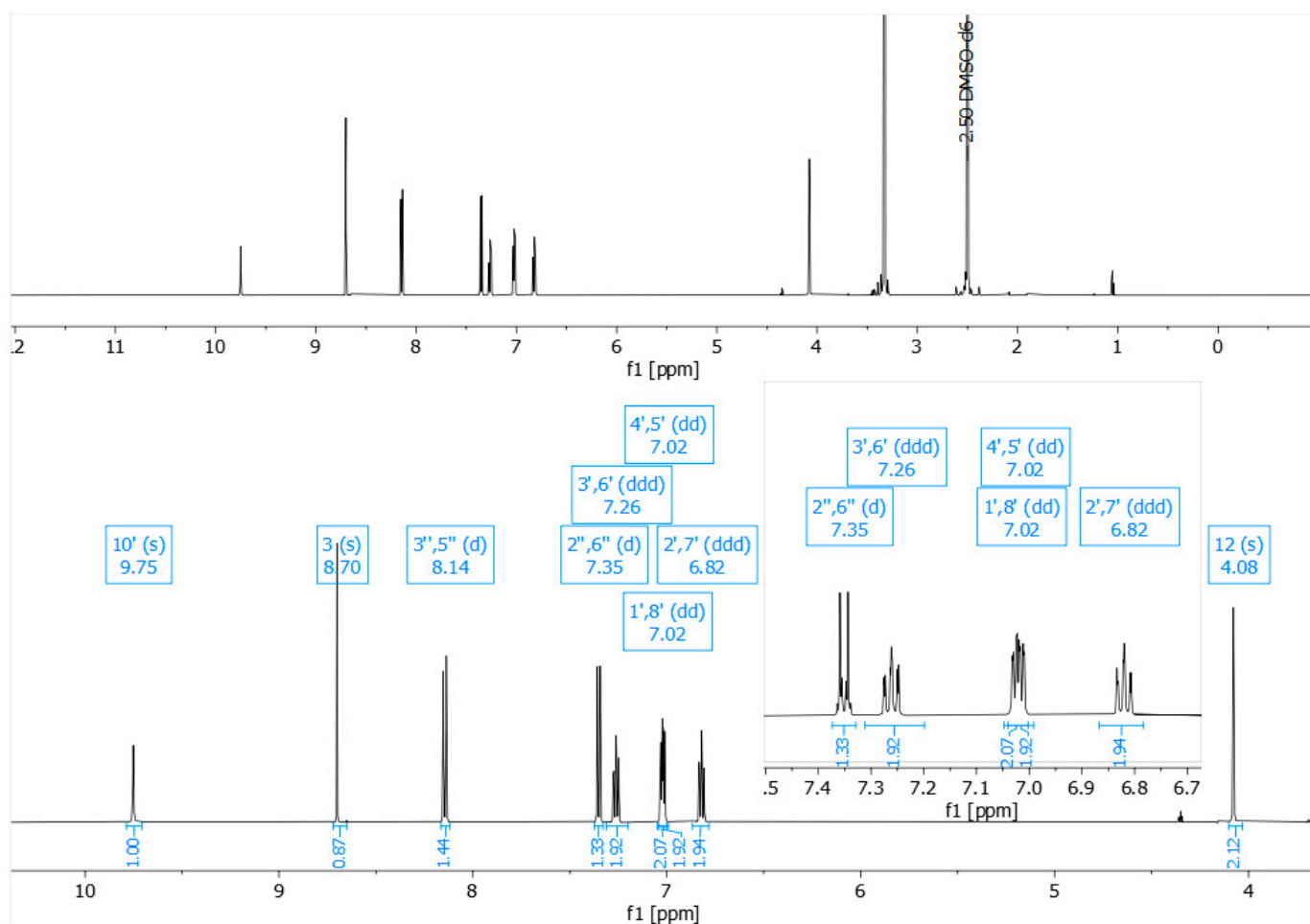
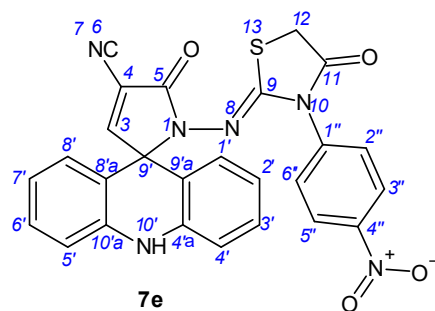


FTIR spectrum of derivative **7d**.



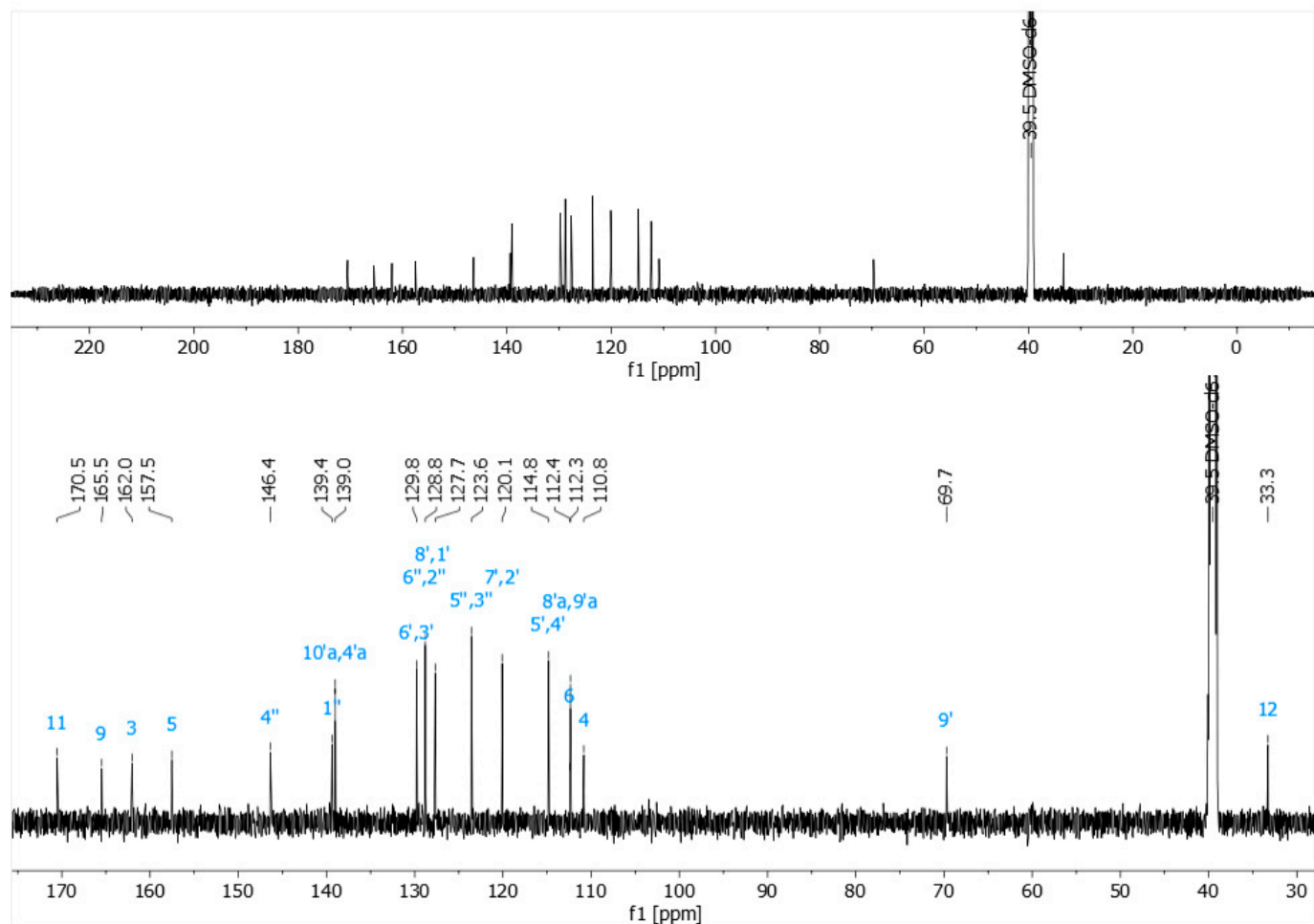
MS2 spectrum of derivative **7d**.

2.10 1'-{[(2Z)-3-(4-Nitrophenyl)-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**7e**)

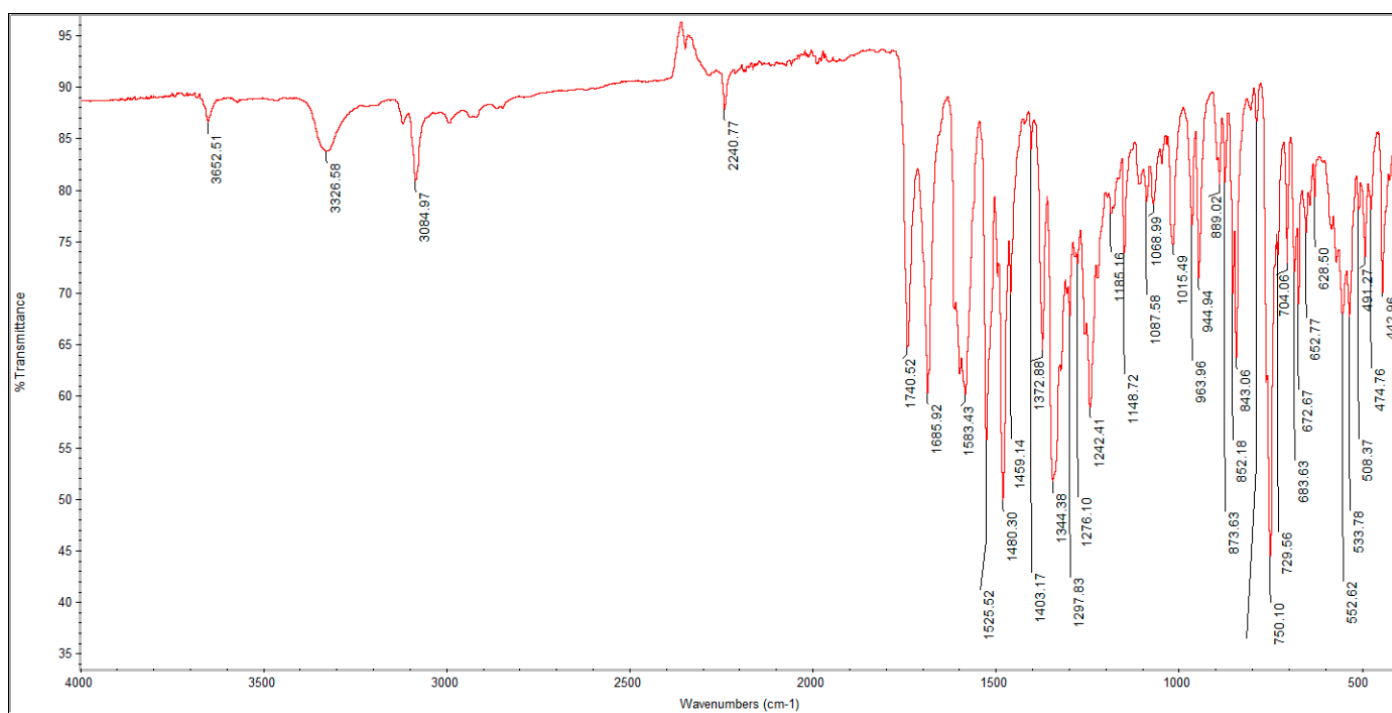


$^1\text{H}$  NMR (600 MHz, DMSO- $\text{d}_6$ ) spectrum of derivative **7e**.

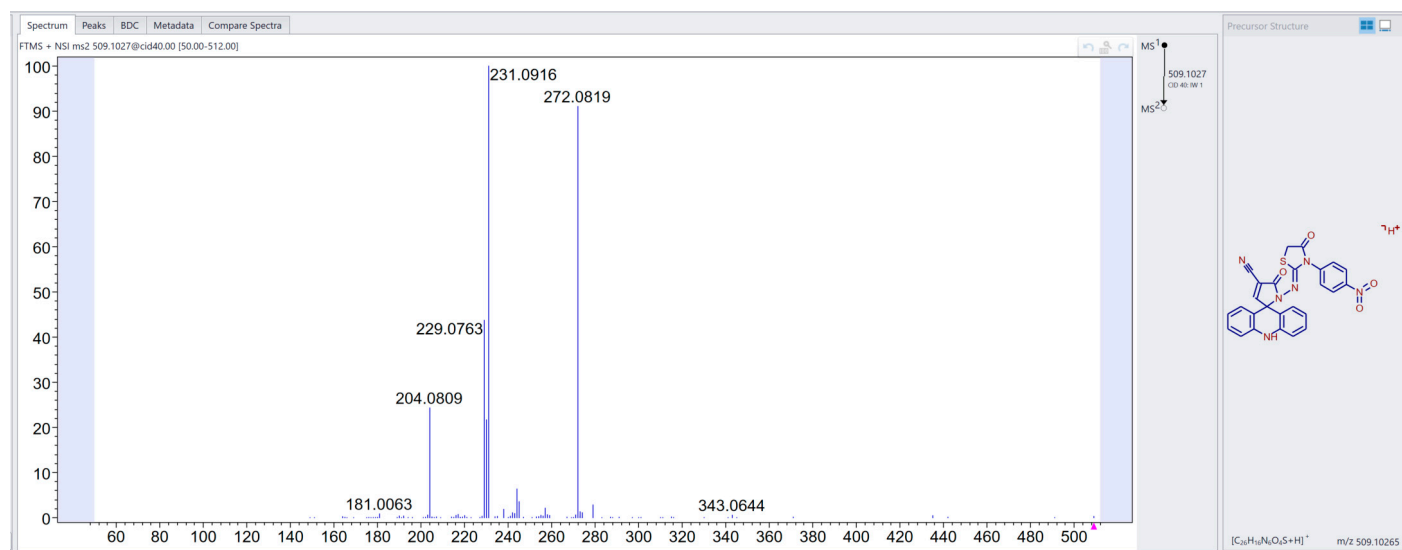




<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **7e**.

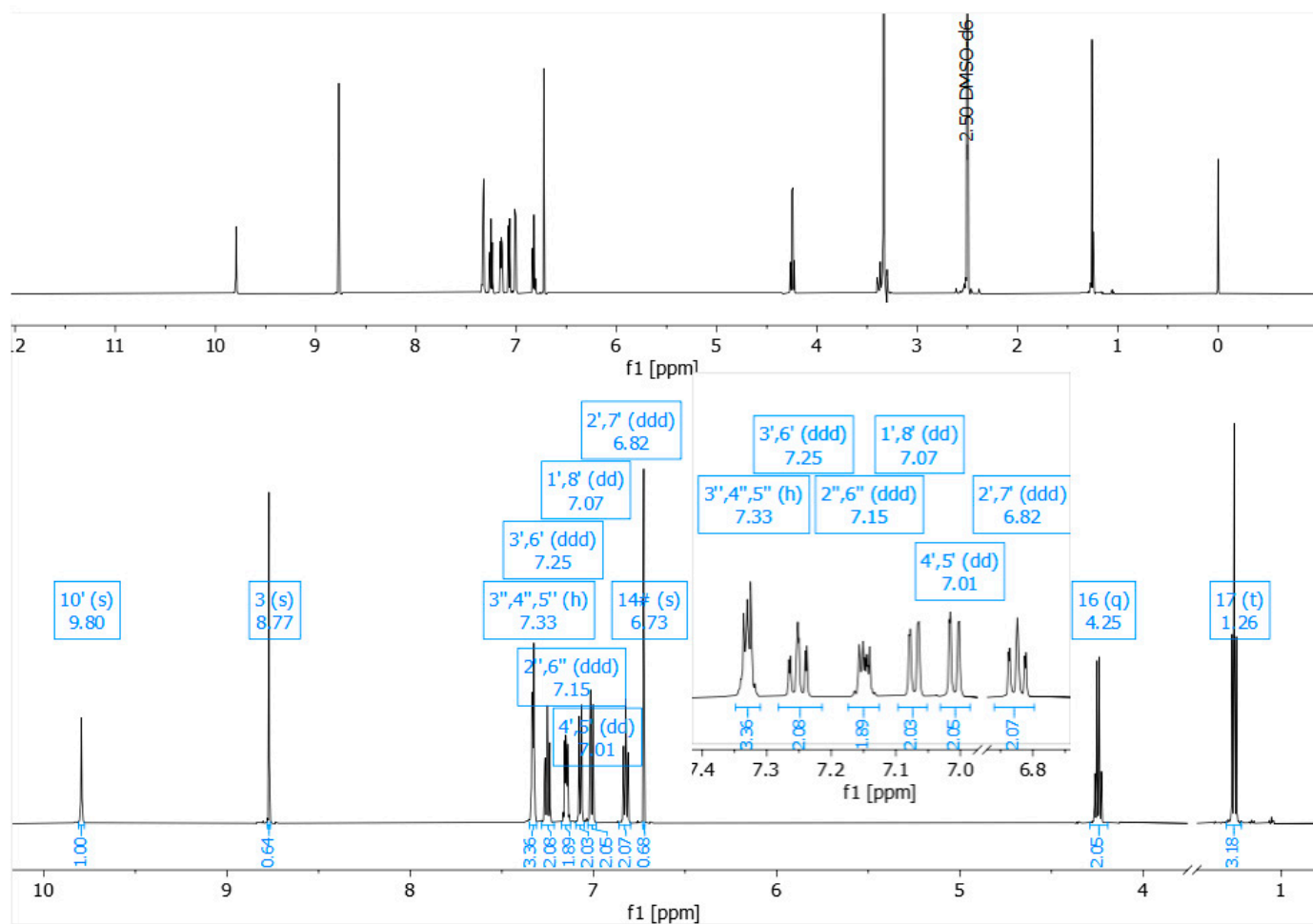
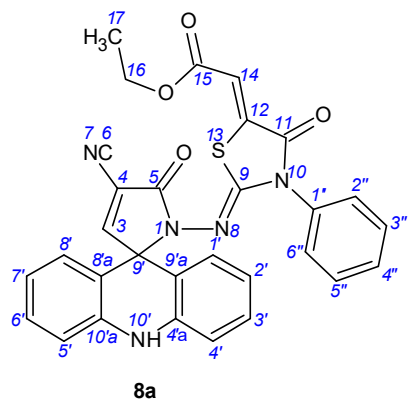


FTIR spectrum of derivative **7e**.

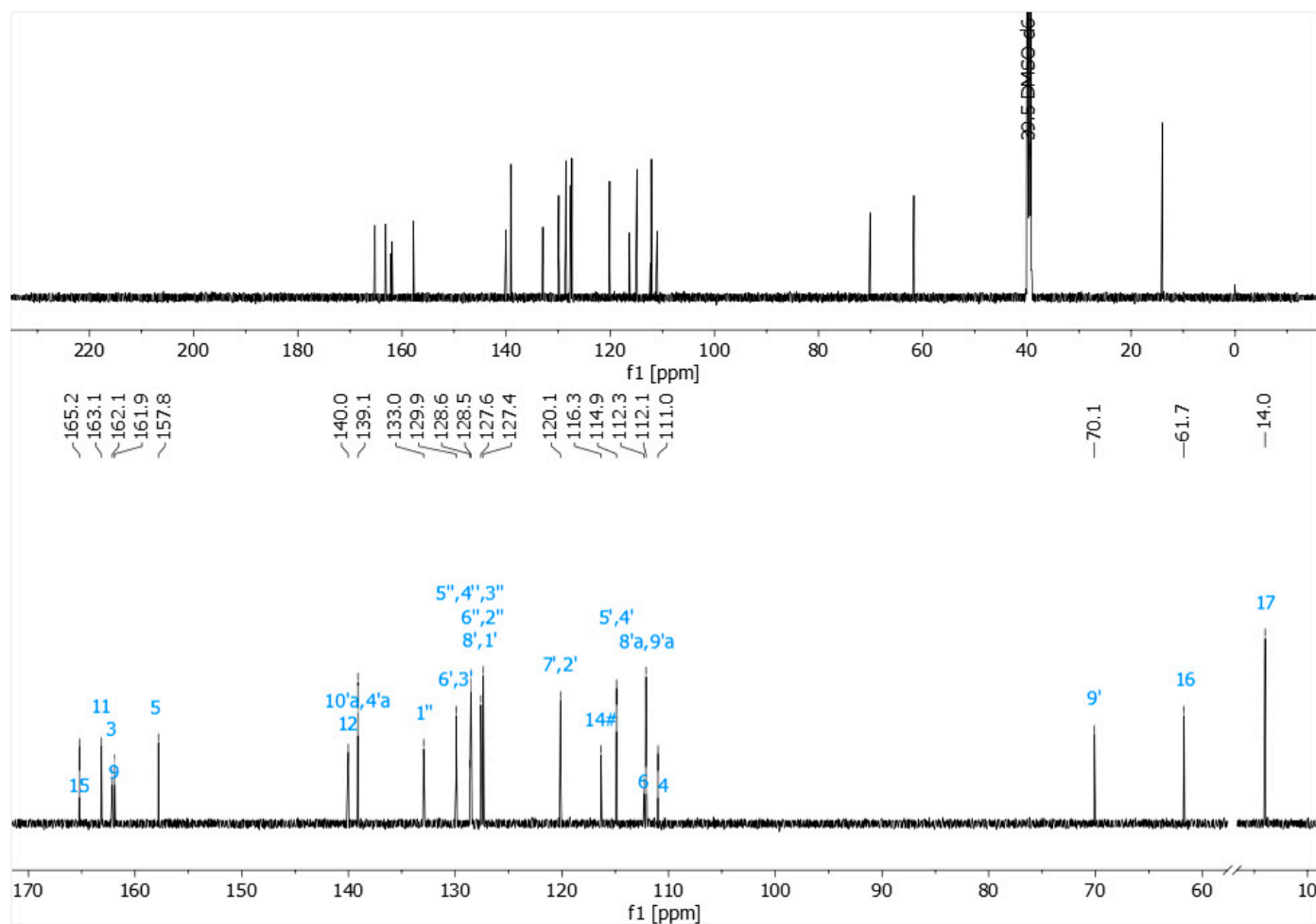


MS2 spectrum of derivative **7e**.

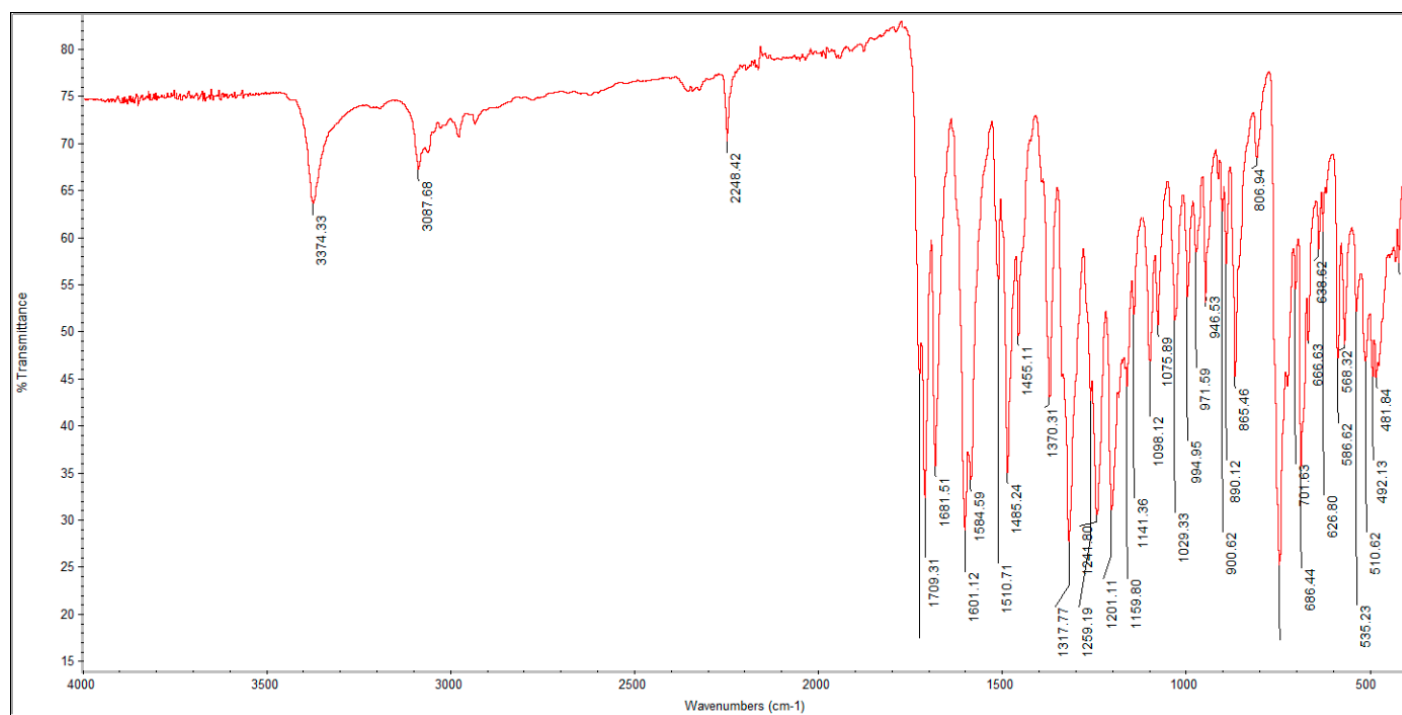
2.11 Ethyl 2-[(2Z,5Z)-2-({4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl)imino)-4-oxo-3-phenyl-1,3-thiazolidin-5-ylidene]acetate (**8a**)



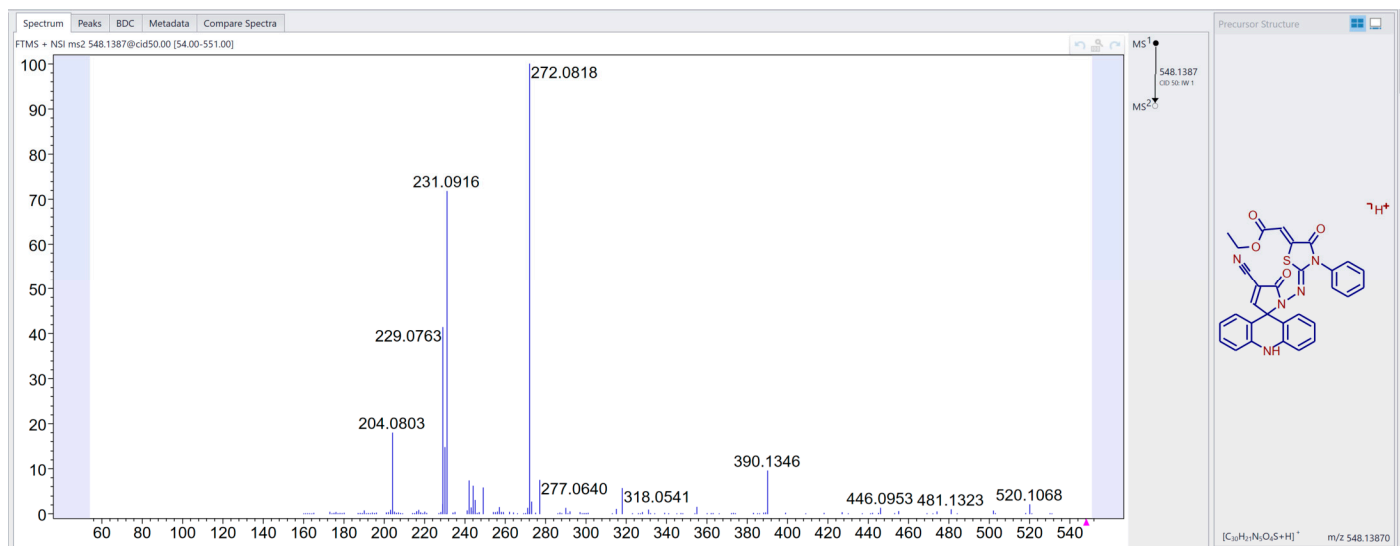
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **8a**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **8a**.

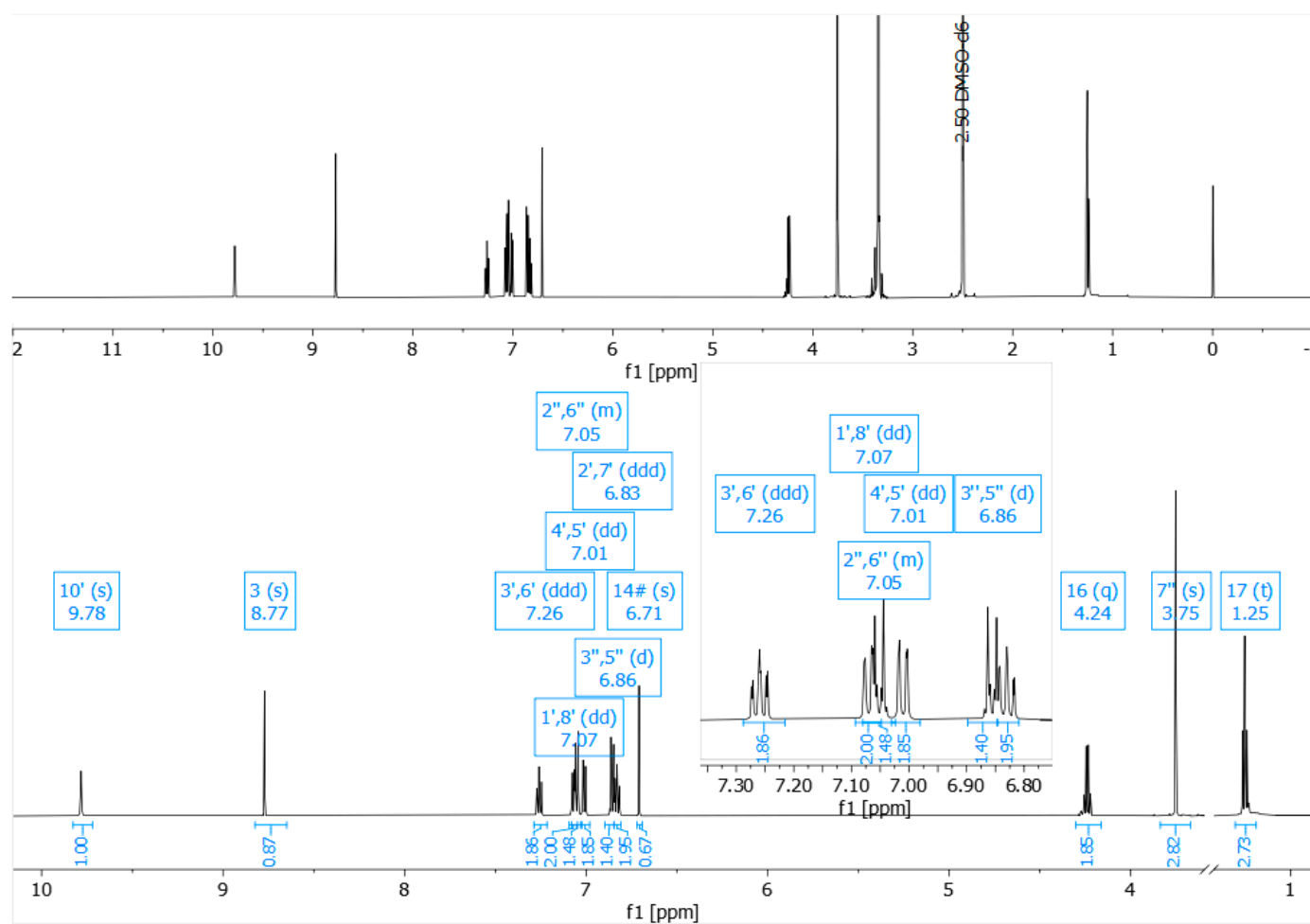
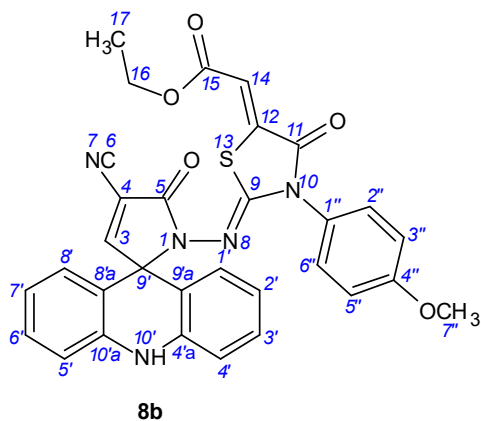


FTIR spectrum of derivative **8a**.

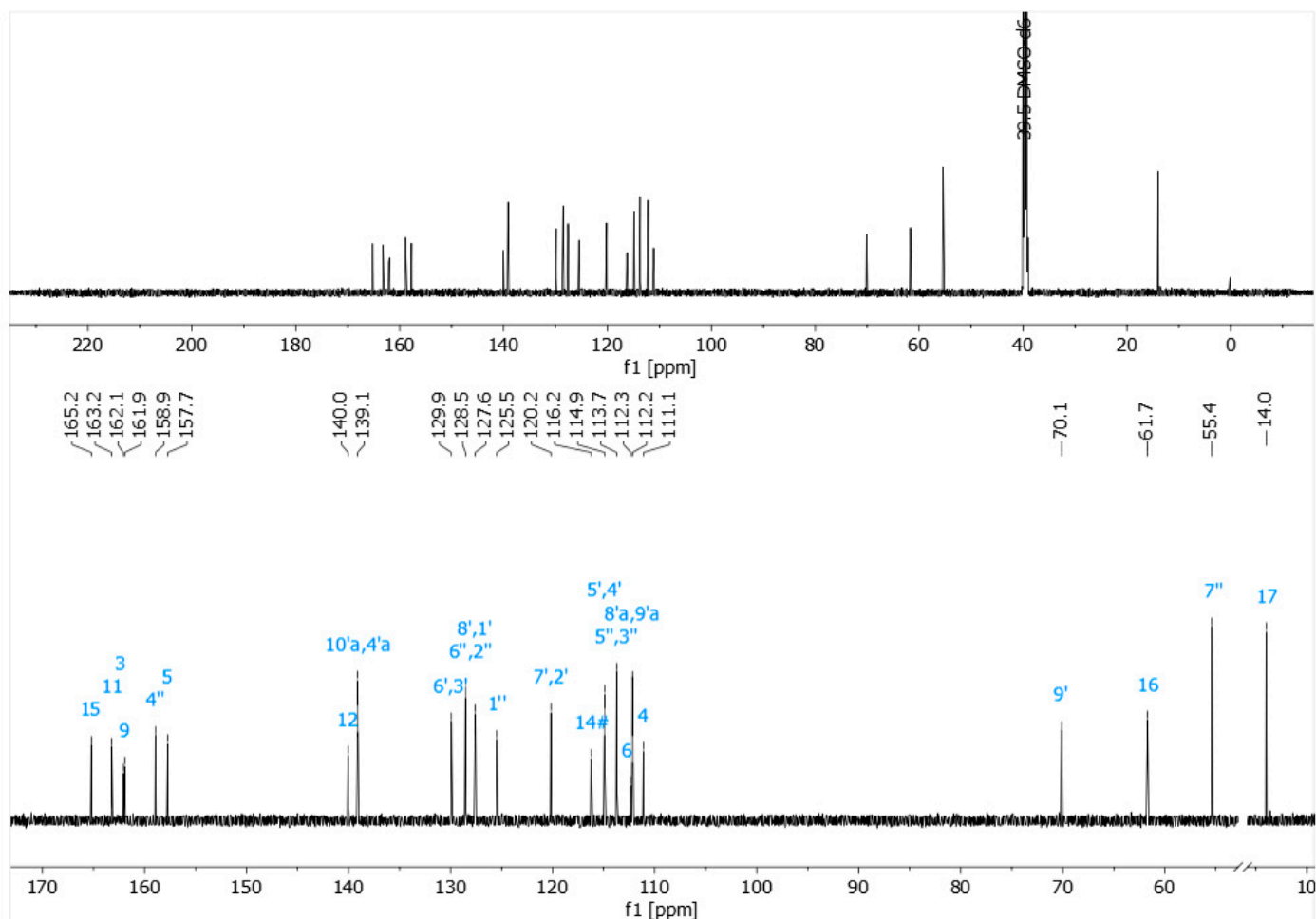


MS2 spectrum of derivative **8a**.

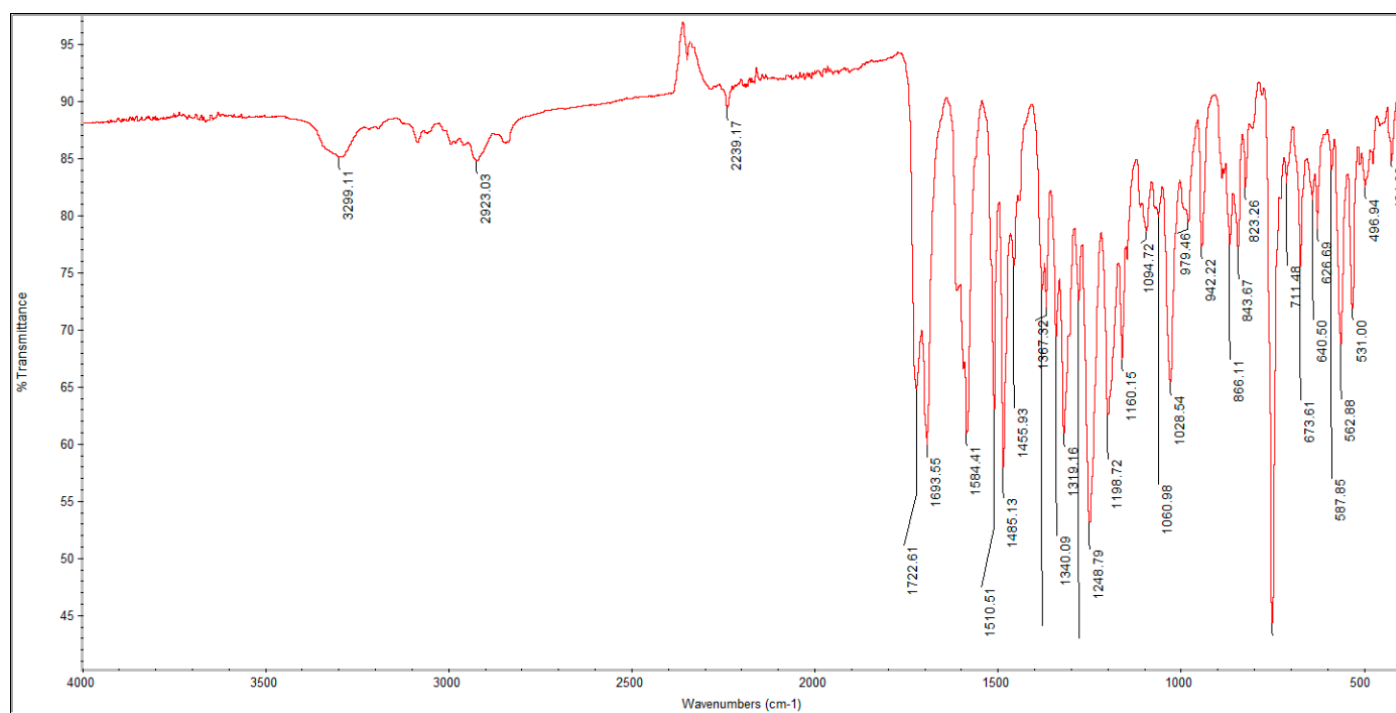
2.12 Ethyl 2-[(2Z,5Z)-2-({4'-cyano-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrol]-1'-yl)imino)-3-(4-methoxyphenyl)-4-oxo-1,3-thiazolidin-5-ylidene]acetate (**8b**)



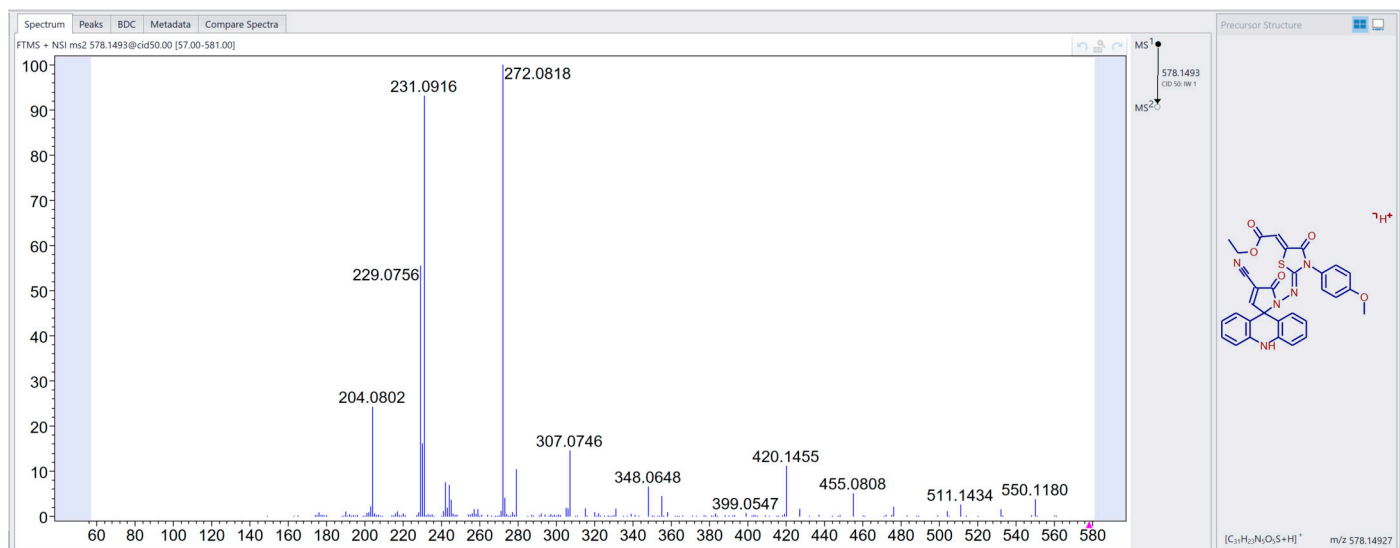
$^1\text{H}$  NMR (600 MHz, DMSO- $d_6$ ) spectrum of derivative **8b**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **8b**.



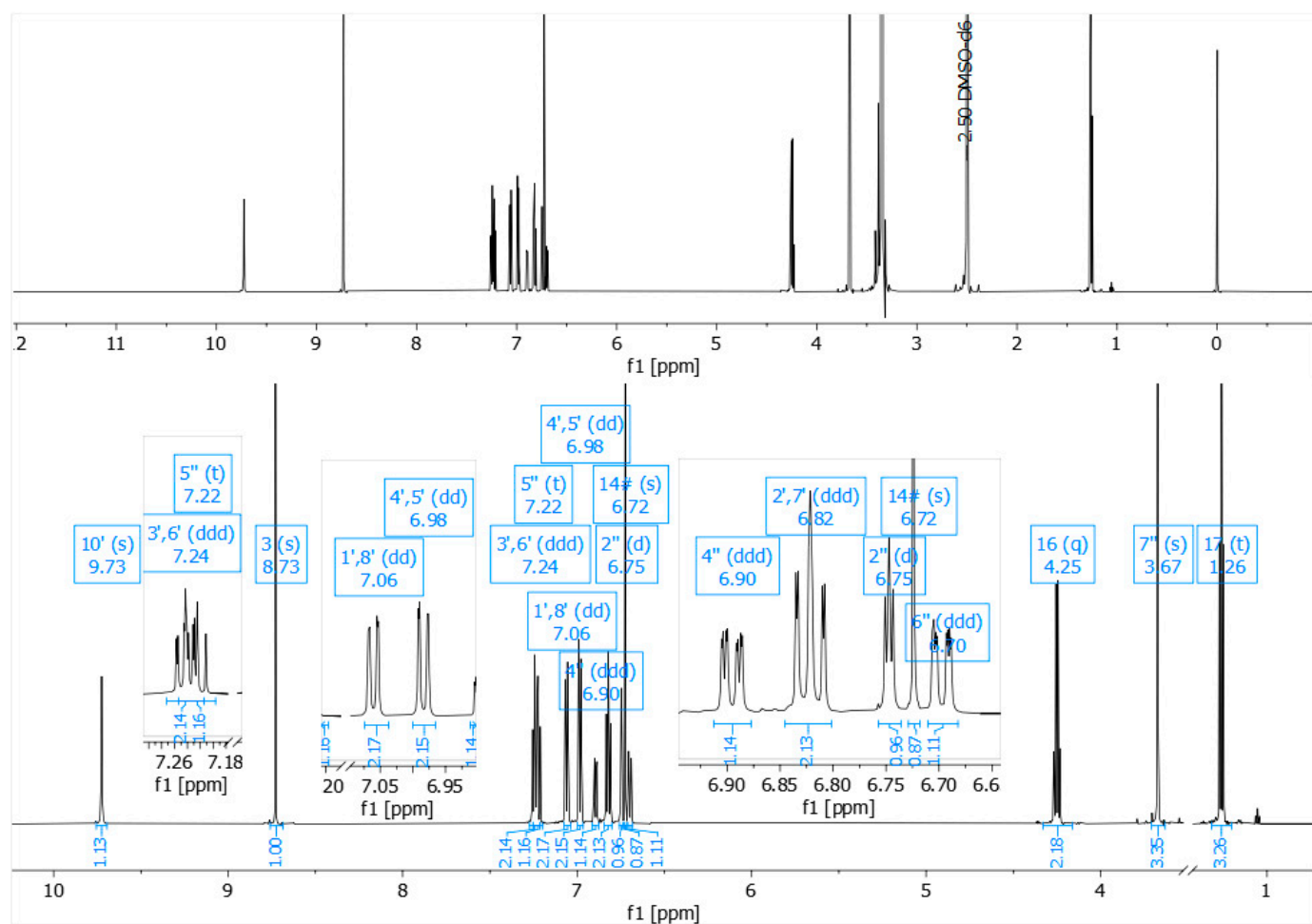
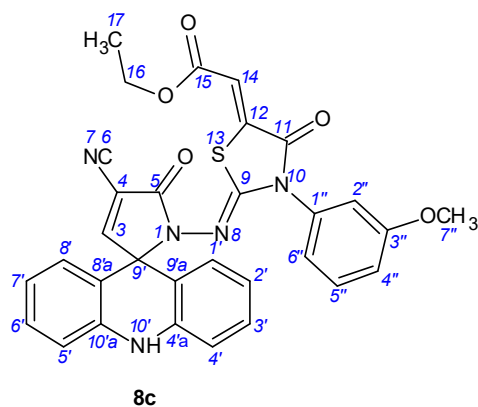
FTIR spectrum of derivative **8b**.



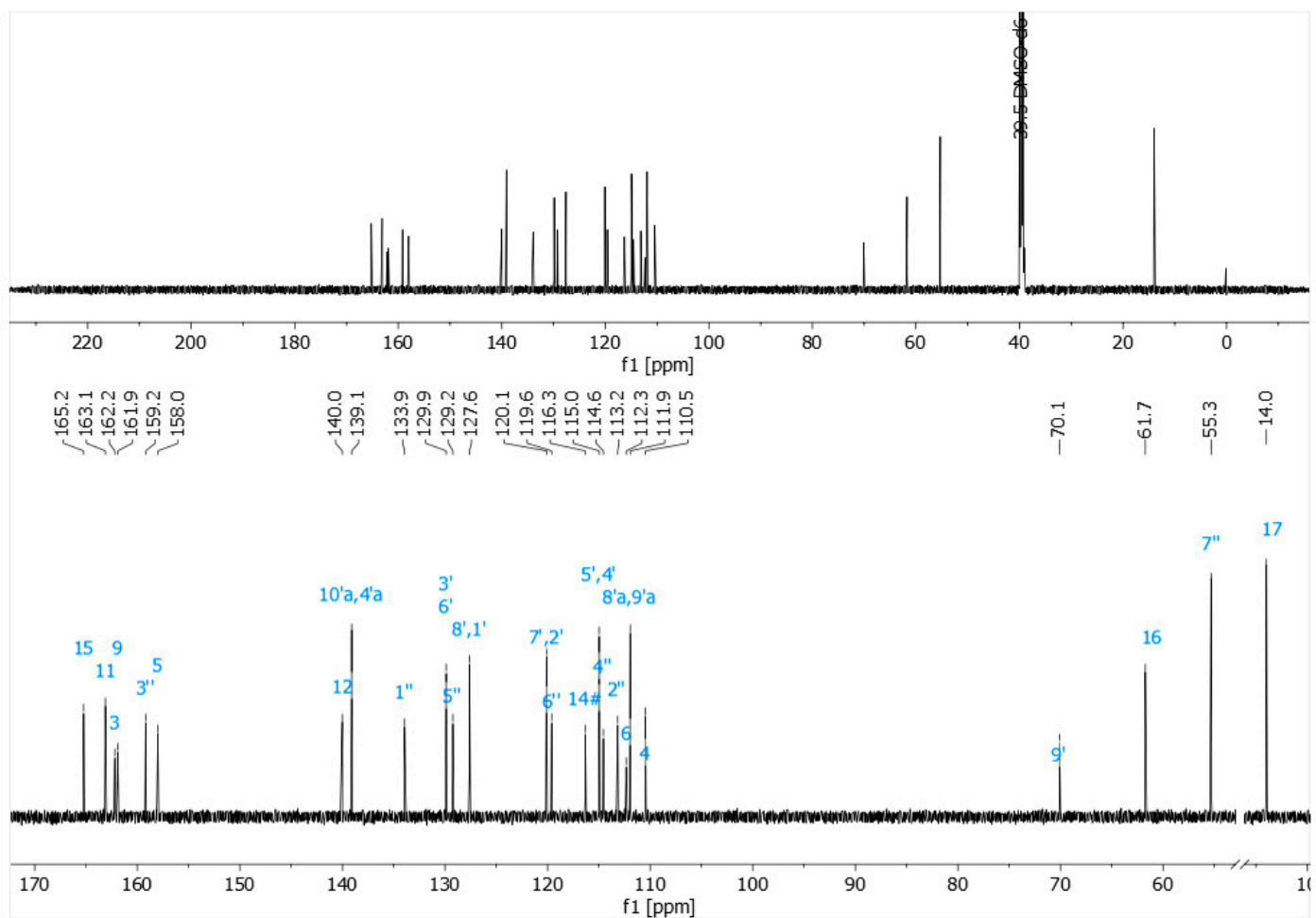
MS2 spectrum of derivative **8b**.



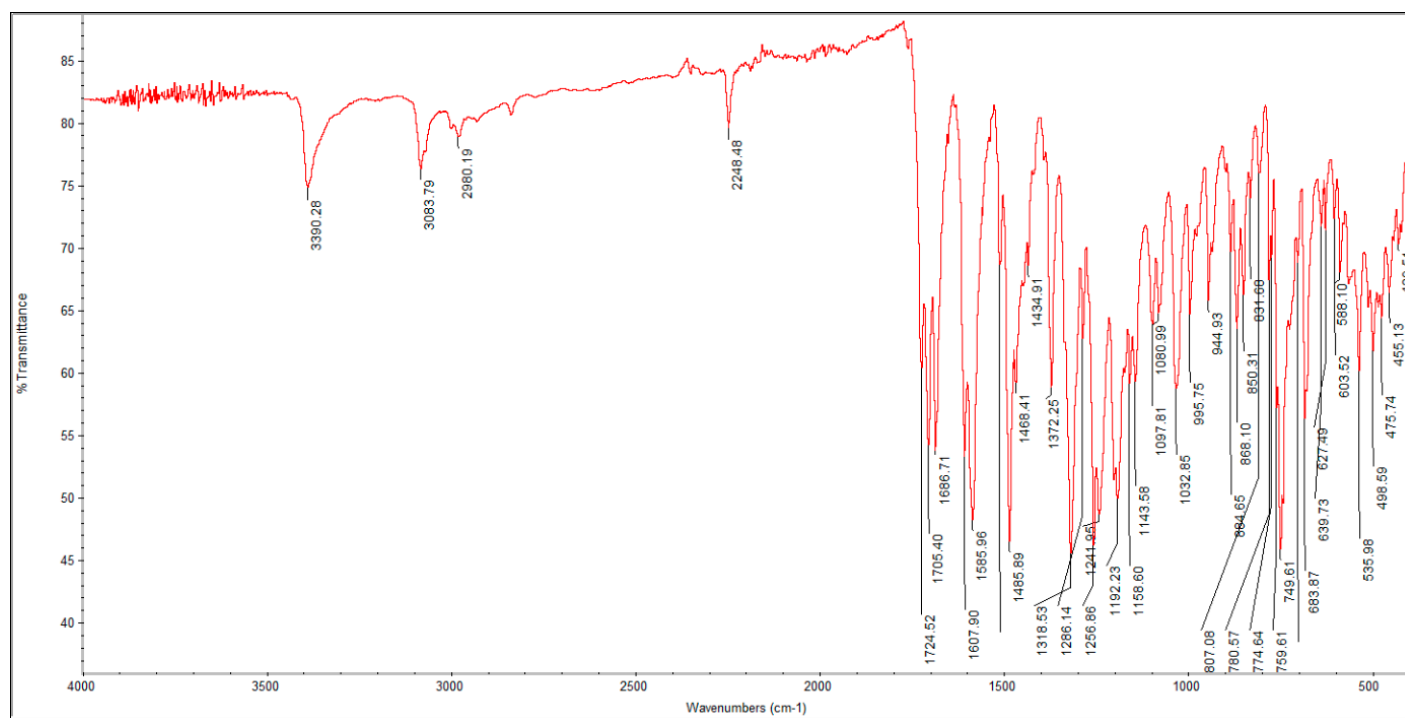
2.13 Ethyl 2-[(2Z,5Z)-2-({4'-cyano-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrol]-1'-yl)imino)-3-(3-methoxyphenyl)-4-oxo-1,3-thiazolidin-5-ylidene]acetate (**8c**)



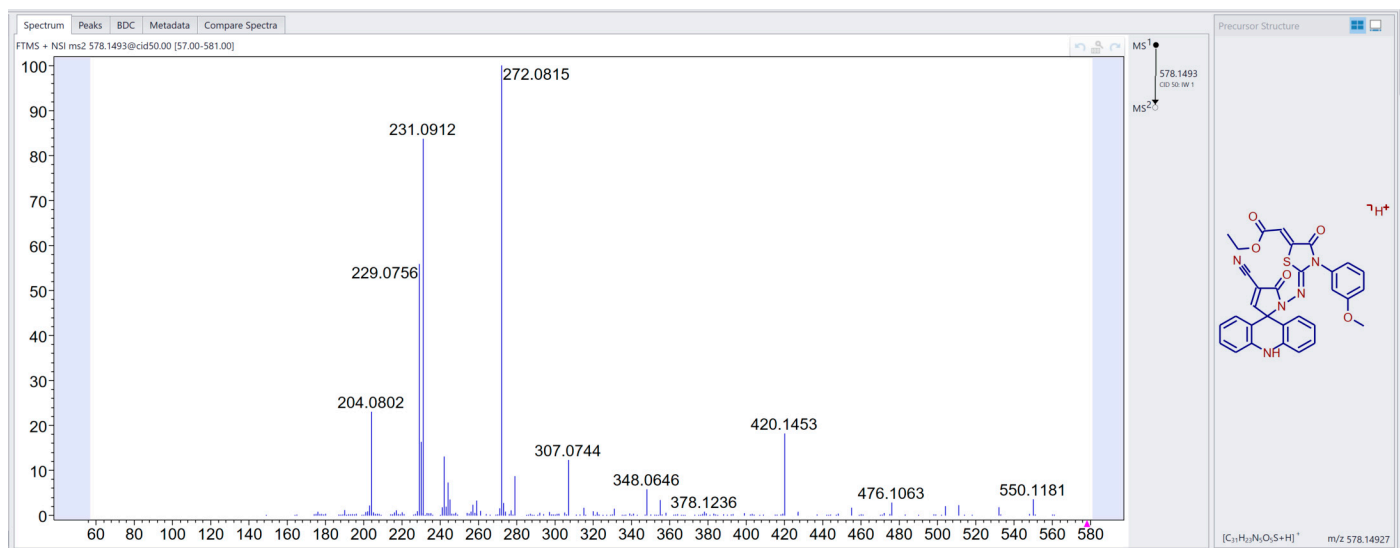
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **8c**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **8c**.

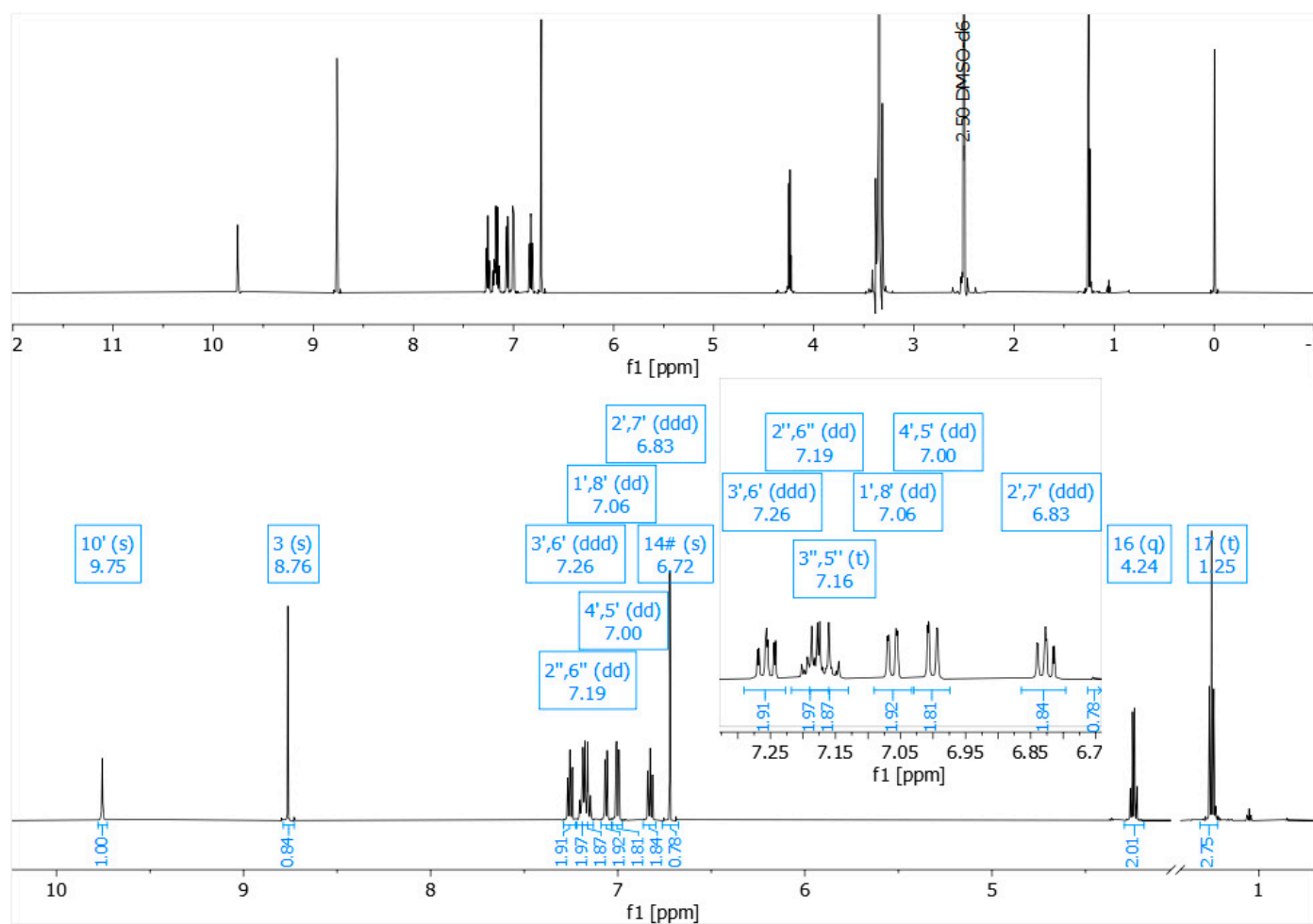
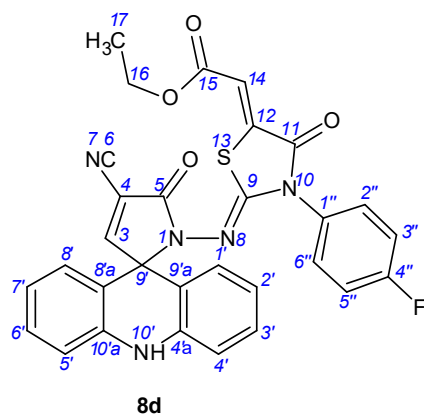


FTIR spectrum of derivative **8c**.

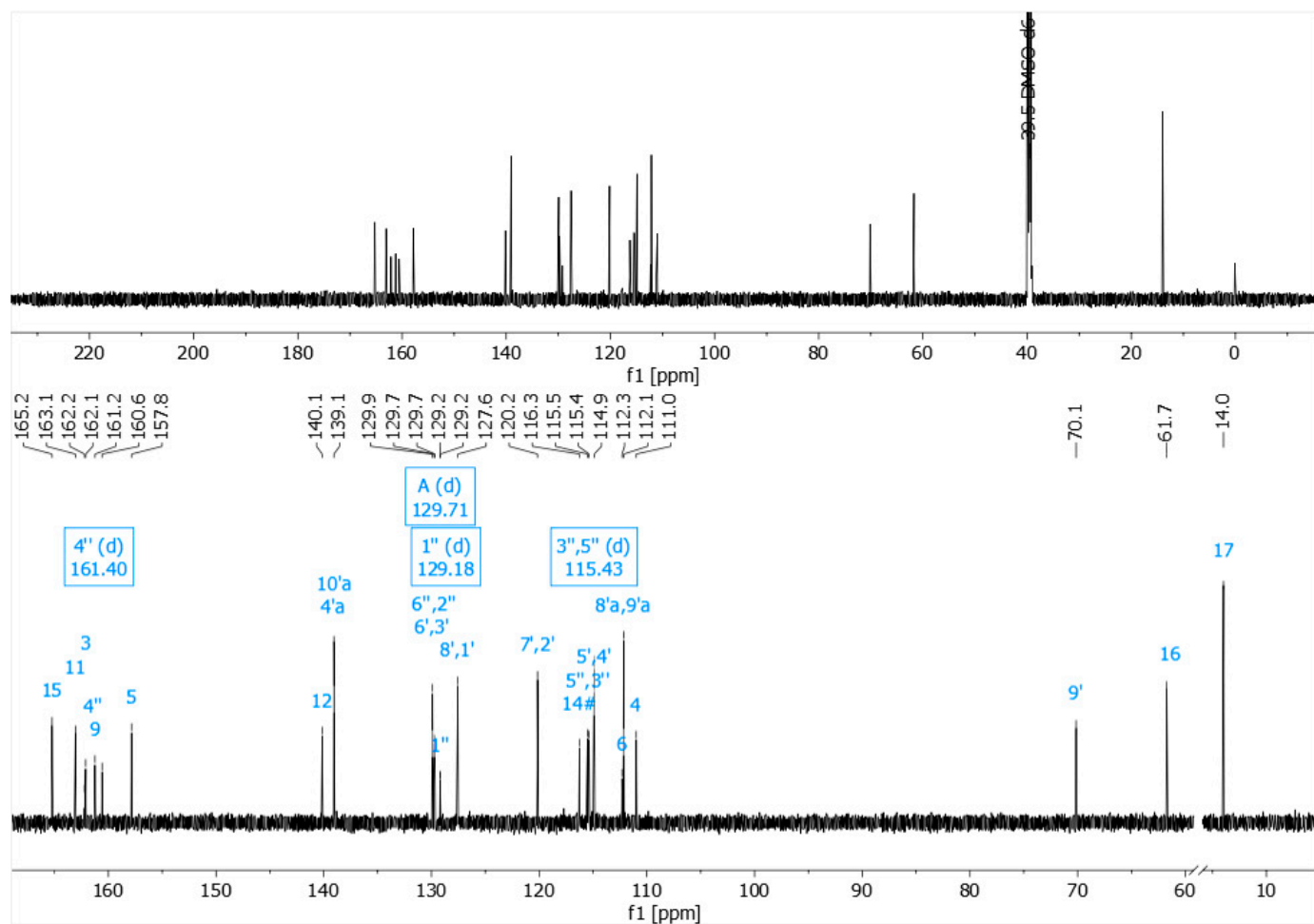


MS2 spectrum of derivative **8c**.

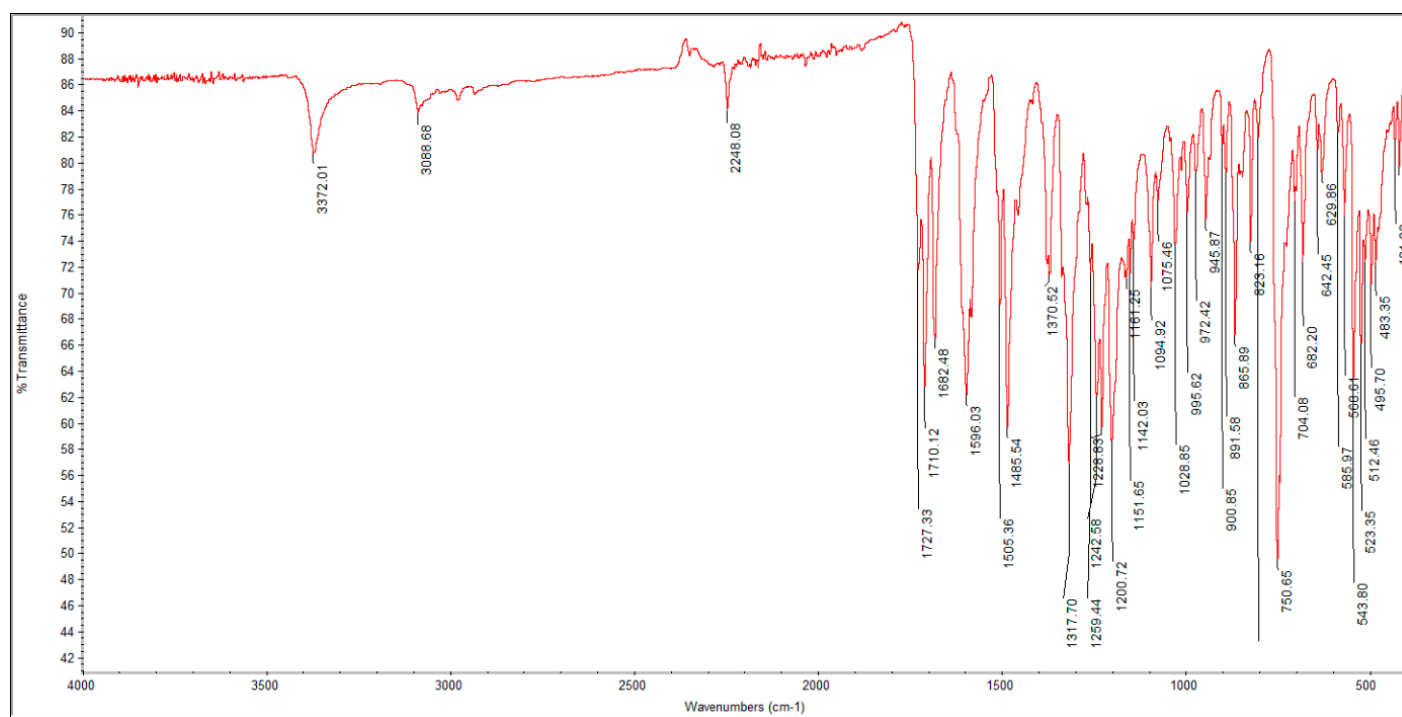
2.14 Ethyl 2-[(2Z,5Z)-2-({4'-cyano-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrol]-1'-yl)imino)-3-(4-fluorophenyl)-4-oxo-1,3-thiazolidin-5-ylidene]acetate (**8d**)



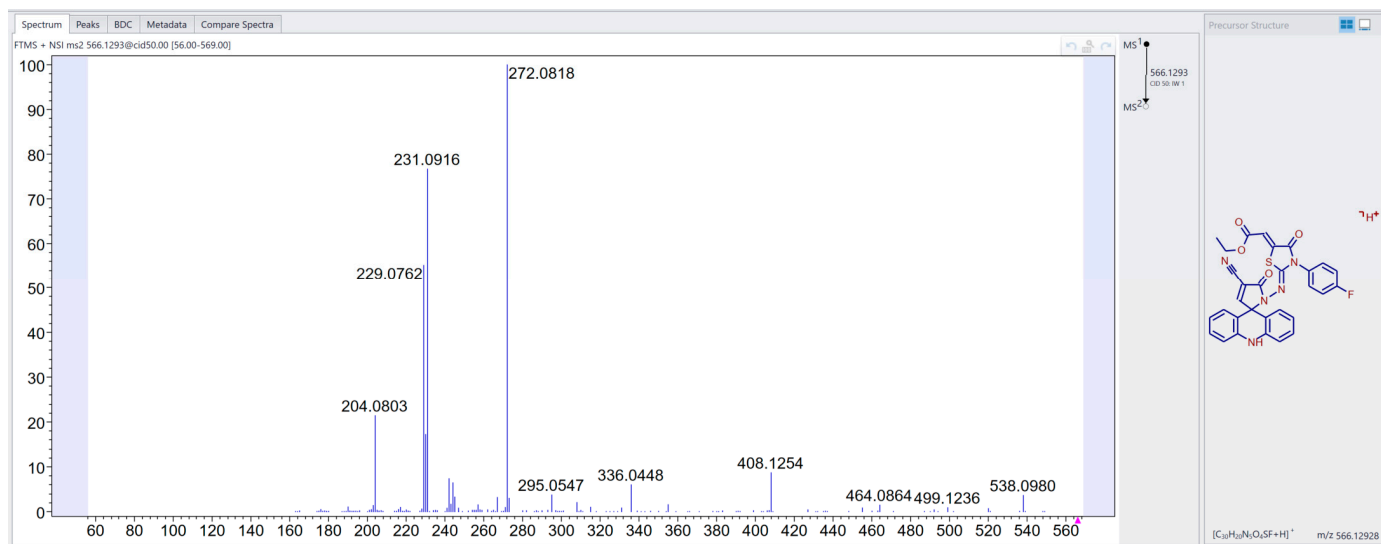
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **8d**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **8d**.

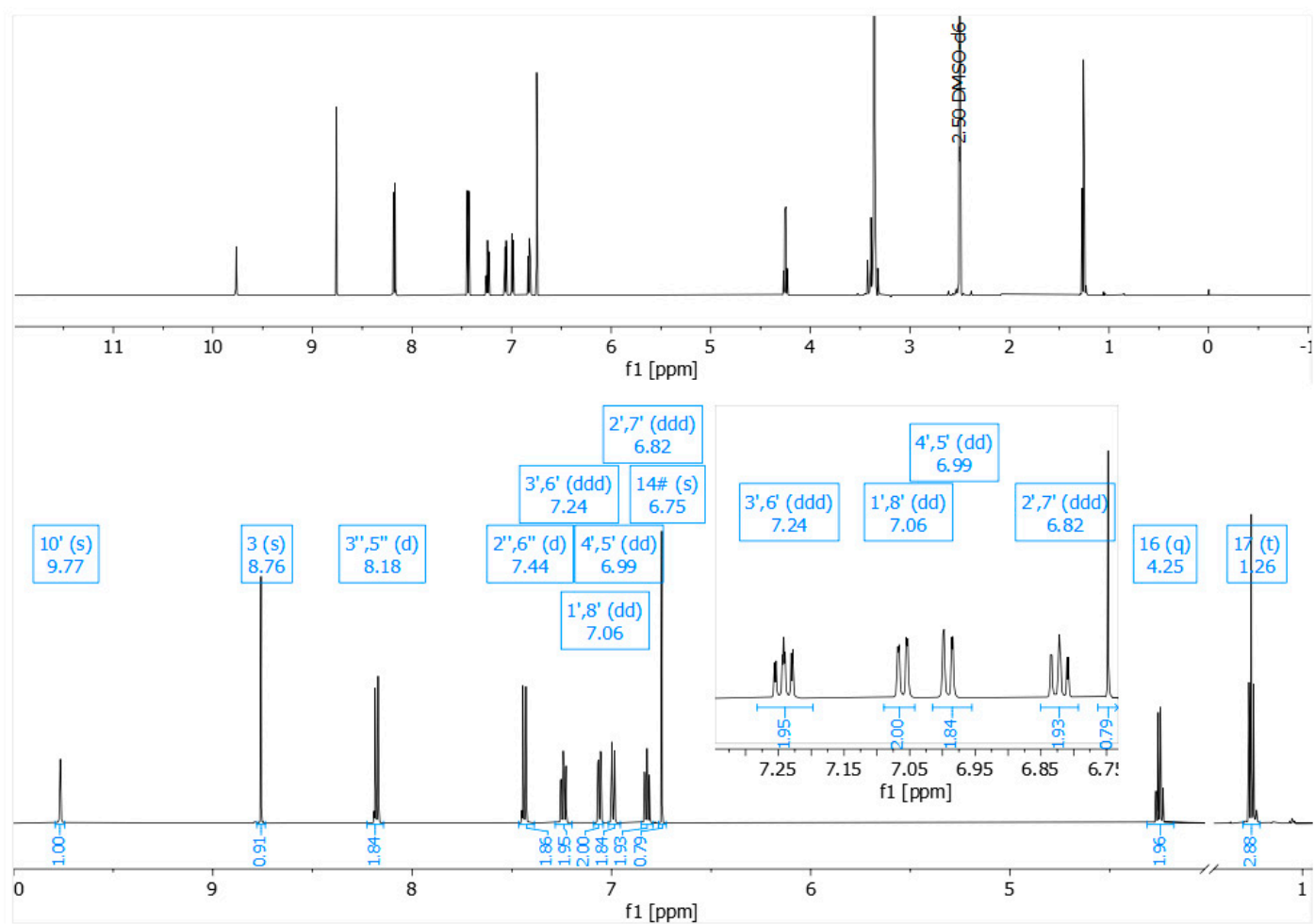
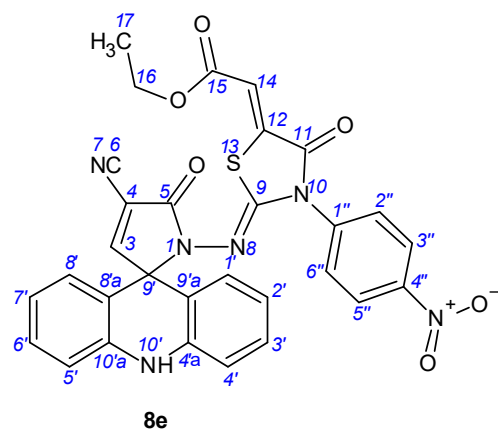


FTIR spectrum of derivative **8d**.

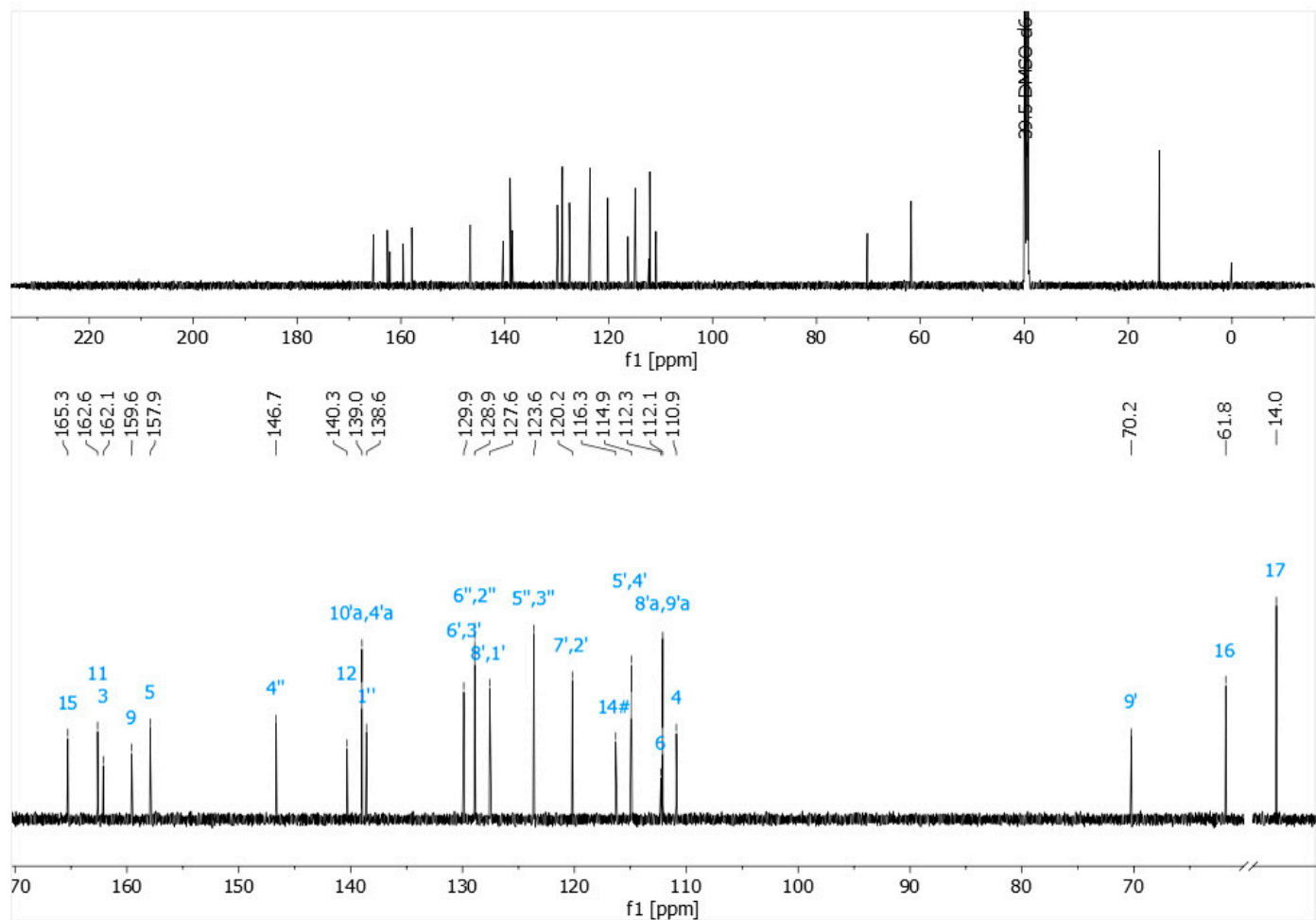


MS2 spectrum of derivative **8d**.

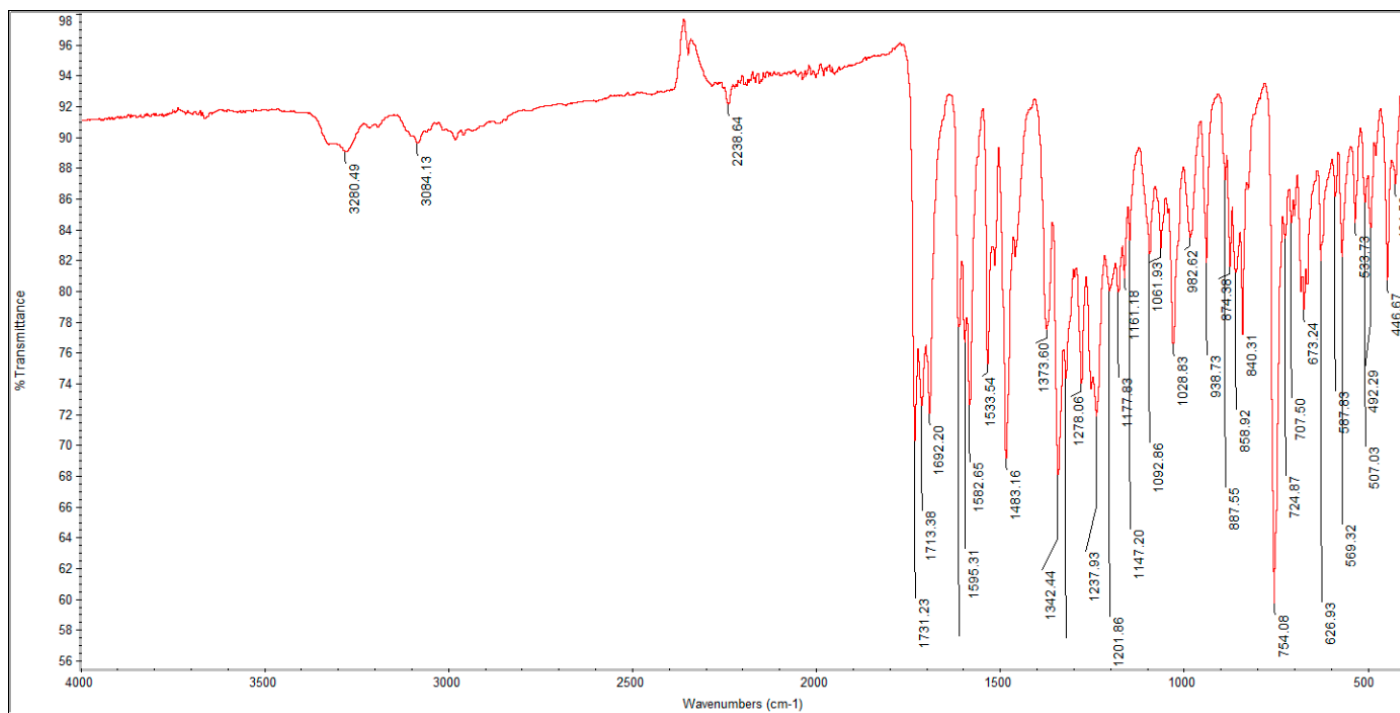
2.15 Ethyl 2-[(2Z,5Z)-2-({4'-cyano-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrol]-1'-yl)imino)-3-(4-nitrophenyl)-4-oxo-1,3-thiazolidin-5-ylidene]acetate (**8e**)



<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **8e**.

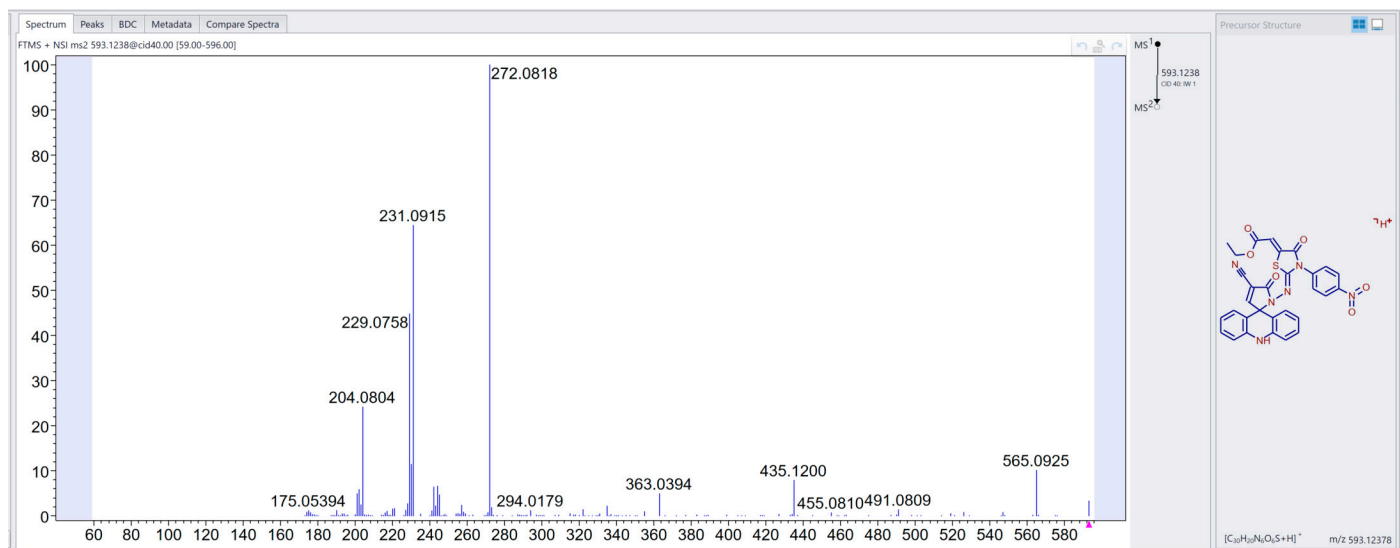


$^{13}\text{C}$  NMR (150 MHz,  $\text{DMSO-d}_6$ ) spectrum of derivative **8e**.



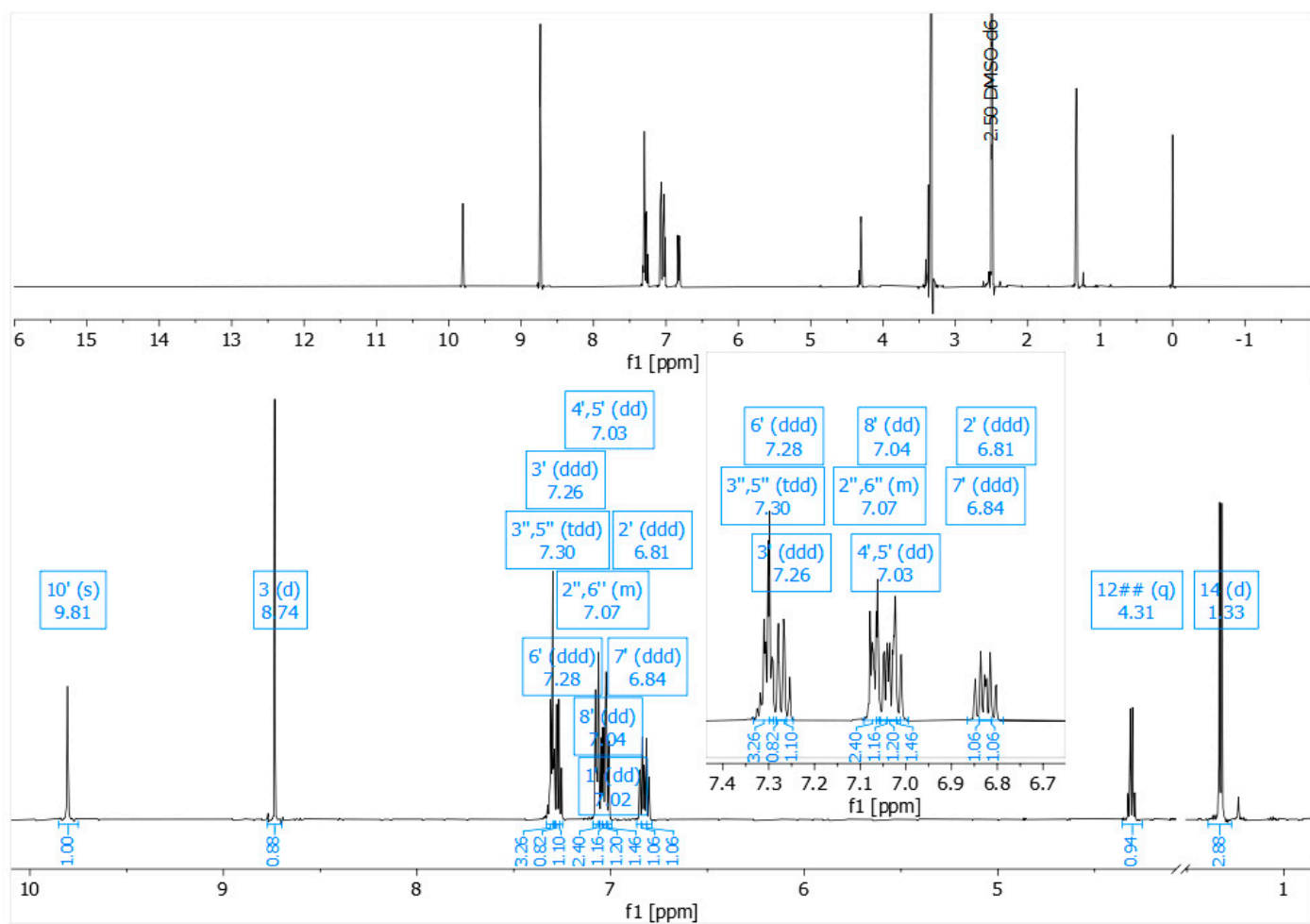
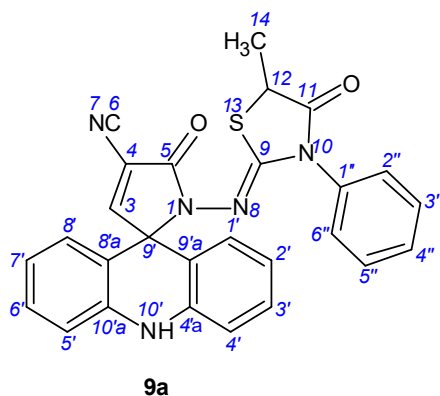
FTIR spectrum of derivative **8e**.



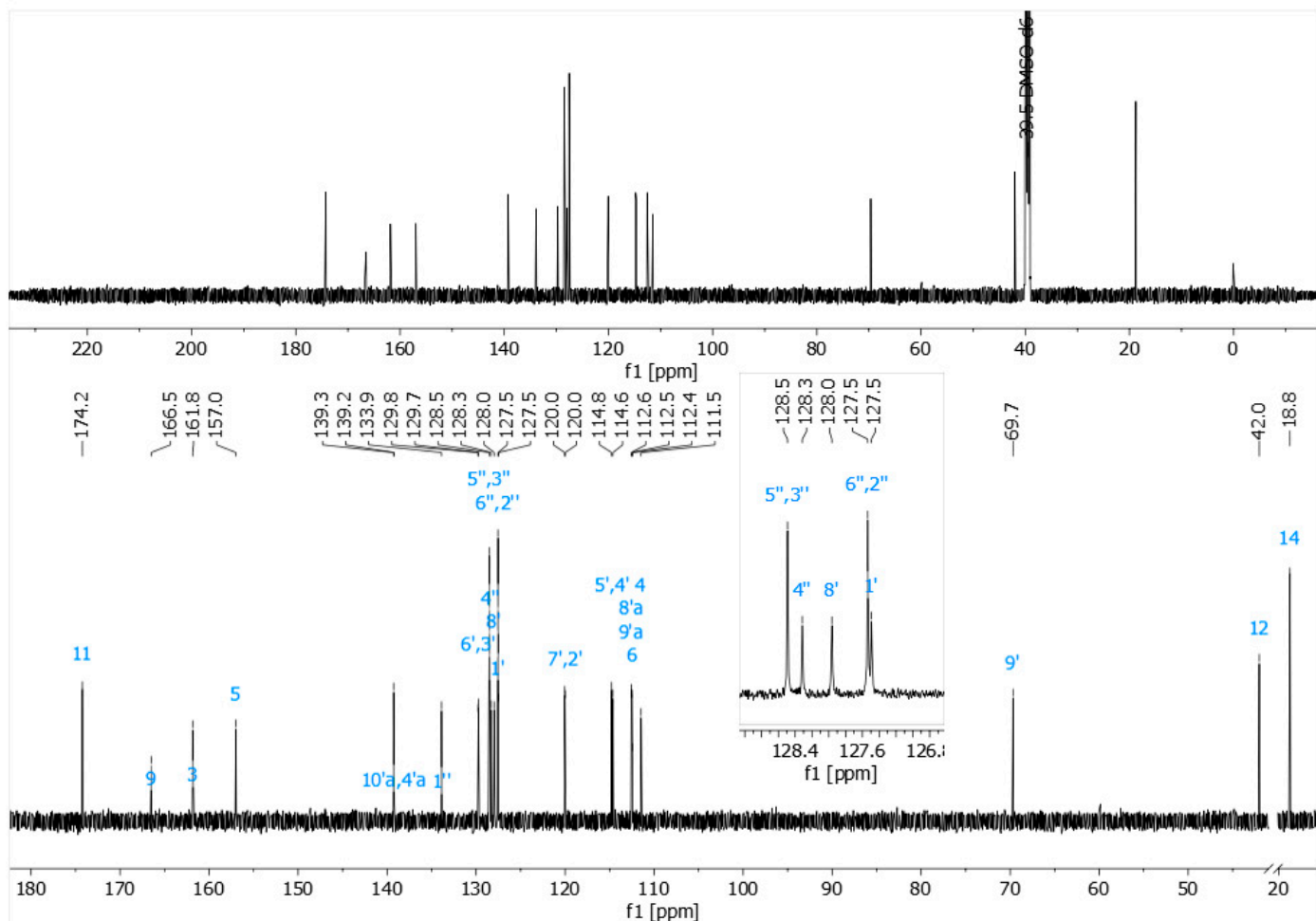


MS2 spectrum of derivative **8e**.

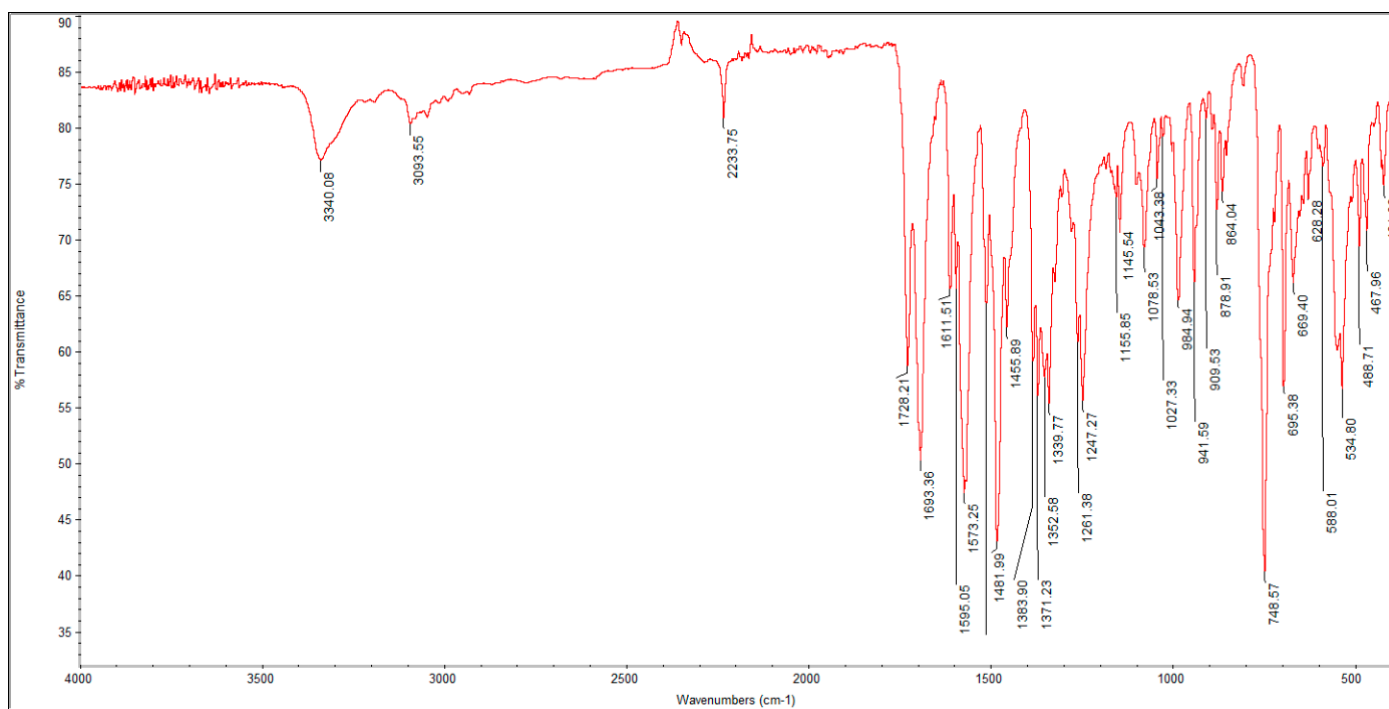
2.16 1'-{[(2Z)-5-Methyl-4-oxo-3-phenyl-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**9a**)



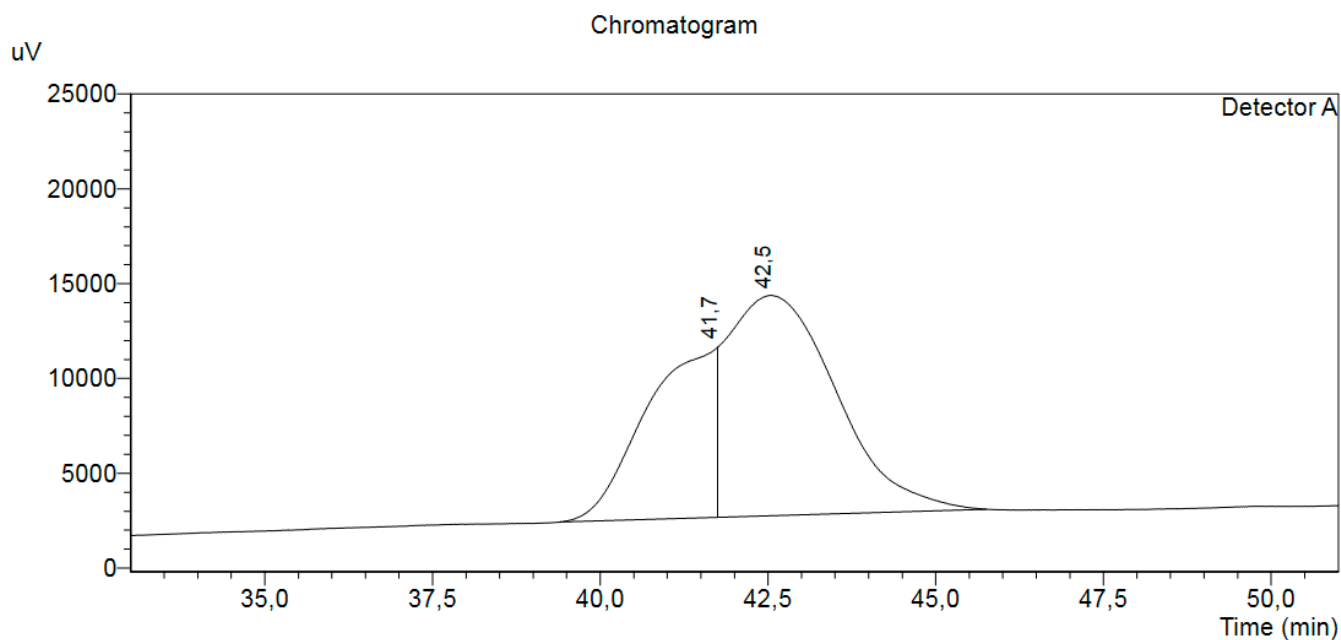
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **9a**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **9a**.



FTIR spectrum of derivative **9a**.

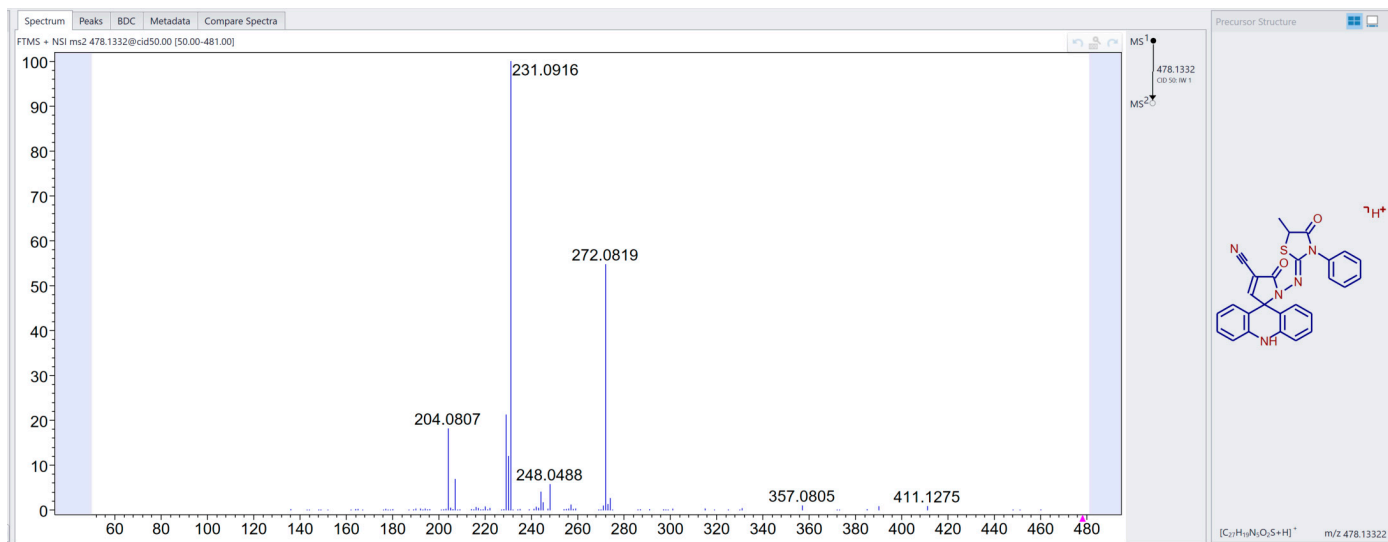


### <Peak Table>

Detector A

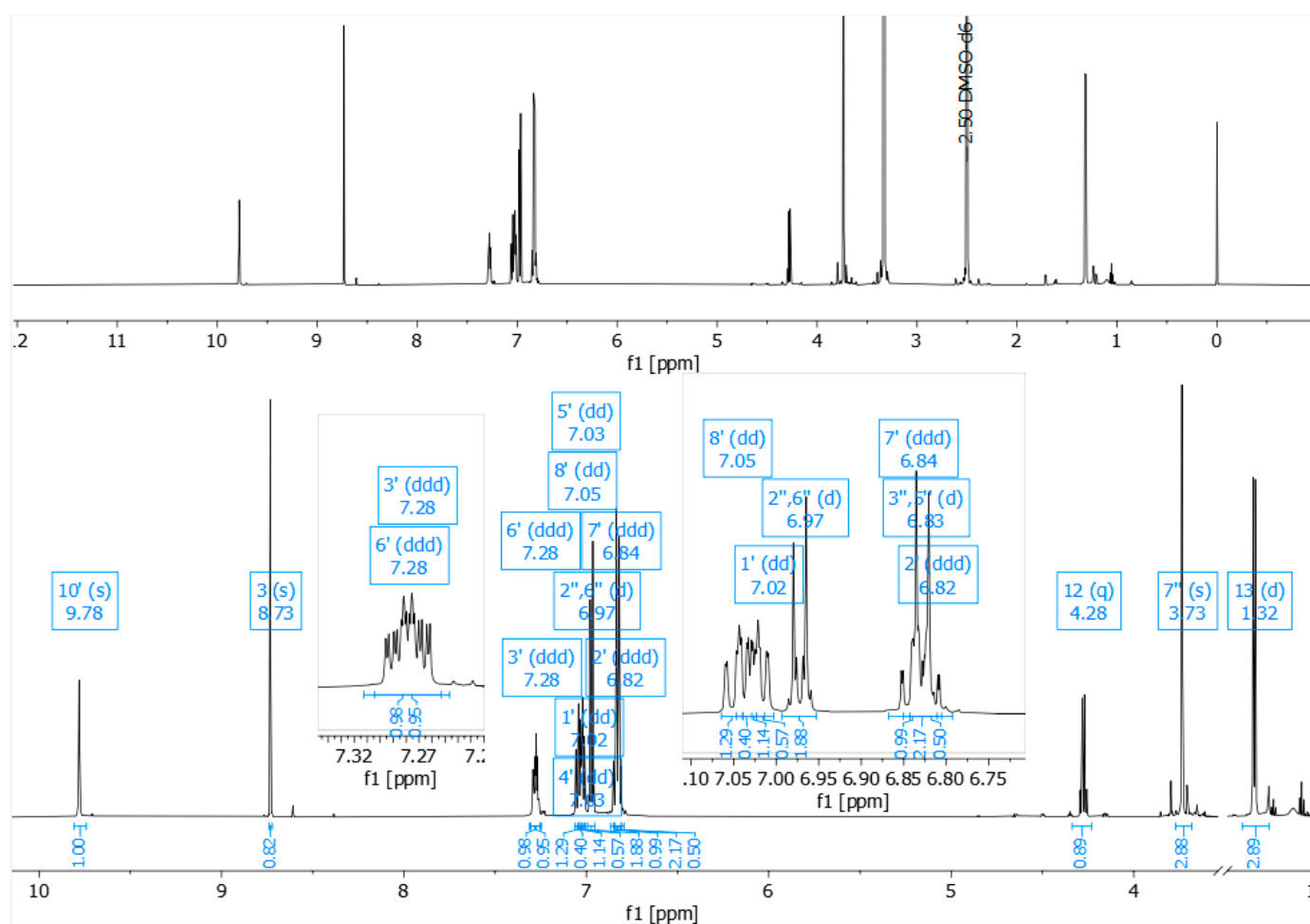
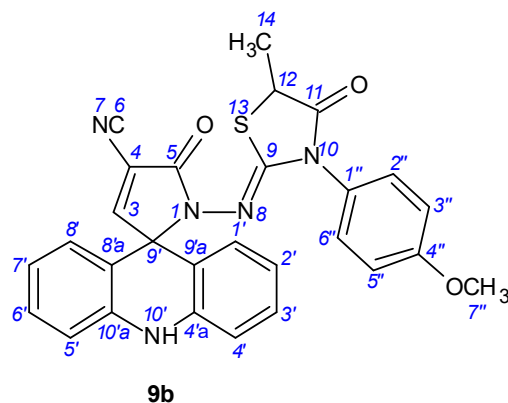
Peak#	Ret. Time	Area	Height	Conc.	Unit	Area%
1	41,746	653960	8950	33,533		33,533
2	42,544	1296223	11625	66,467		66,467
Total		1950183	20575			100,000

Chiral HPLC chromatogram of compound **9a**. Chiralpak IA column; flow rate of 0.5 mL/min; temperature 25 °C; *n*-hexane/acetone (75/25, v/v).

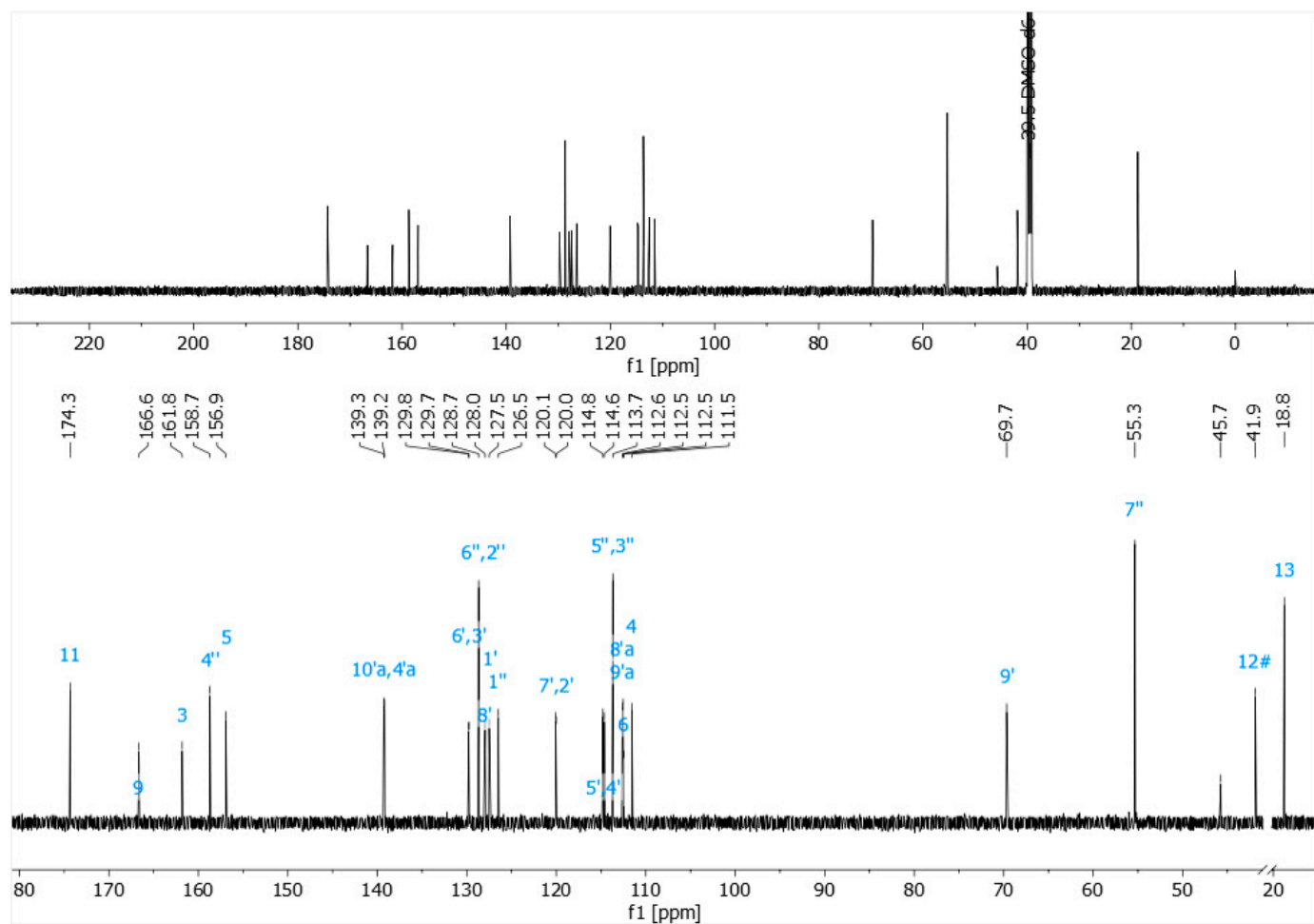


MS2 spectrum of derivative **9a**.

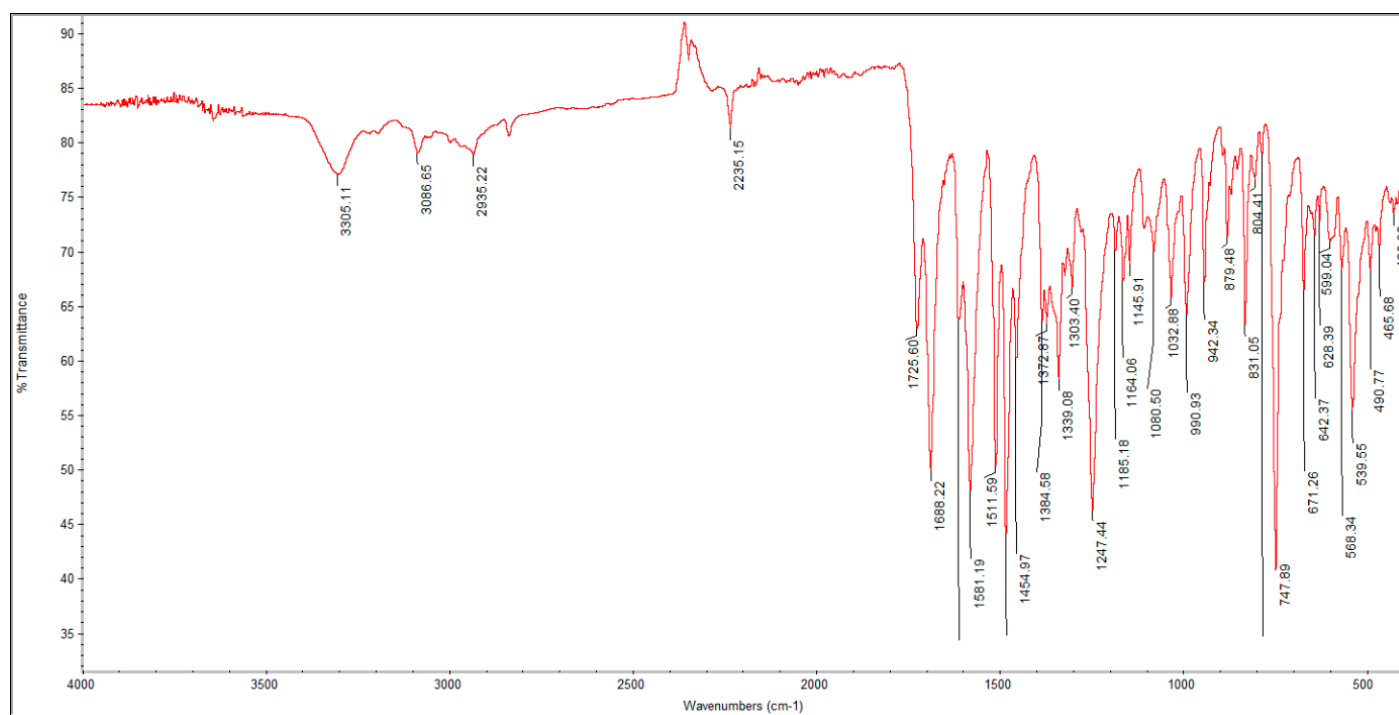
2.17 1'-{[(2Z)-3-(4-Methoxyphenyl)-5-methyl-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**9b**)



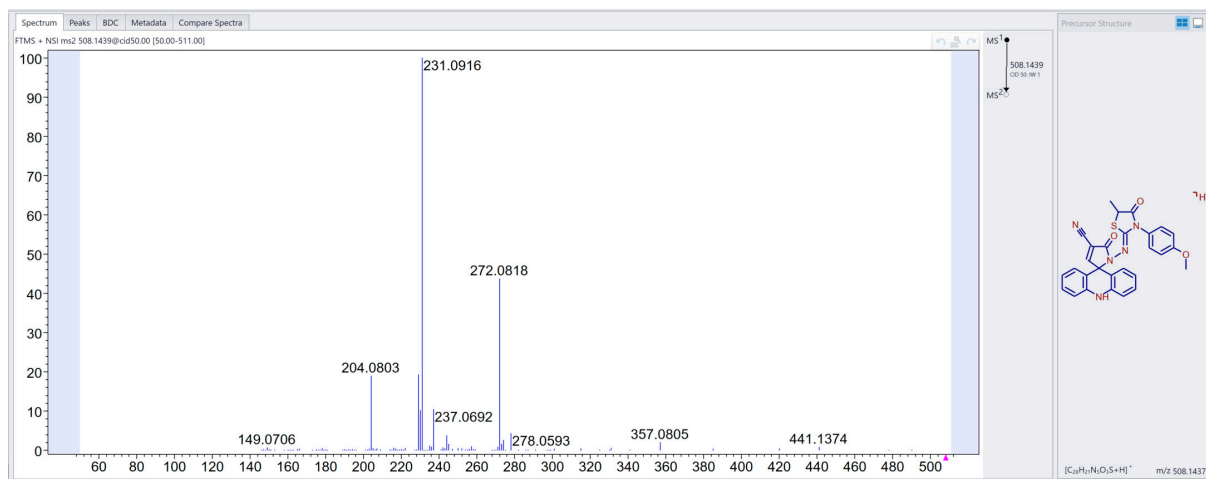
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **9b**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **9b**.

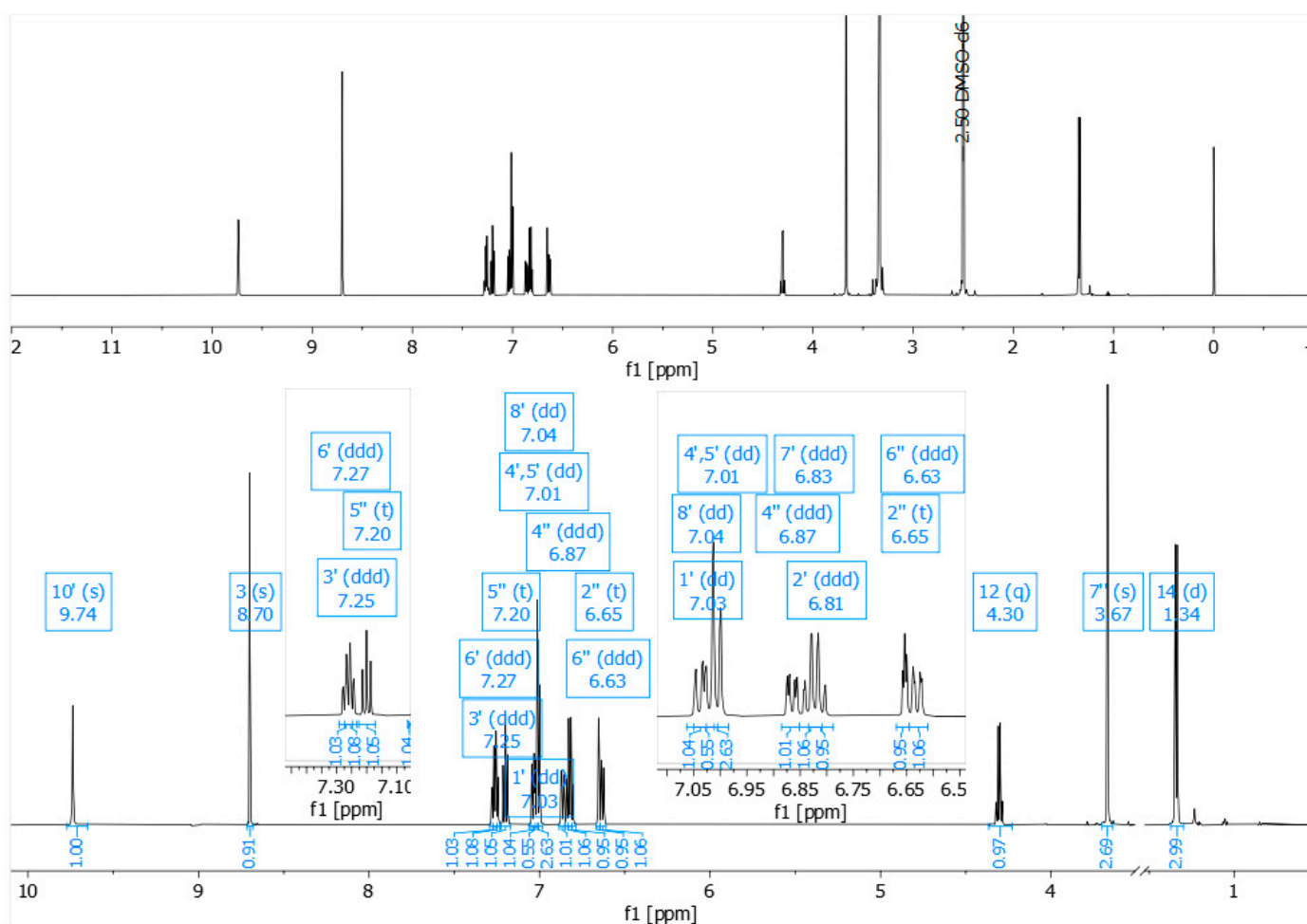
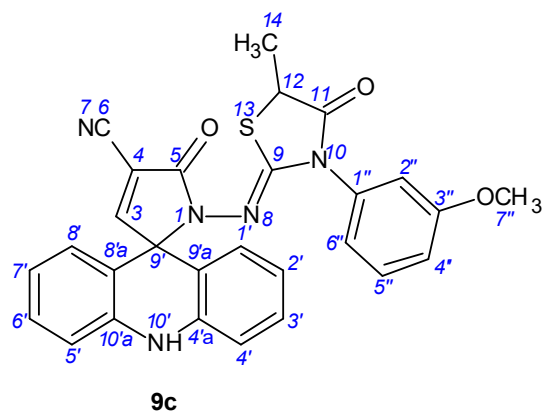


FTIR spectrum of derivative **9b**.

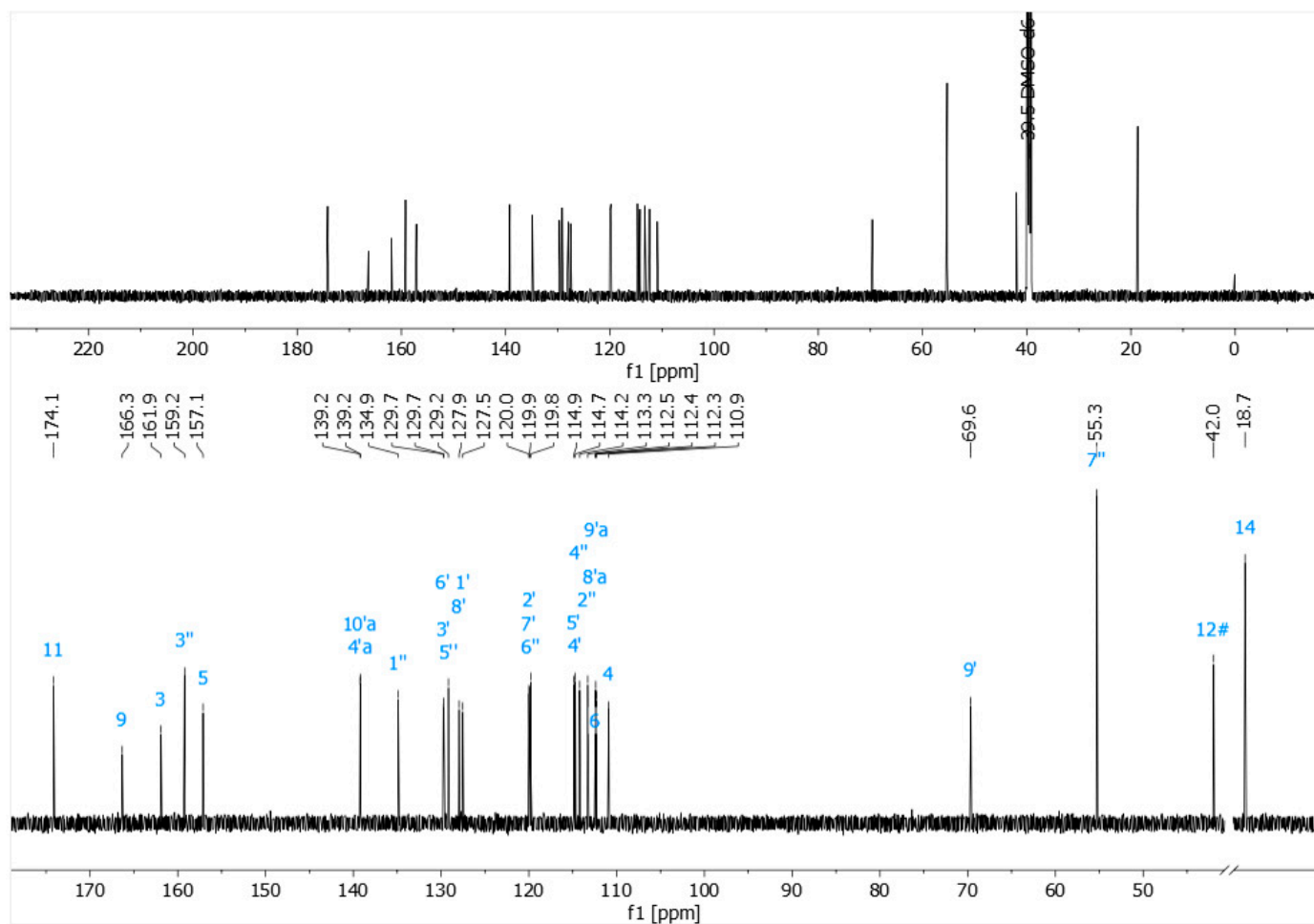


MS2 spectrum of derivative **9b**.

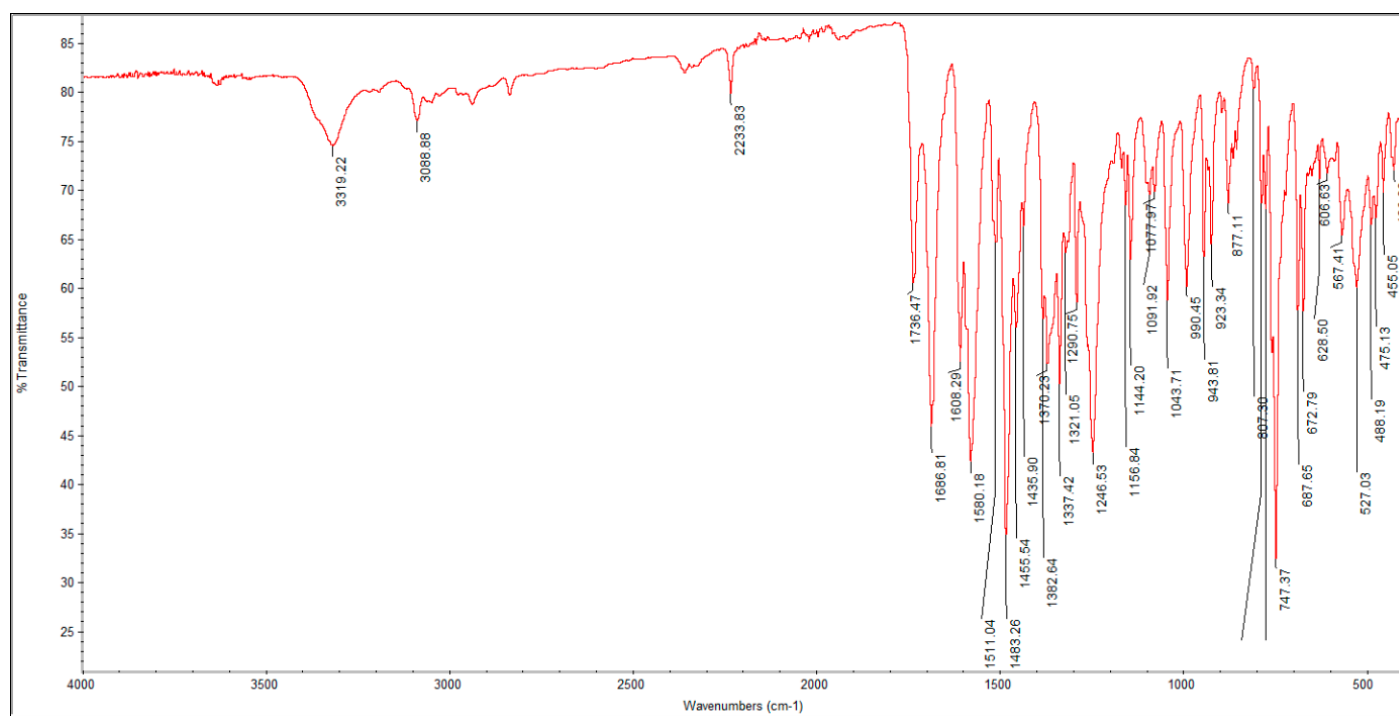
2.18 1'-{[(2Z)-3-(3-Methoxyphenyl)-5-methyl-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**9c**)



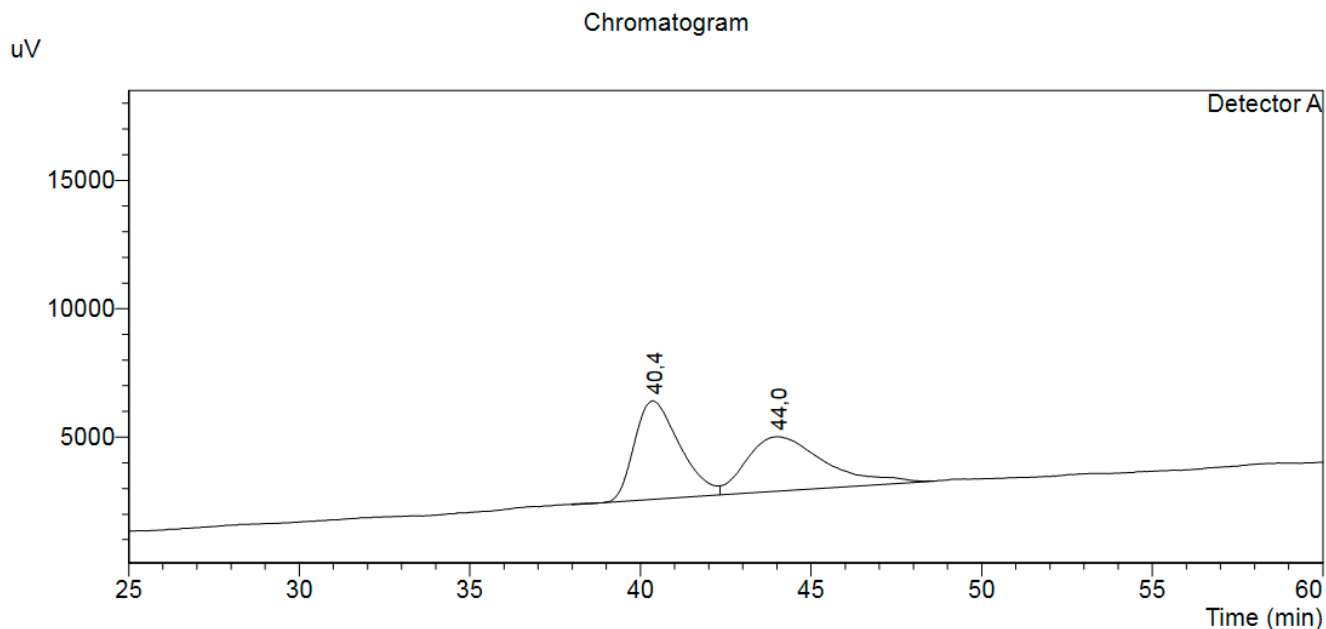




<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **9c**.



FTIR spectrum of derivative **9c**.

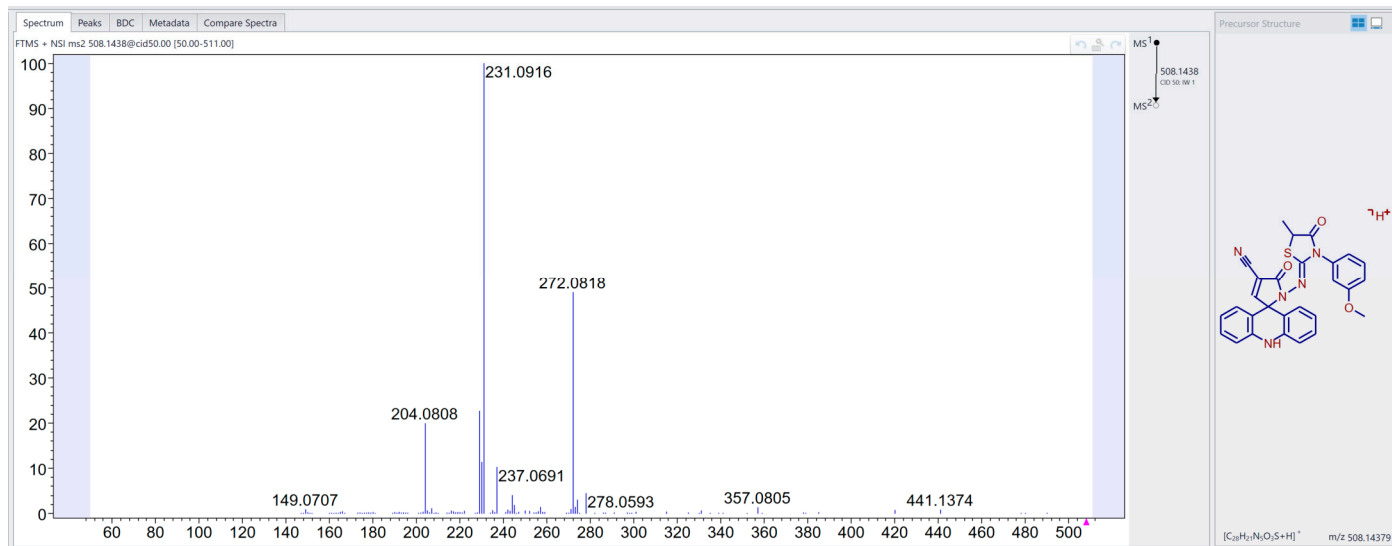


### <Peak Table>

Detector A

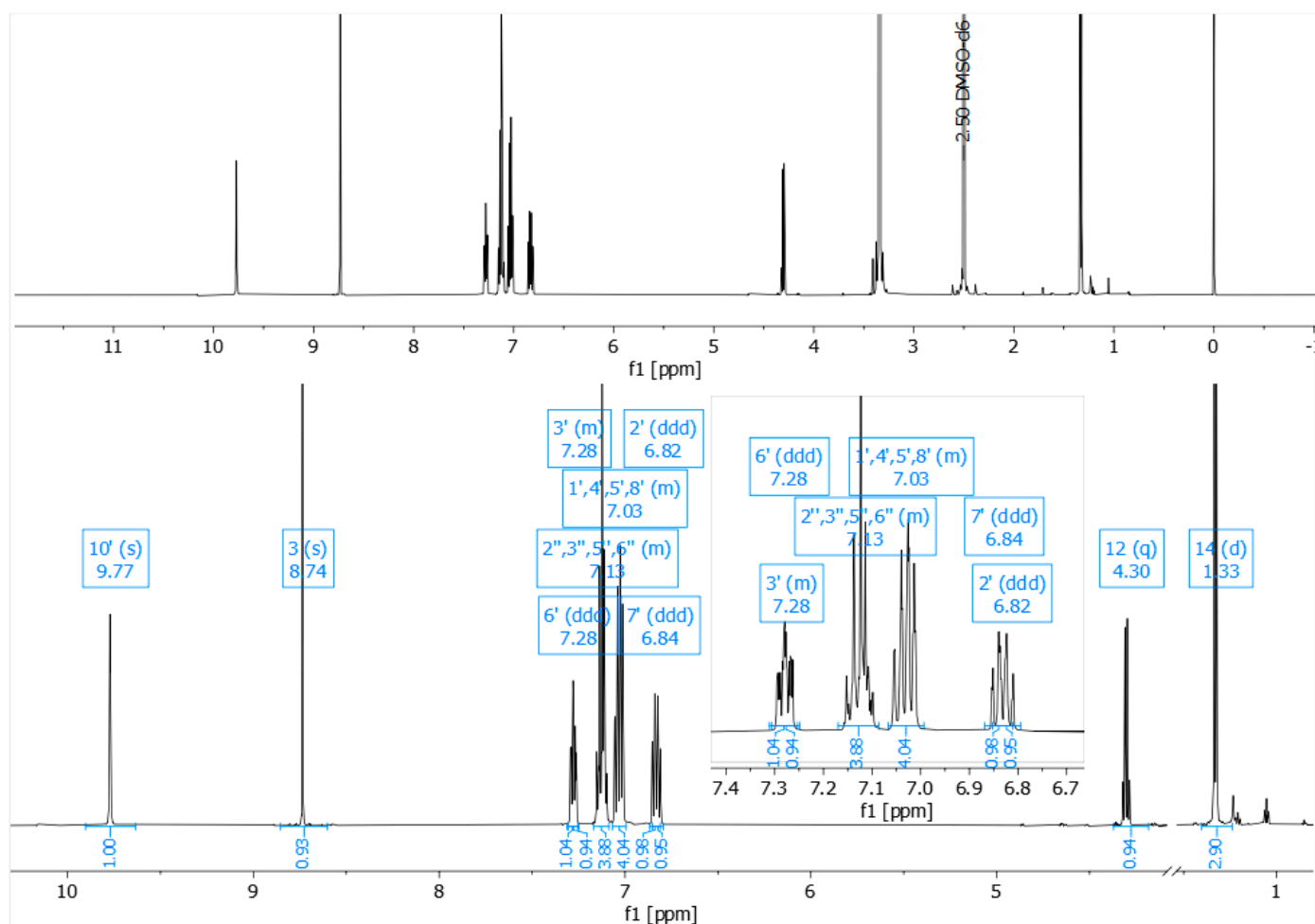
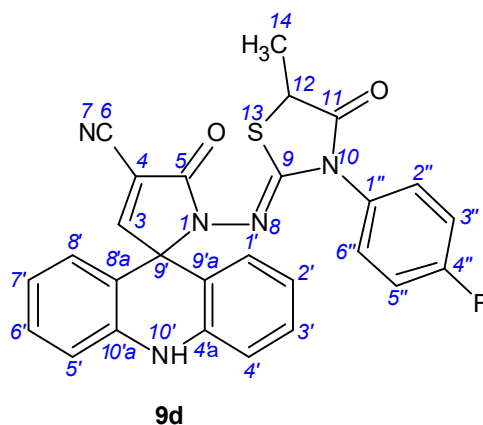
Peak#	Ret. Time	Area	Height	Conc.	Unit	Area%
1	40,382	354177	3687	51,012		51,012
2	44,023	340130	2090	48,988		48,988
Total		694306	5777			100,000

Chiral HPLC chromatogram of compound **9c**. Chiralpak IA column; flow rate of 0.5 mL/min; temperature 25 °C; *n*-hexane/acetone (85/15, v/v)

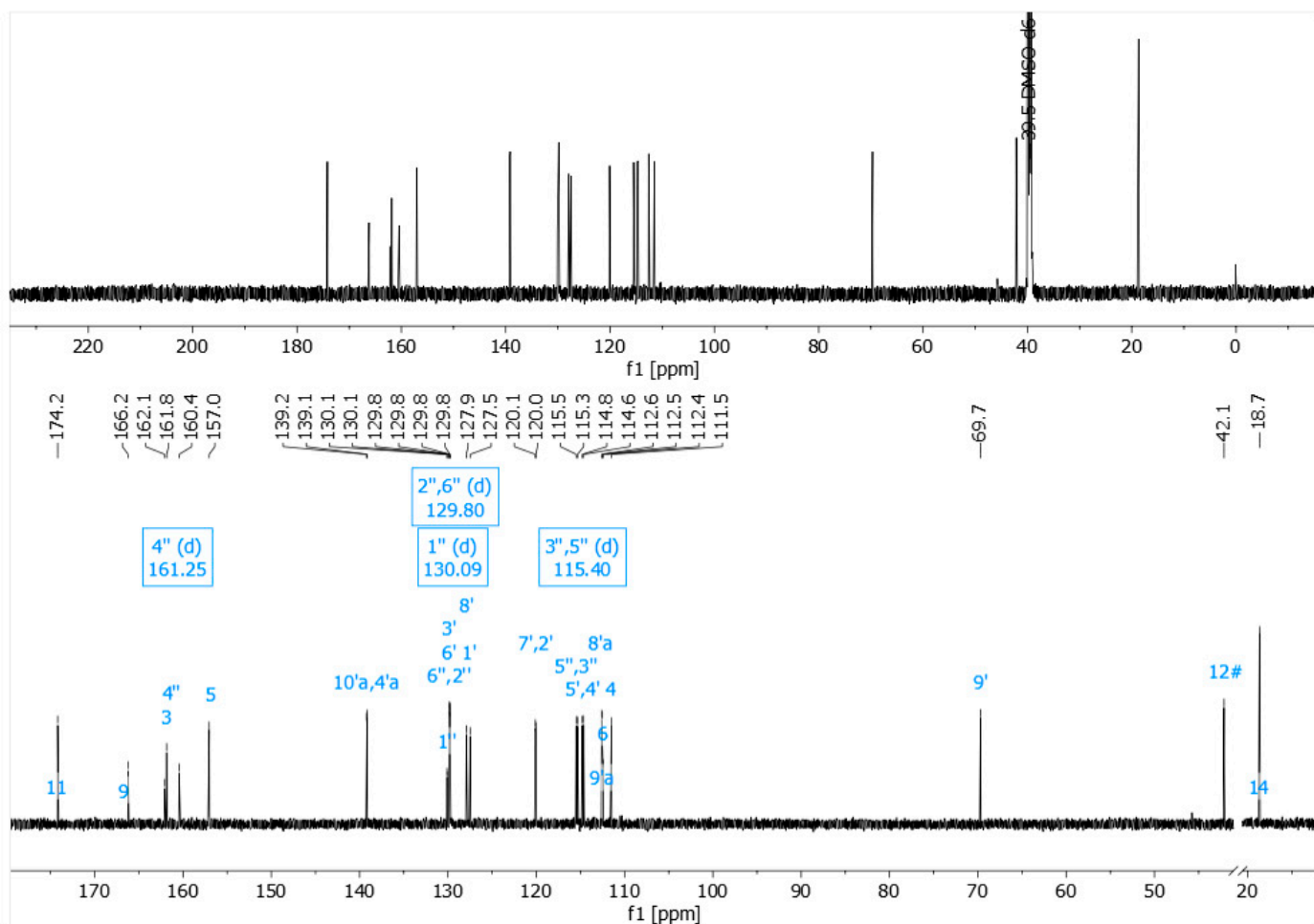


MS2 spectrum of derivative **9c**.

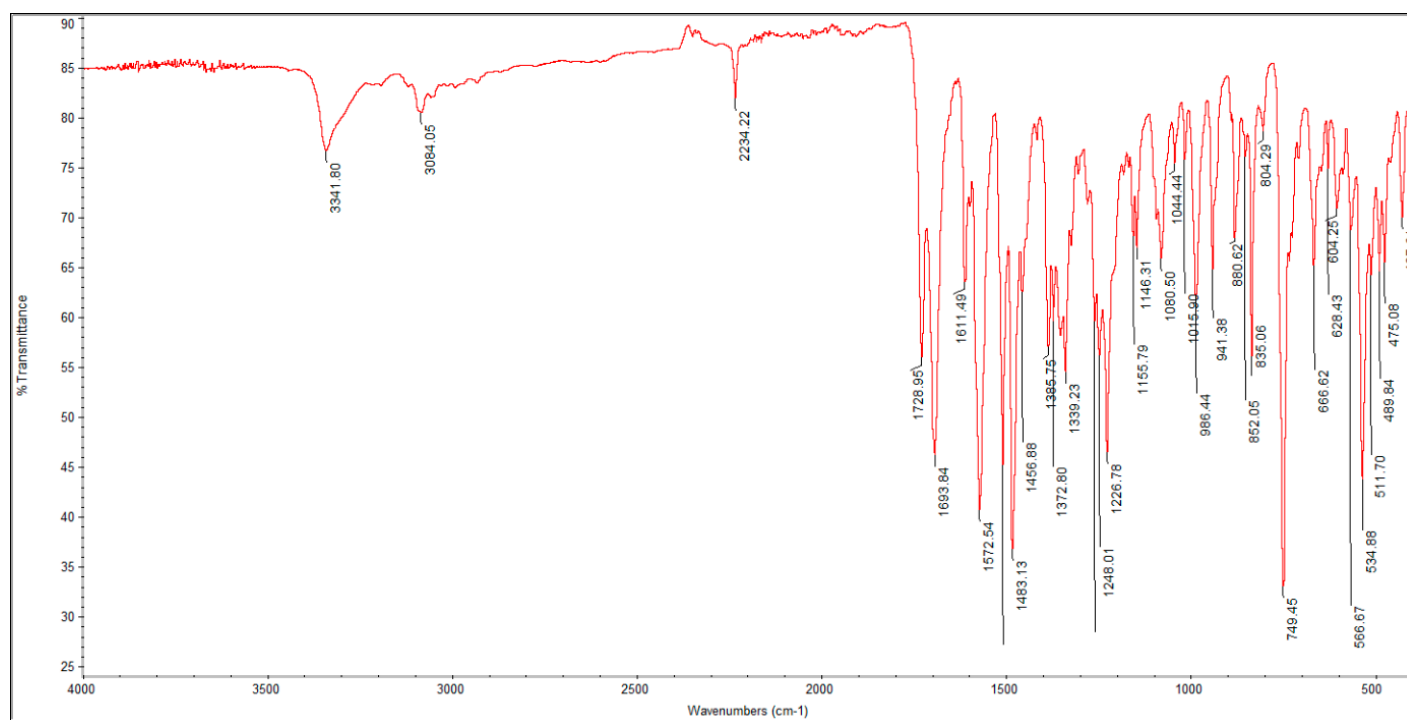
2.19 1'-{[(2Z)-3-(4-Fluorophenyl)-5-methyl-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**9d**)



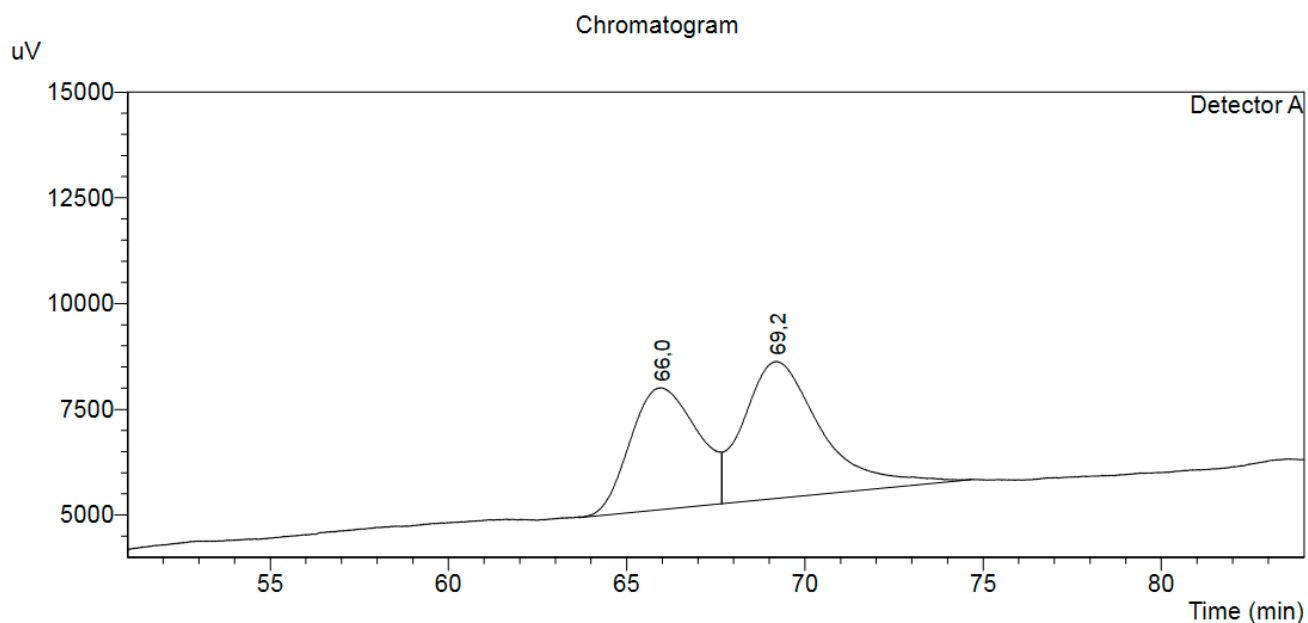
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **9d**.



**<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative 9d.**



**FTIR spectrum of derivative 9d.**

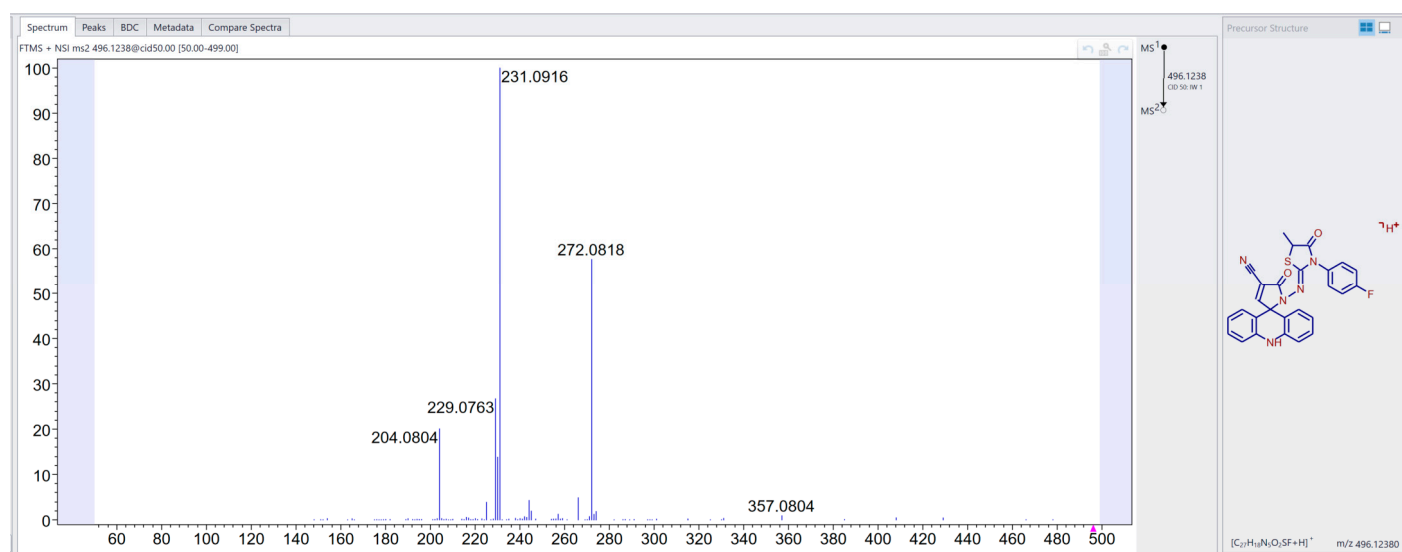


### <Peak Table>

Detector A

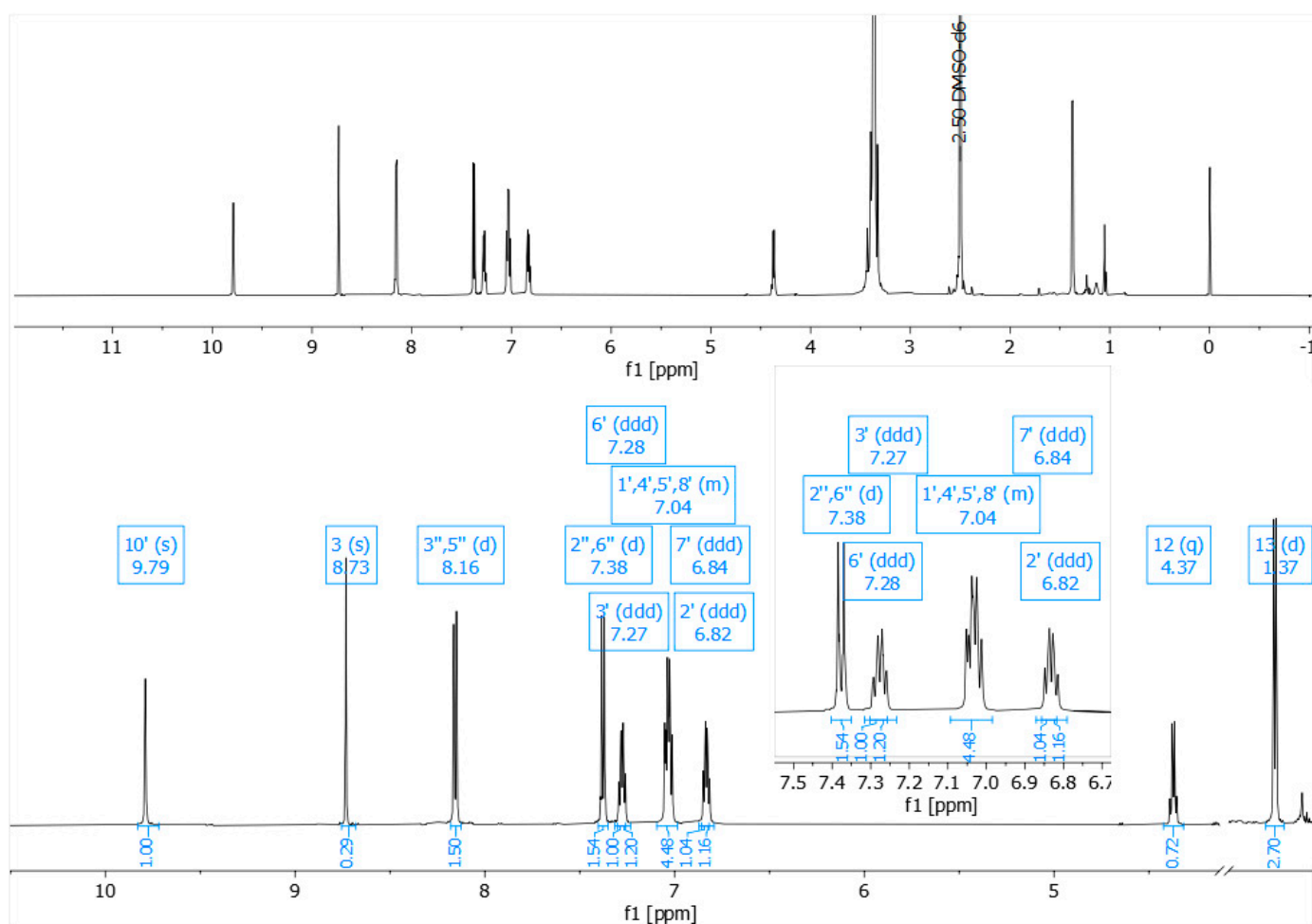
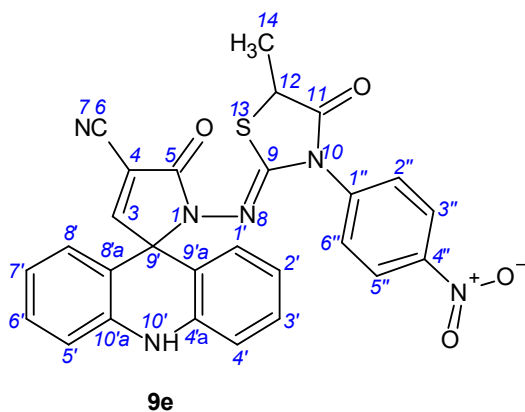
Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	65,962	378532	2841	43,368			
2	69,209	494304	3215	56,632		V	
Total		872835	6056				

Chiral HPLC chromatogram of compound **9d**. Chiralpak IA column; flow rate of 0.5 mL/min; temperature 25 °C; *n*-hexane/acetone (85/15, v/v)

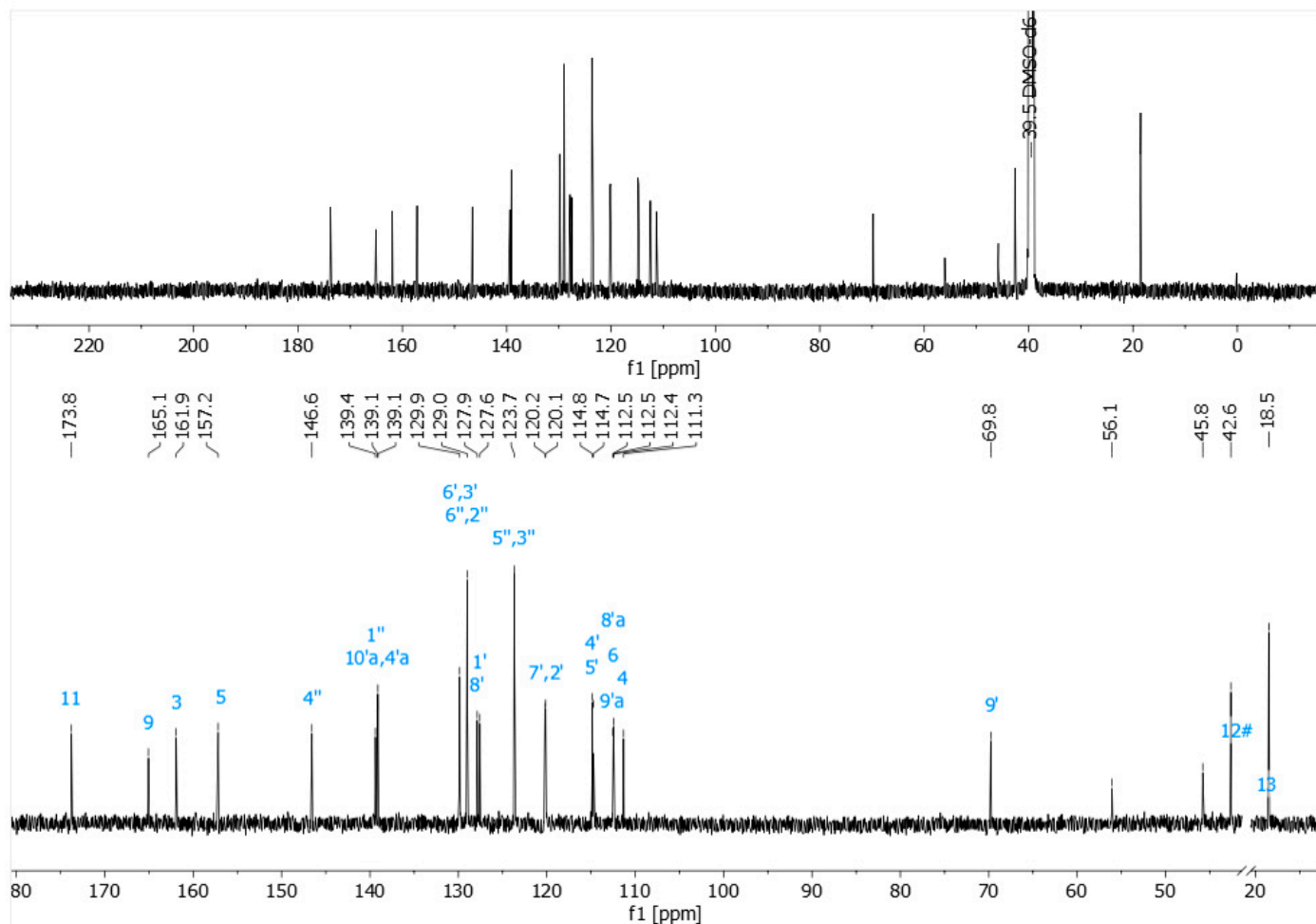


MS2 spectrum of derivative **9d**.

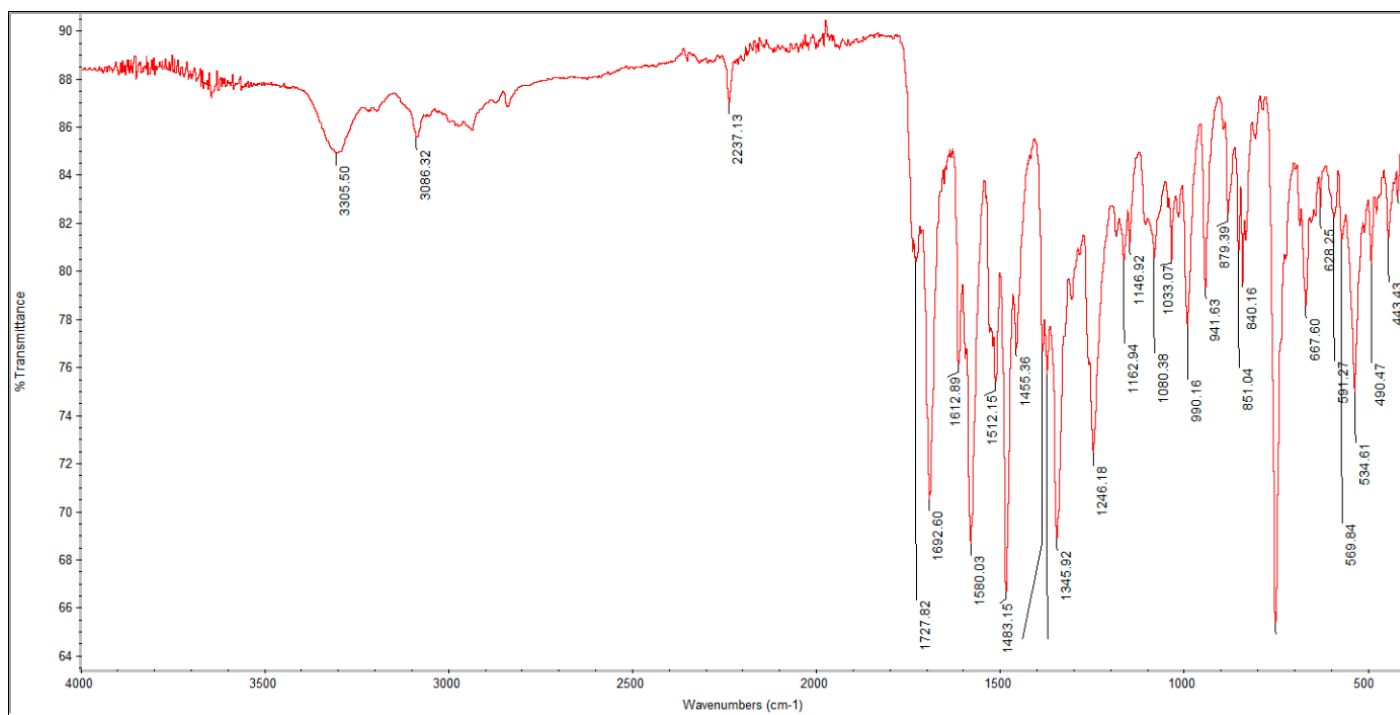
2.20 1'-{[(2Z)-5-Methyl-3-(4-nitrophenyl)-4-oxo-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**9e**)



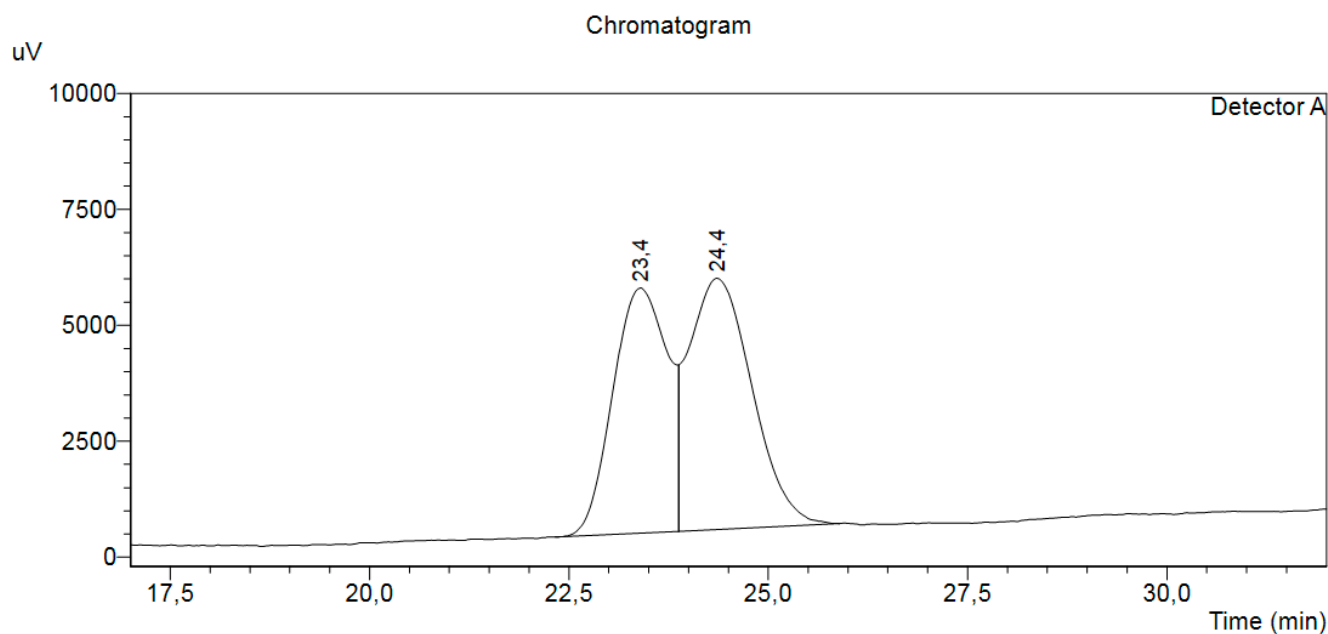
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **9e**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **9e**.



FTIR spectrum of derivative **9e**.

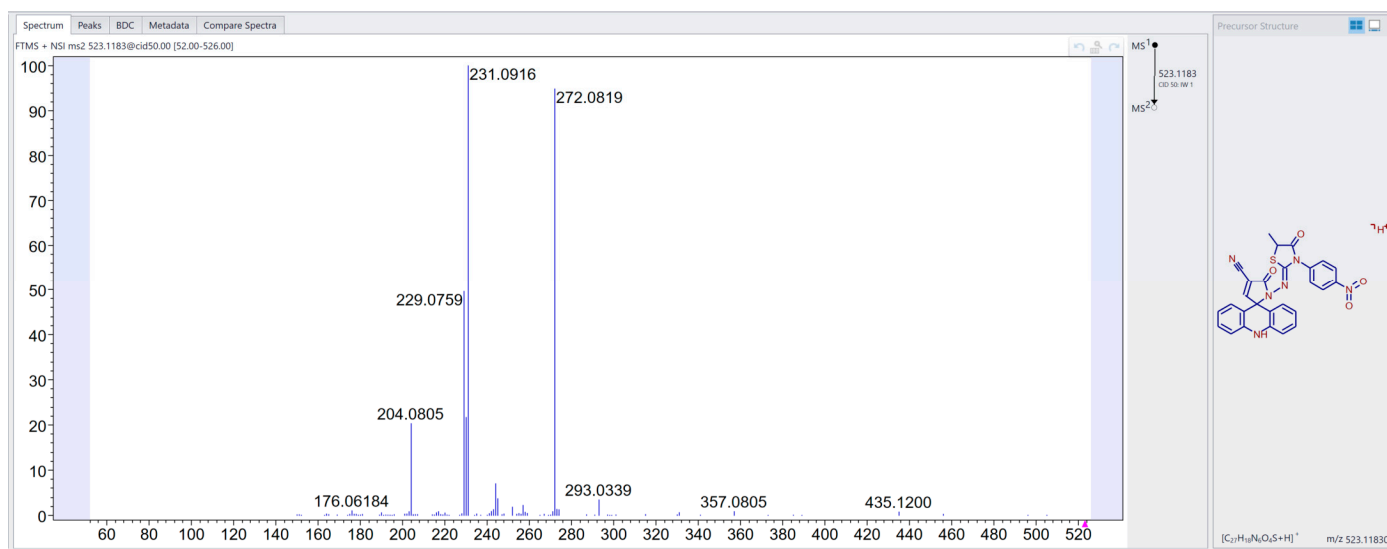


### <Peak Table>

Detector A

Peak#	Ret. Time	Area	Height	Conc.	Unit	Area%
1	23,395	253680	5281	45,935		45,935
2	24,358	298576	5414	54,065		54,065
Total		552256	10694			100,000

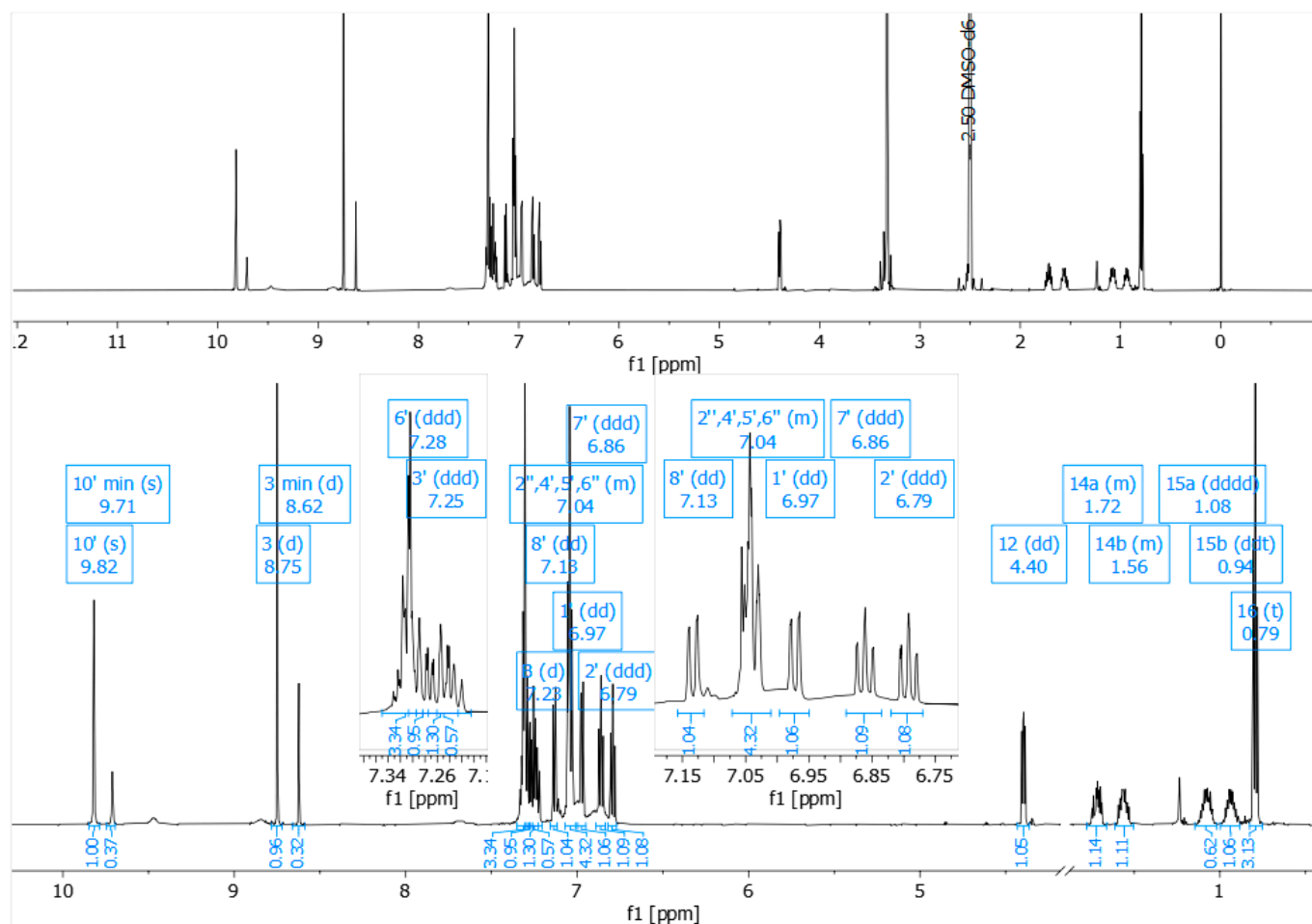
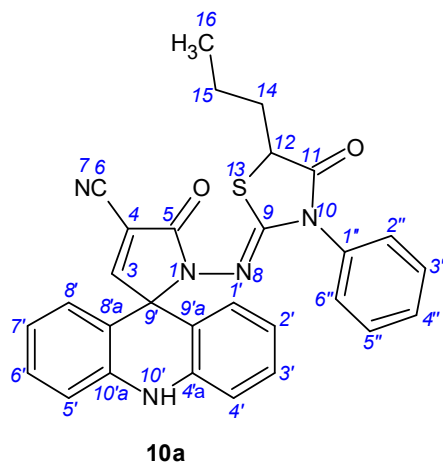
Chiral HPLC chromatogram of compound **9e**. Chiralpak IA column; flow rate of 0.5 mL/min; temperature 25 °C; *n*-hexane/acetone (75/25, v/v)



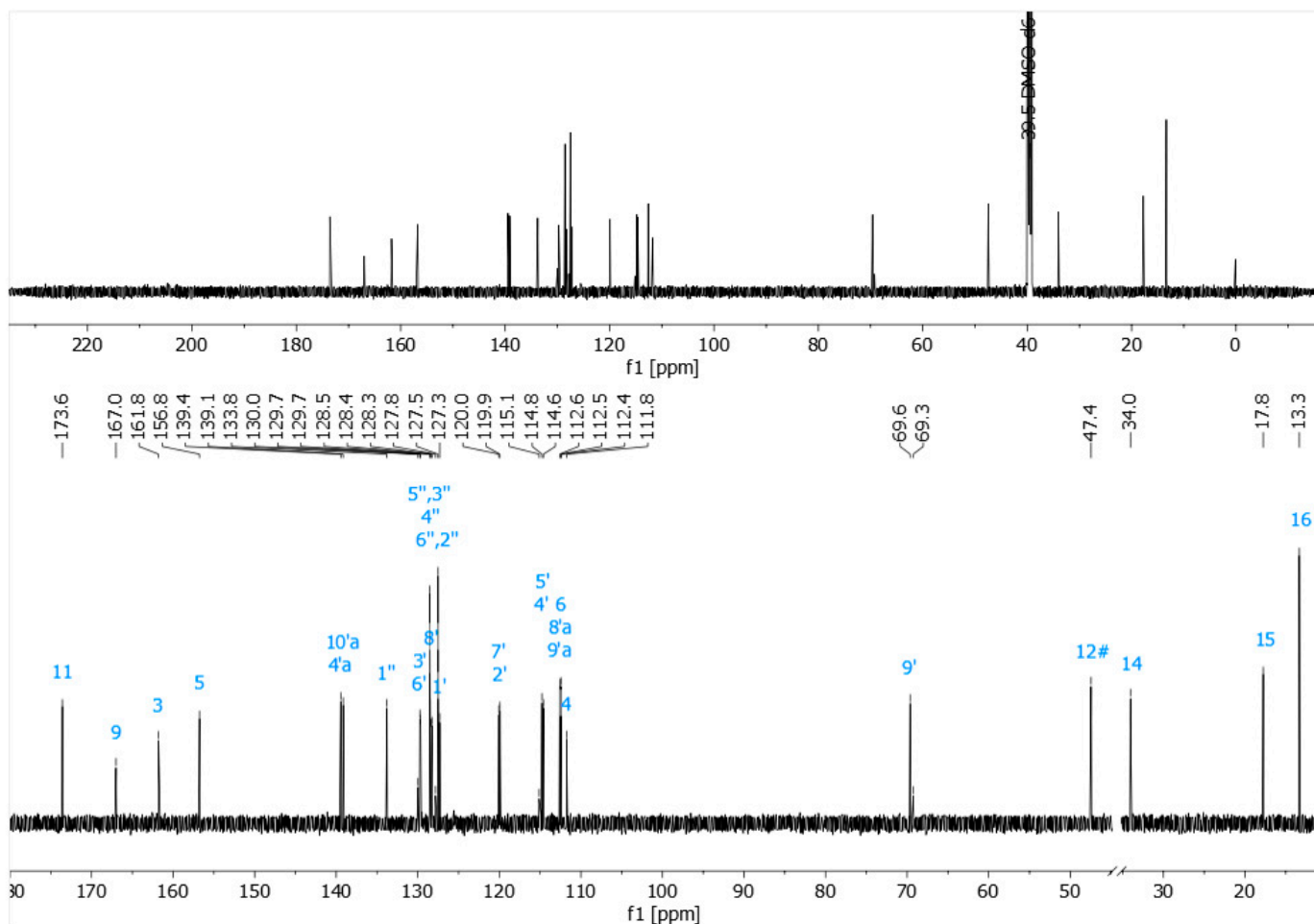
MS2 spectrum of derivative **9e**.



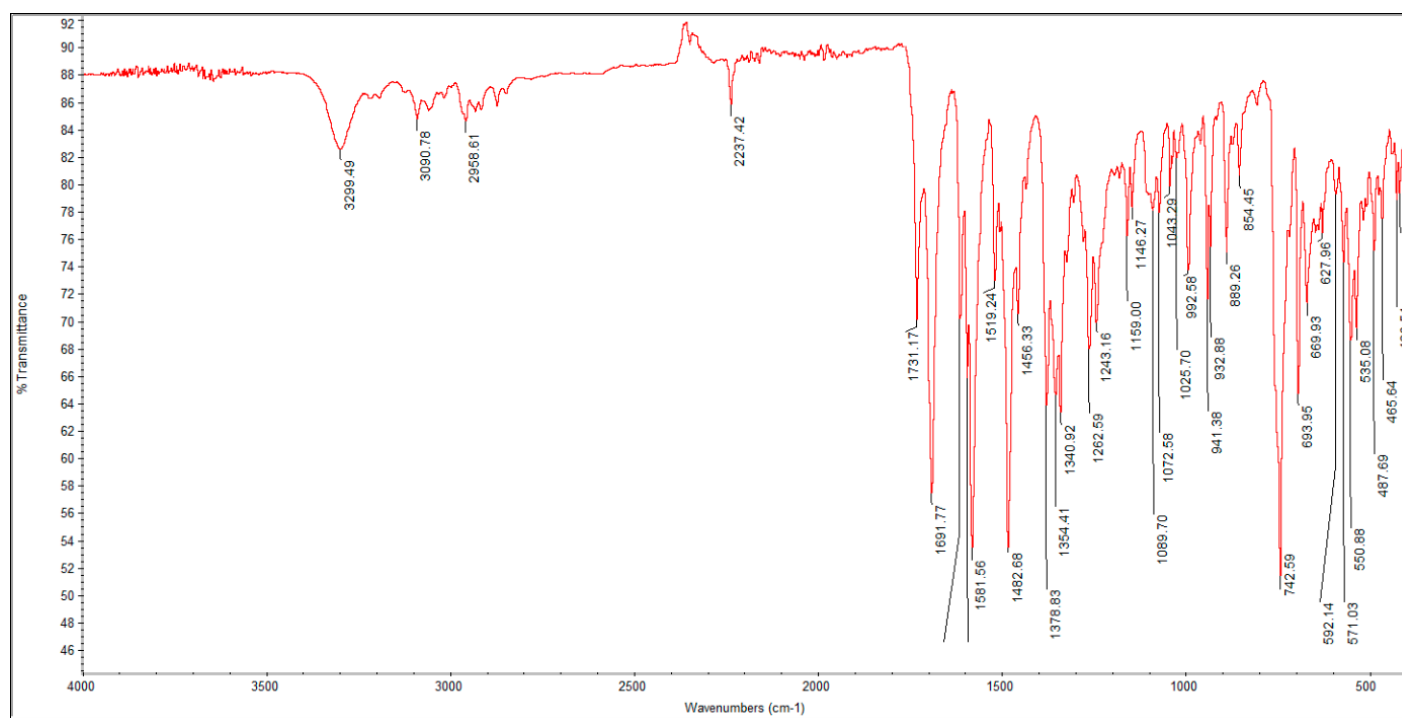
2.21 5'-Oxo-1'-{[(2Z)-4-oxo-3-phenyl-5-propyl-1,3-thiazolidin-2-ylidene]amino}-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**10a**)



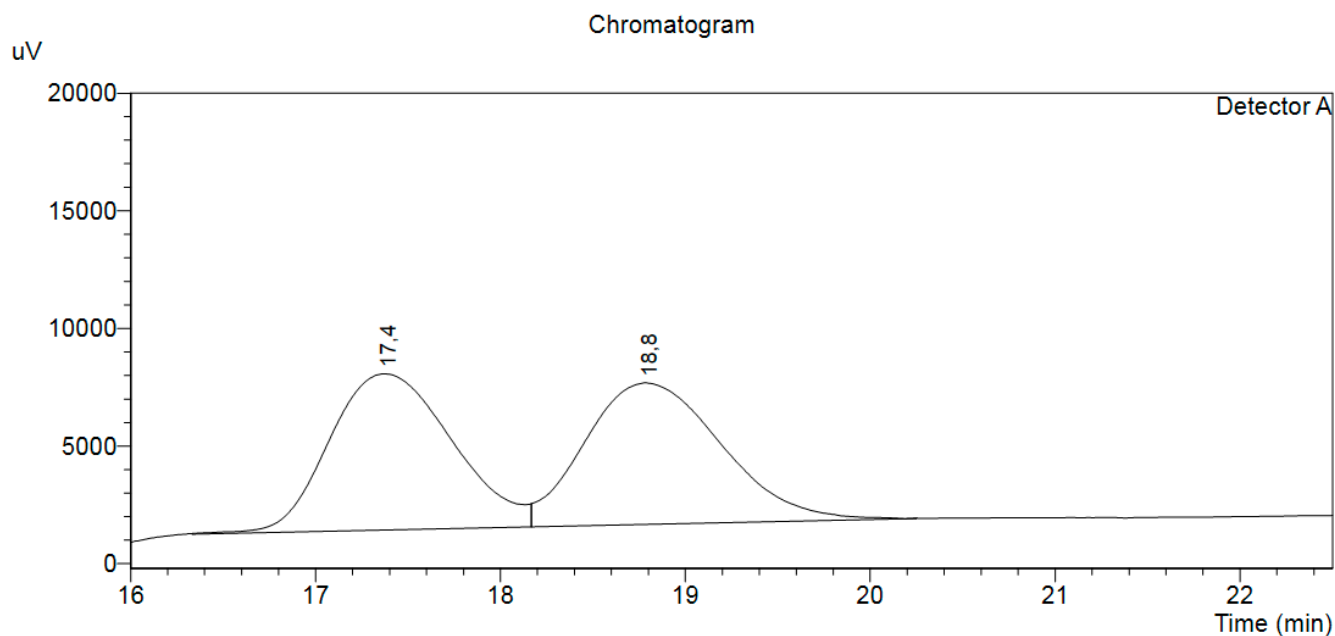
<sup>1</sup>H NMR (600 MHz, DMSO-*d*<sub>6</sub>) spectrum of derivative **10a**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **10a**.



FTIR spectrum of derivative **10a**.

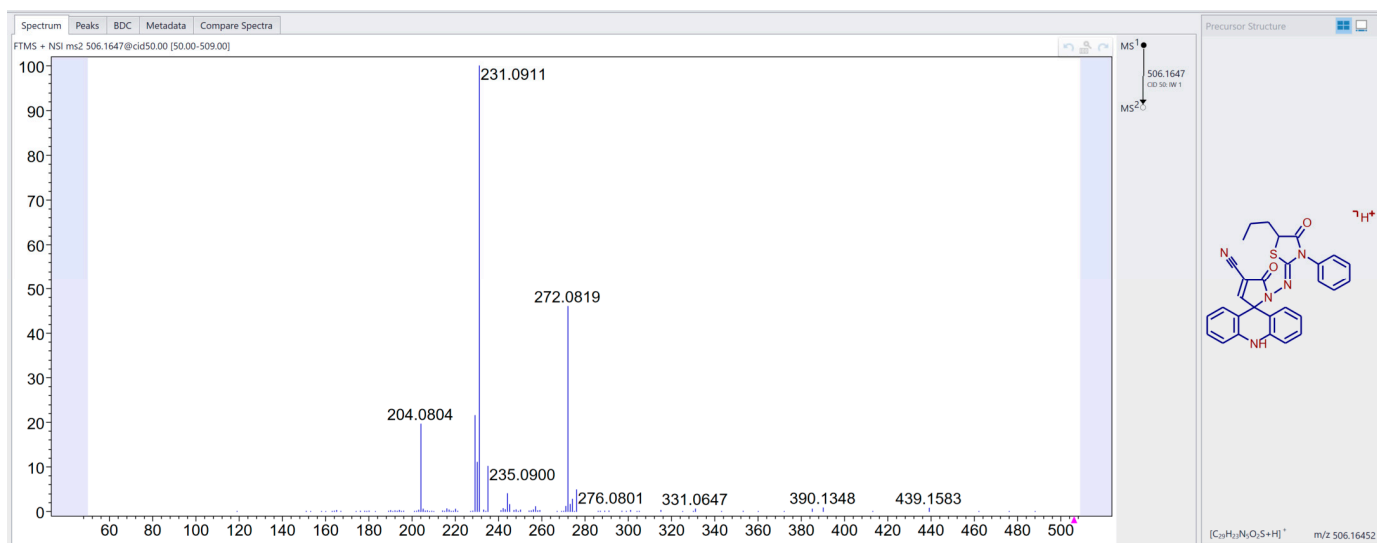


### <Peak Table>

Detector A

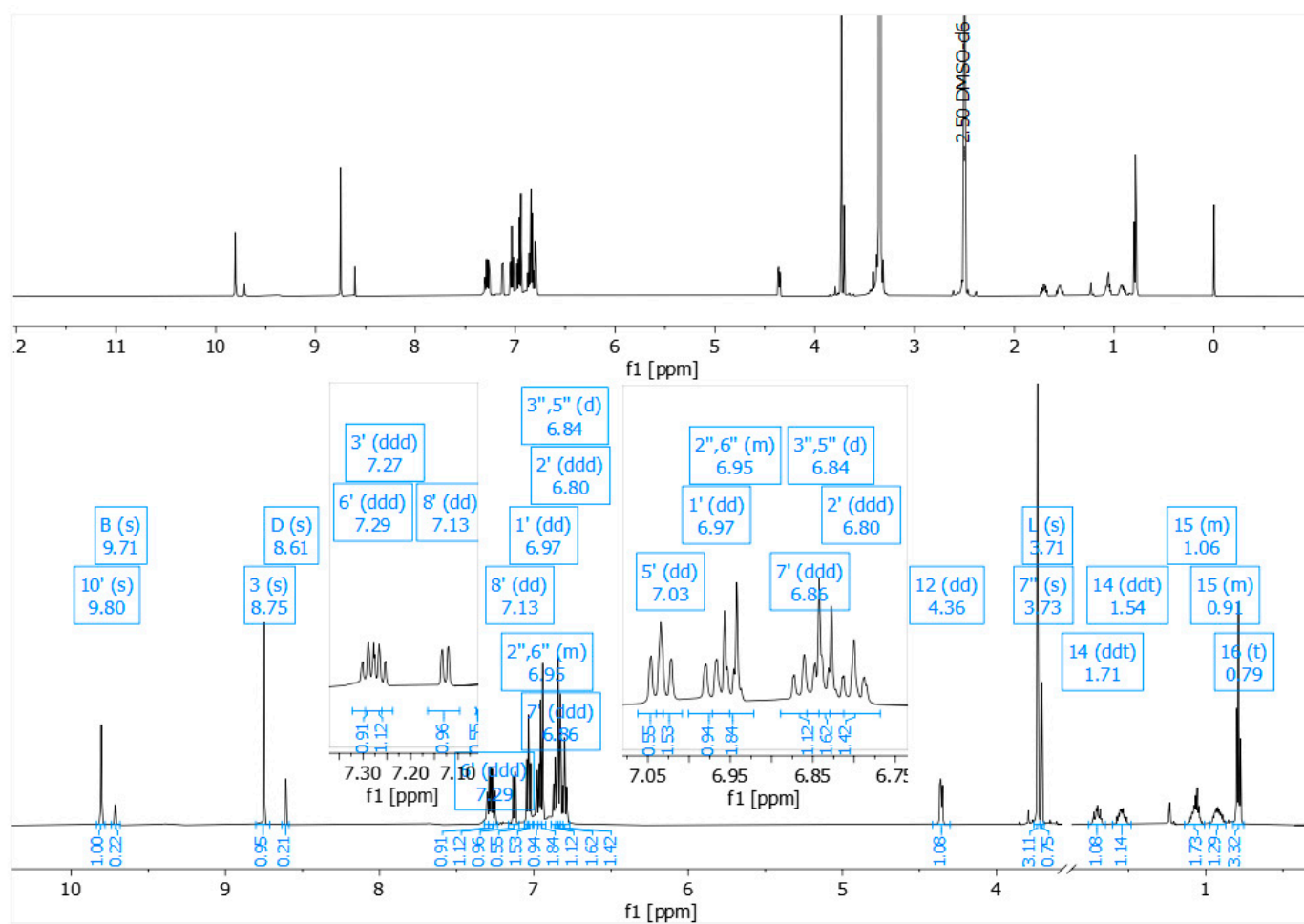
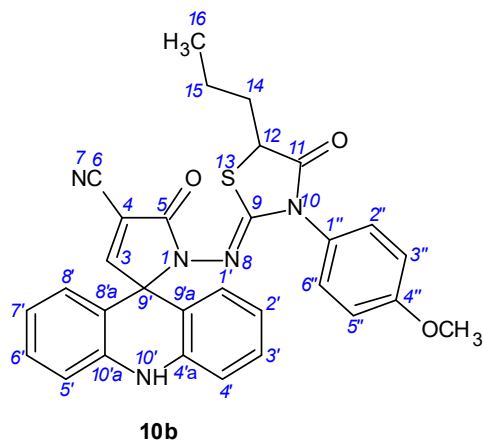
Peak#	Ret. Time	Area	Height	Conc.	Unit	Area%
1	17,376	306155	6615	49,745		49,745
2	18,788	309290	5991	50,255		50,255
Total		615444	12606			100,000

Chiral HPLC chromatogram of compound **10a**. Chiralpak IA column; flow rate of 0.5 mL/min; temperature 25 °C; *n*-hexane/acetone (75/25, v/v)

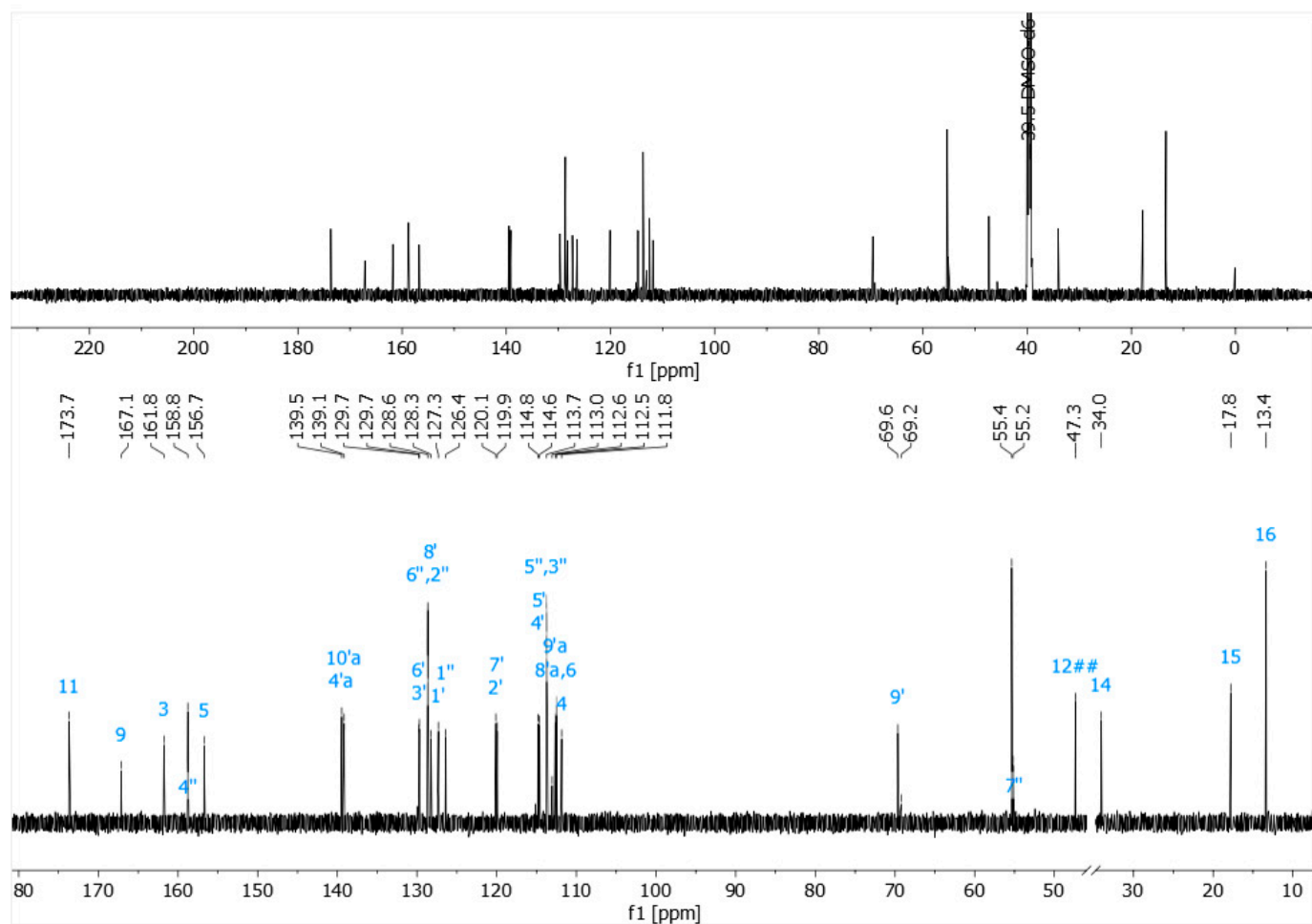


MS2 spectrum of derivative **10a**.

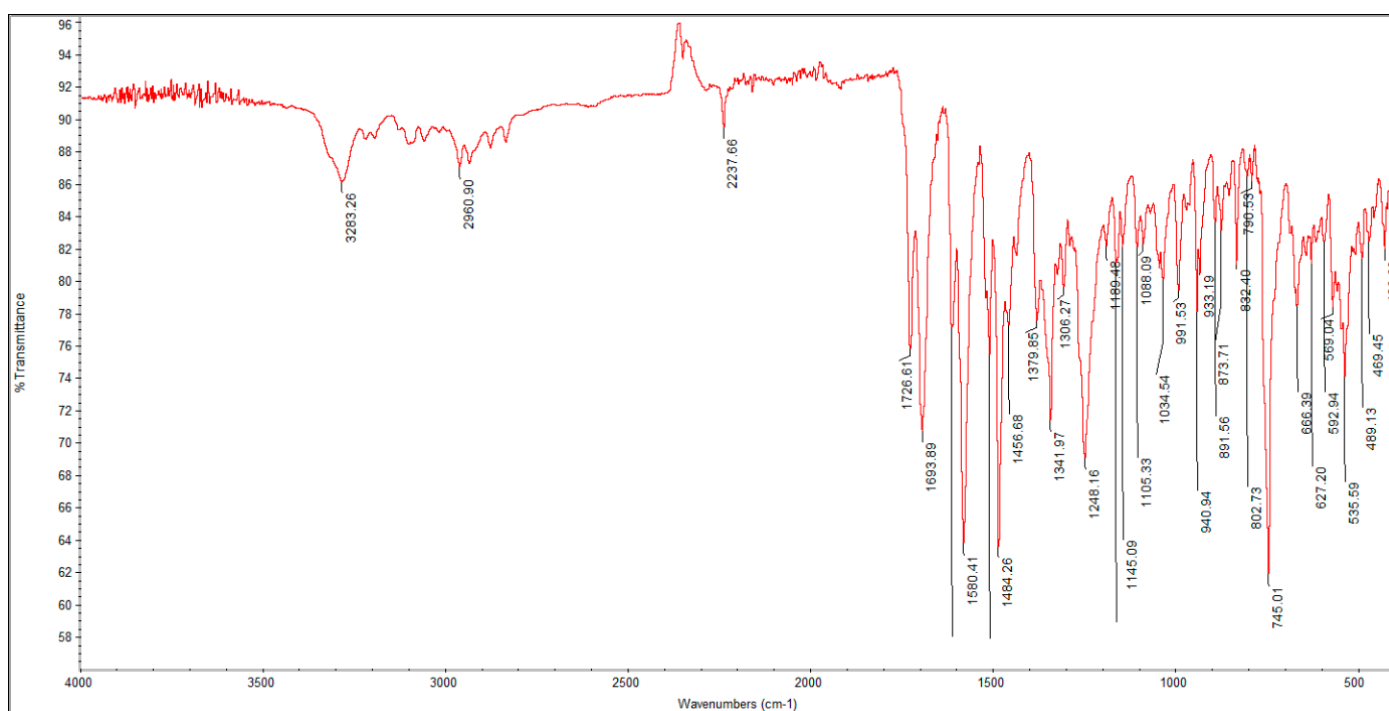
2.22 1'-{[(2Z)-3-(4-Methoxyphenyl)-4-oxo-5-propyl-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**10b**)



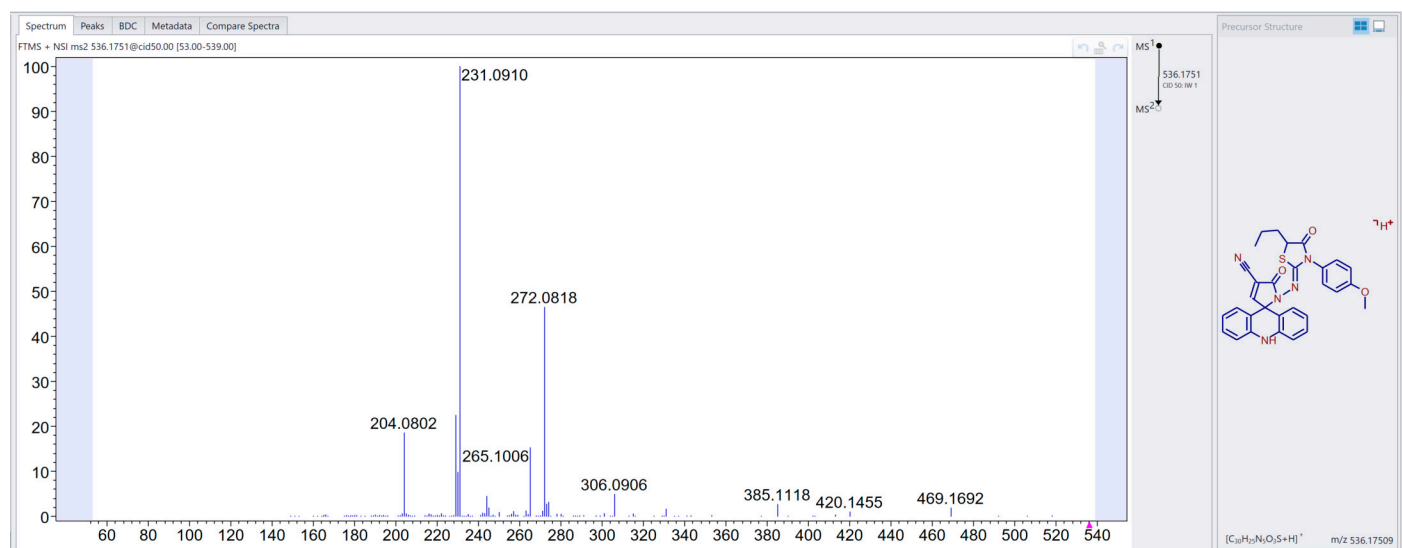
$^1\text{H}$  NMR (600 MHz, DMSO- $d_6$ ) spectrum of derivative **10b**.



<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **10b**.

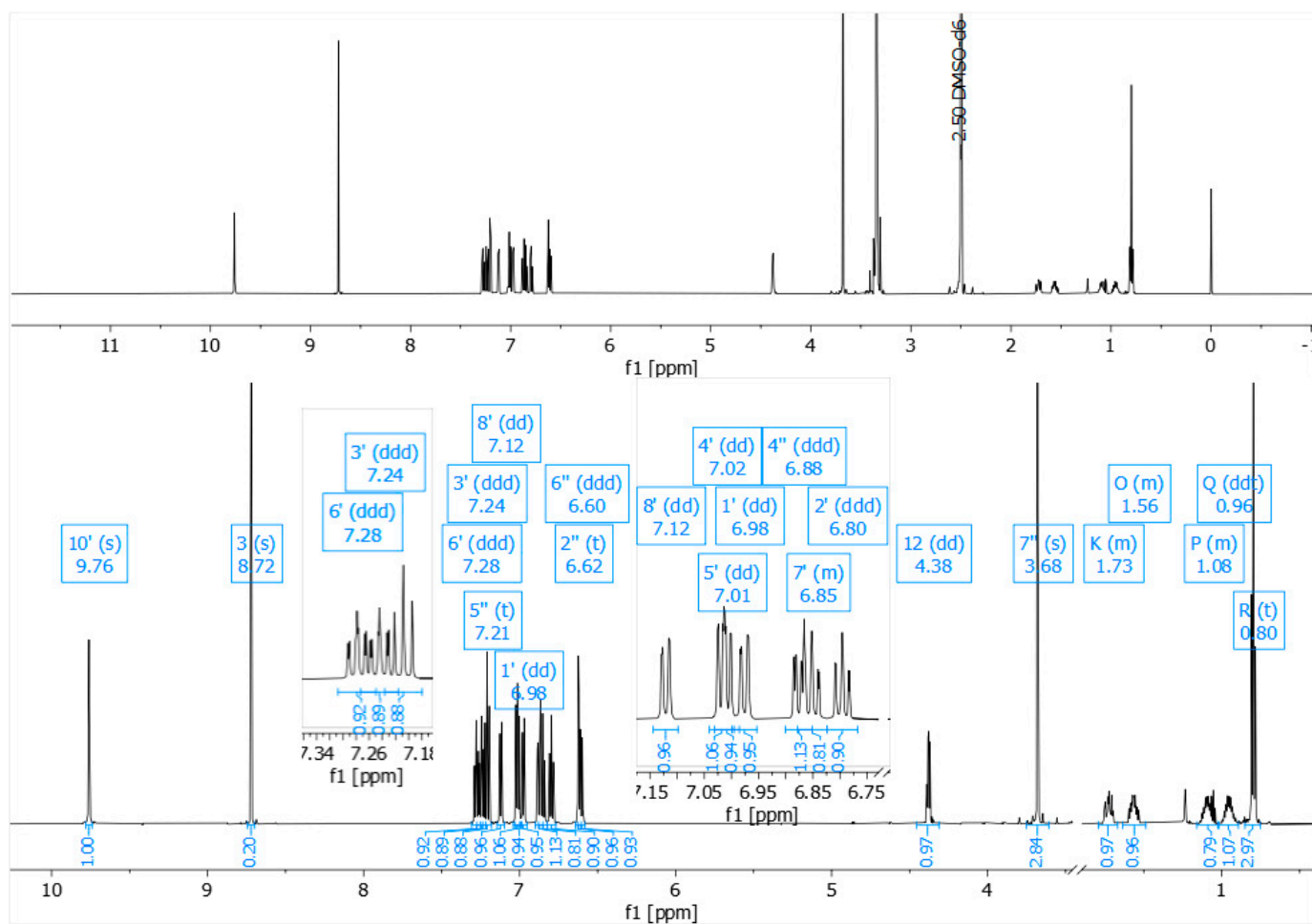
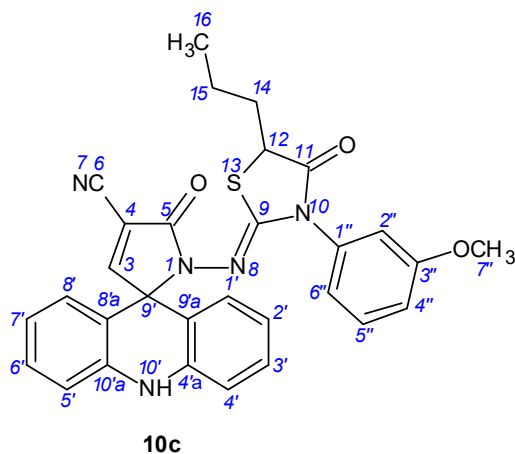


FTIR spectrum of derivative **10b**.

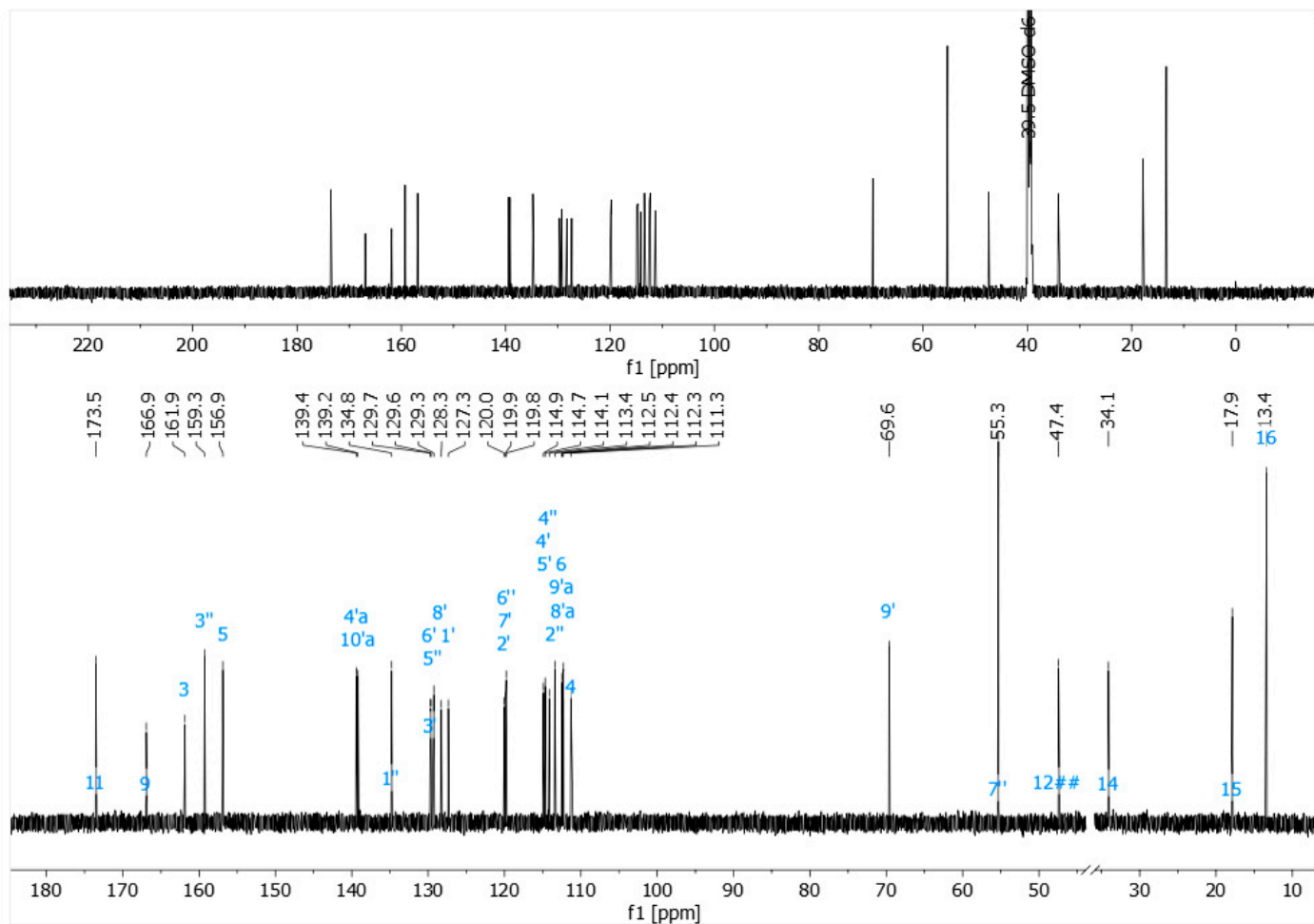


MS2 spectrum of derivative **10b**.

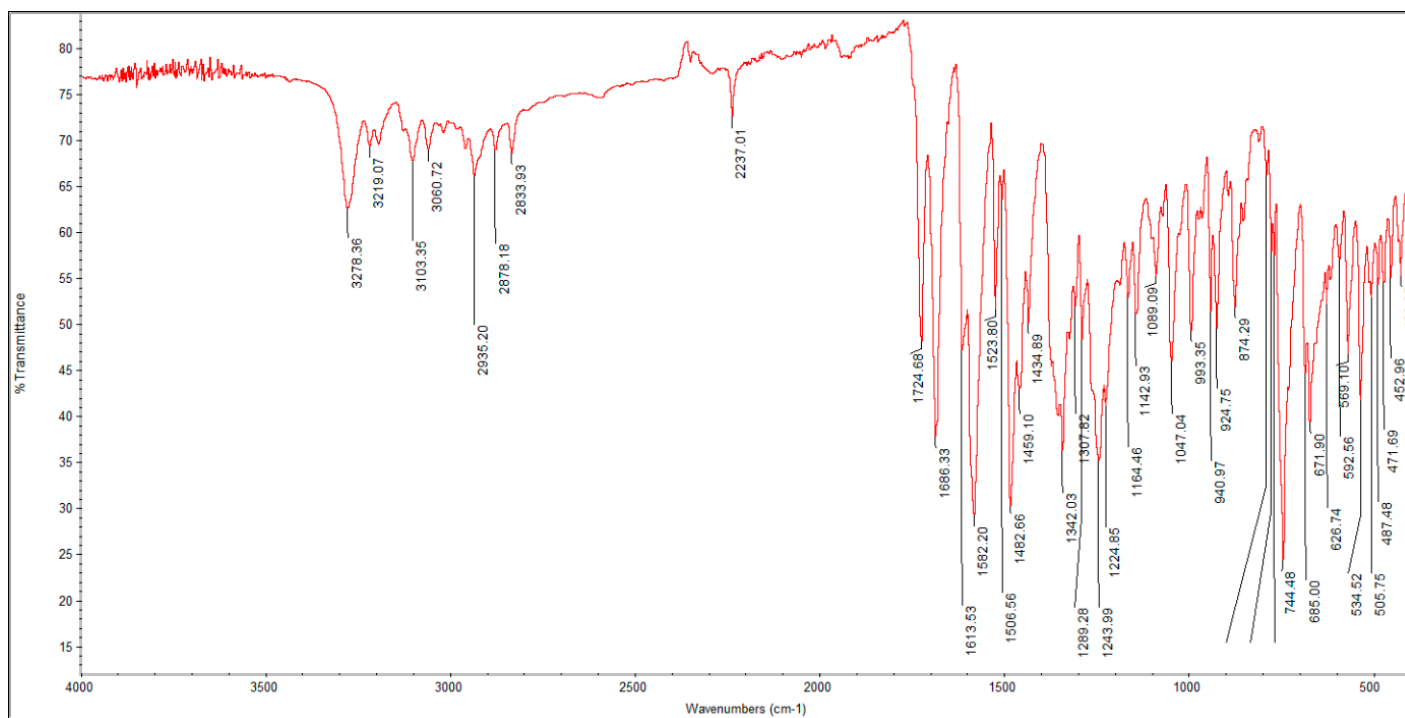
2.23 1'-{[(2Z)-3-(3-Methoxyphenyl)-4-oxo-5-propyl-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10H-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**10c**)



<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **10c**.

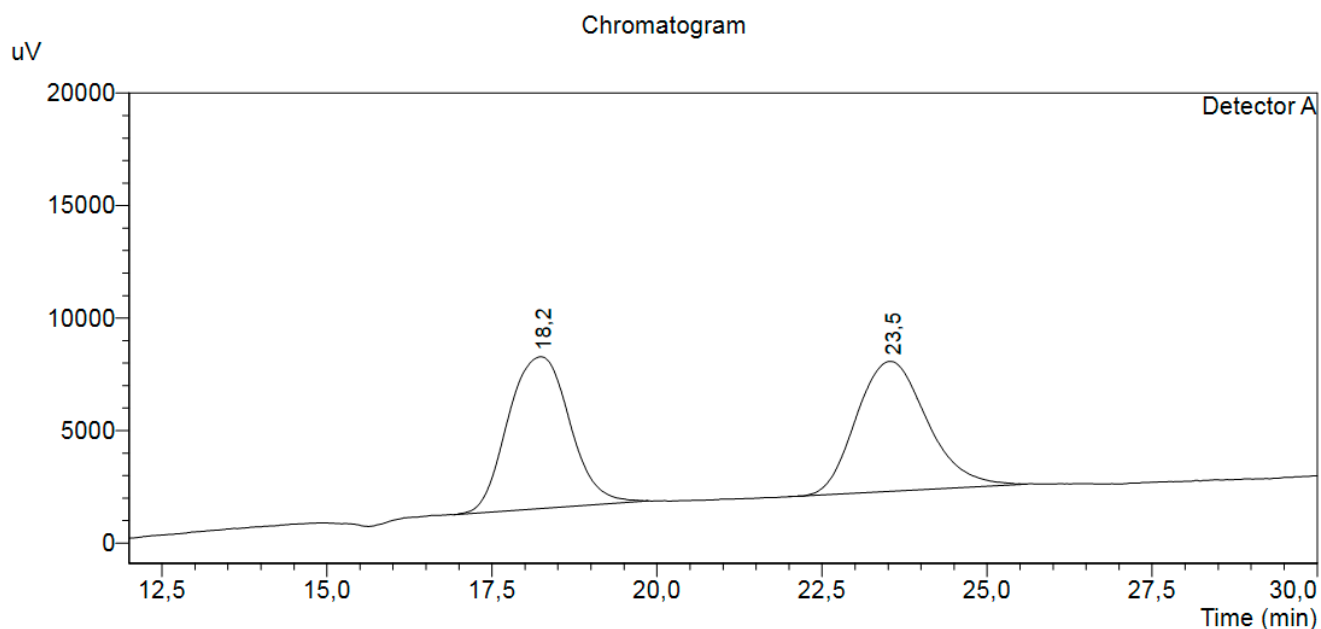


**<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative 10c.**



**FTIR spectrum of derivative 10c.**



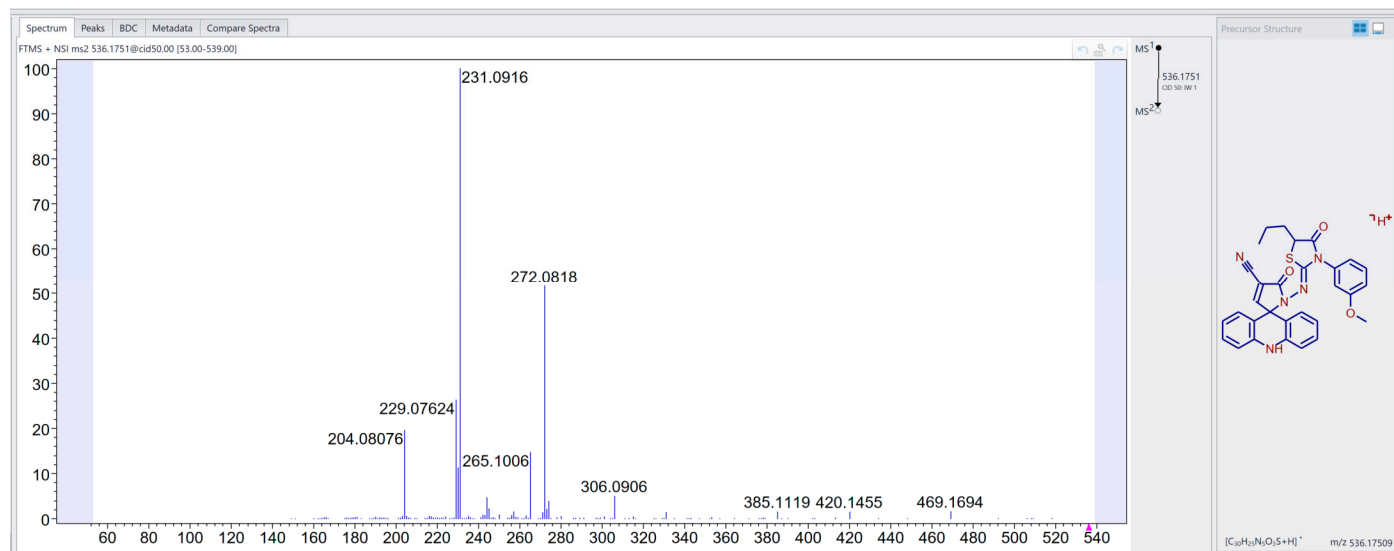


### <Peak Table>

Detector A

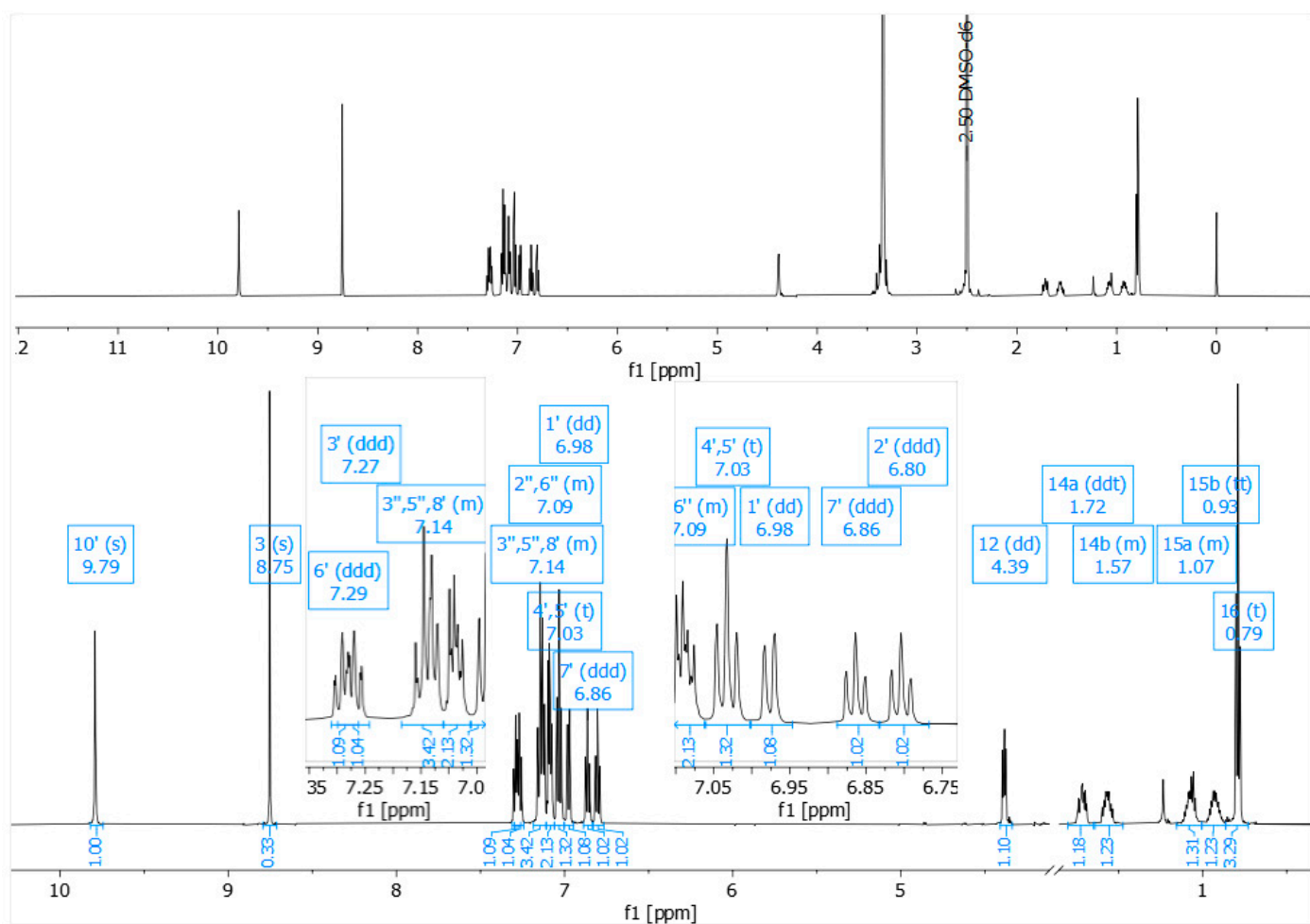
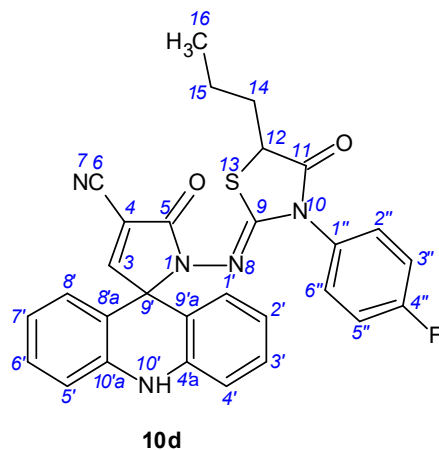
Peak#	Ret. Time	Area	Height	Conc.	Unit	Area%
1	18,236	438502	6731	50,411		50,411
2	23,533	431355	5768	49,589		49,589
Total		869857	12499			100,000

Chiral HPLC chromatogram of compound **10c**. Chiralpak IA column; flow rate of 0.5 mL/min; temperature 25 °C; *n*-hexane/acetone (75/25, v/v)

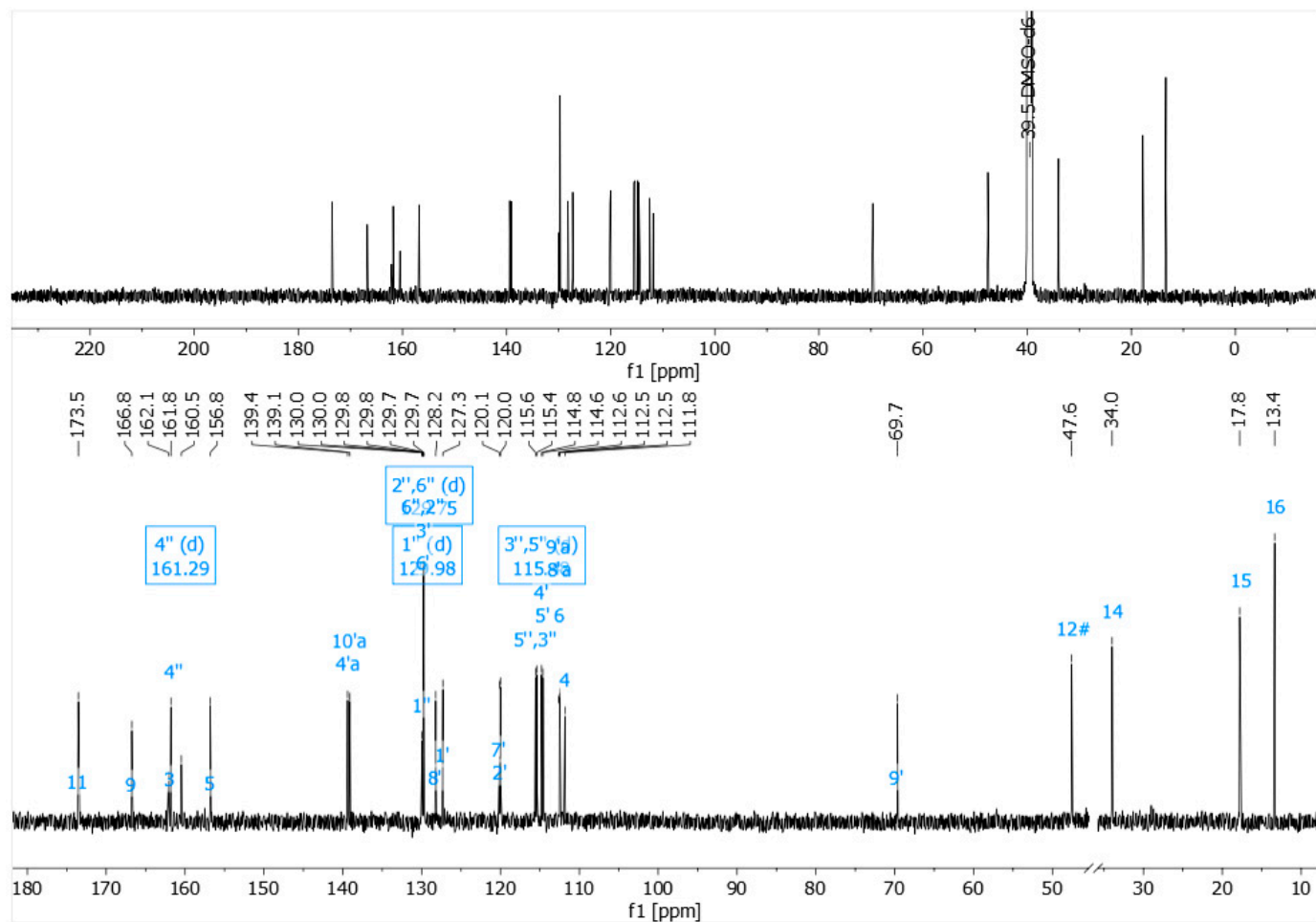


MS2 spectrum of derivative **10c**.

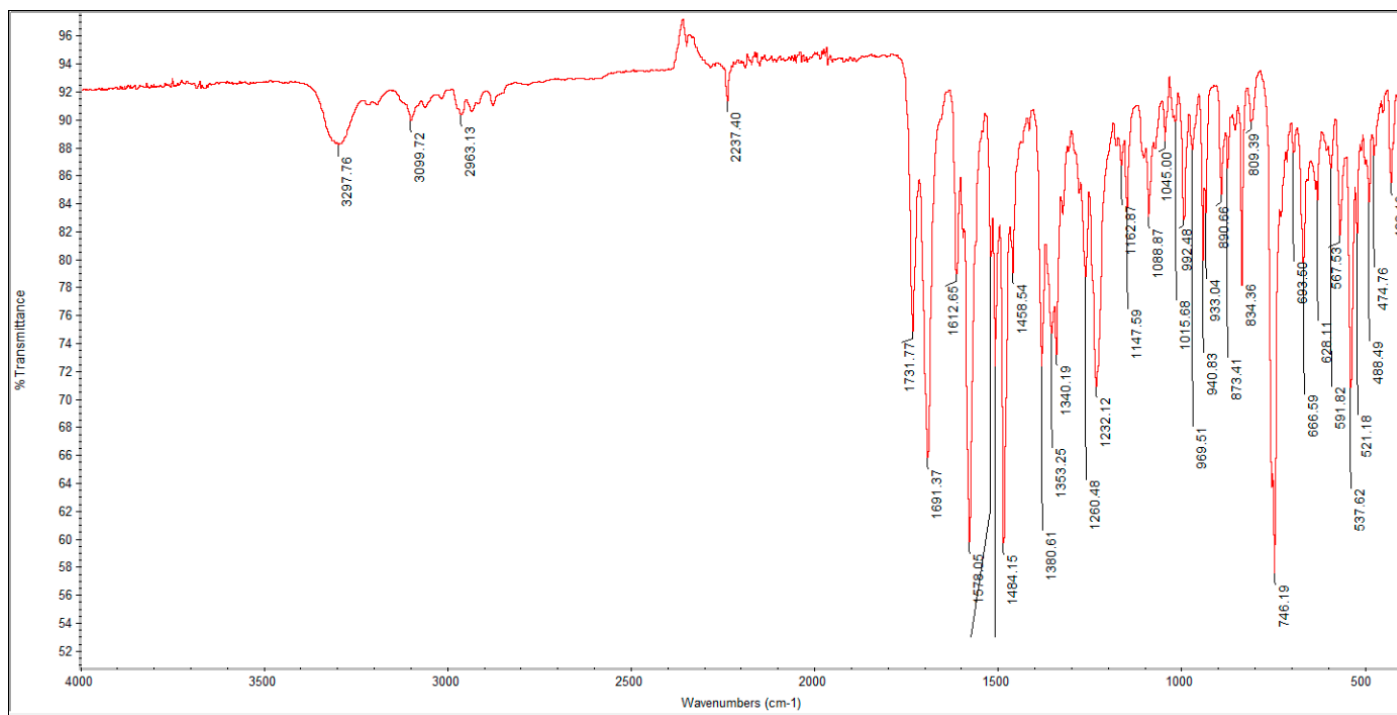
2.24 1'-{[(2Z)-3-(4-Fluorophenyl)-4-oxo-5-propyl-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**10d**)



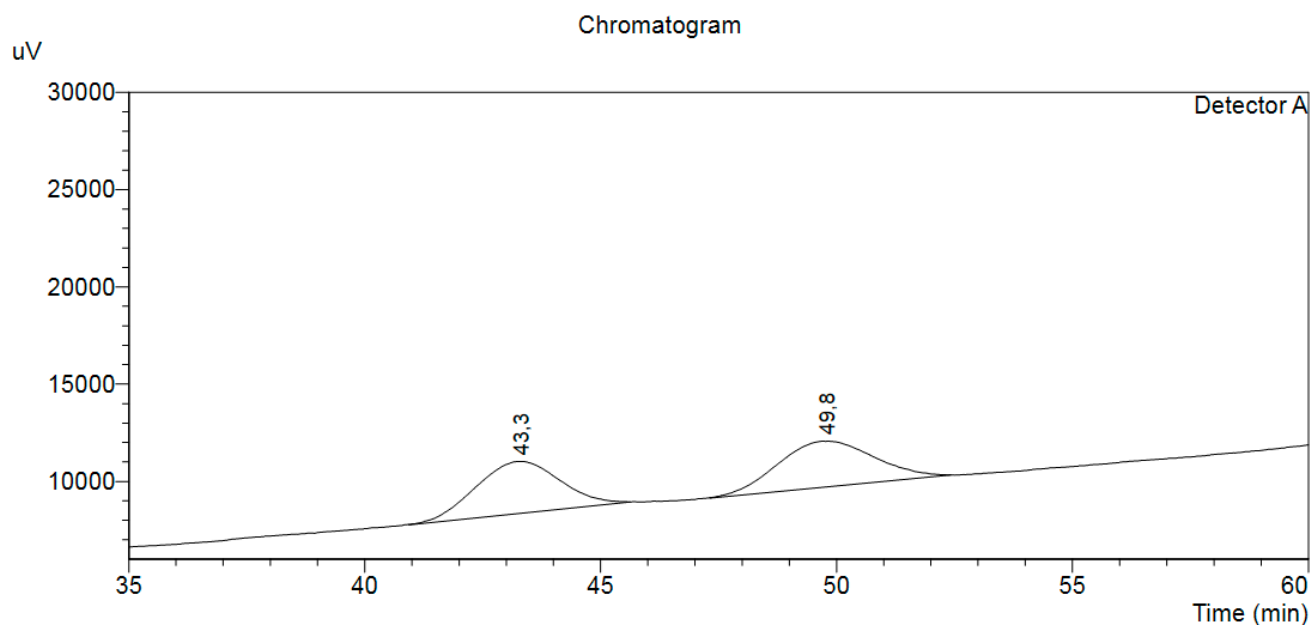
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **10d**.



**<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative 10d.**



**FTIR spectrum of derivative 10d.**

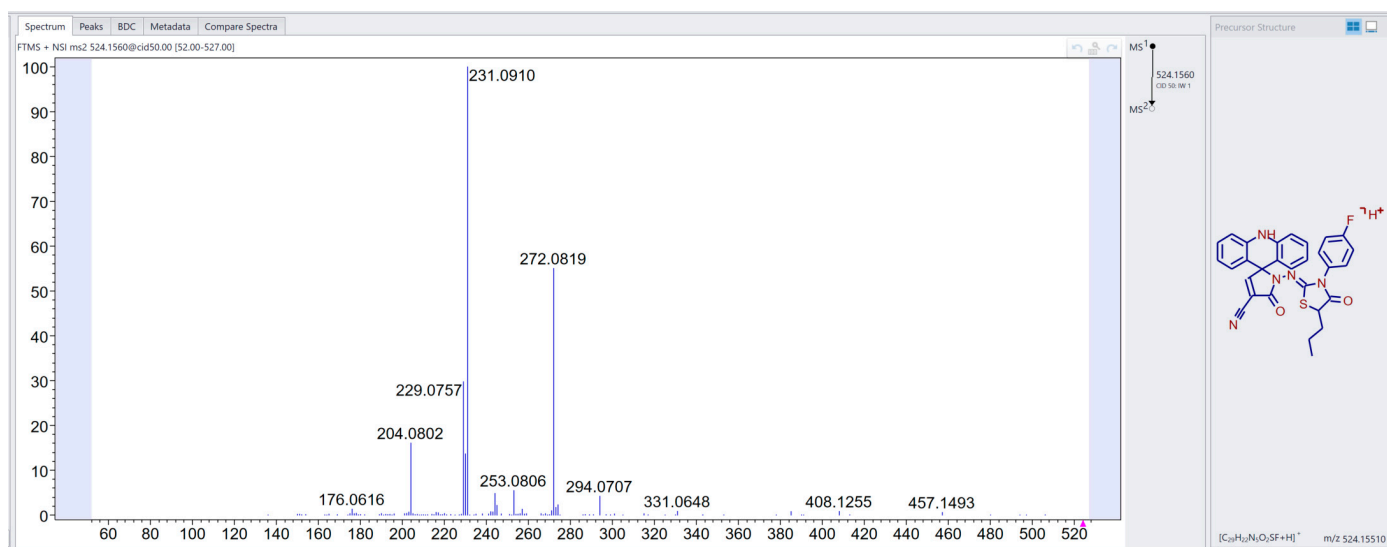


### <Peak Table>

Detector A

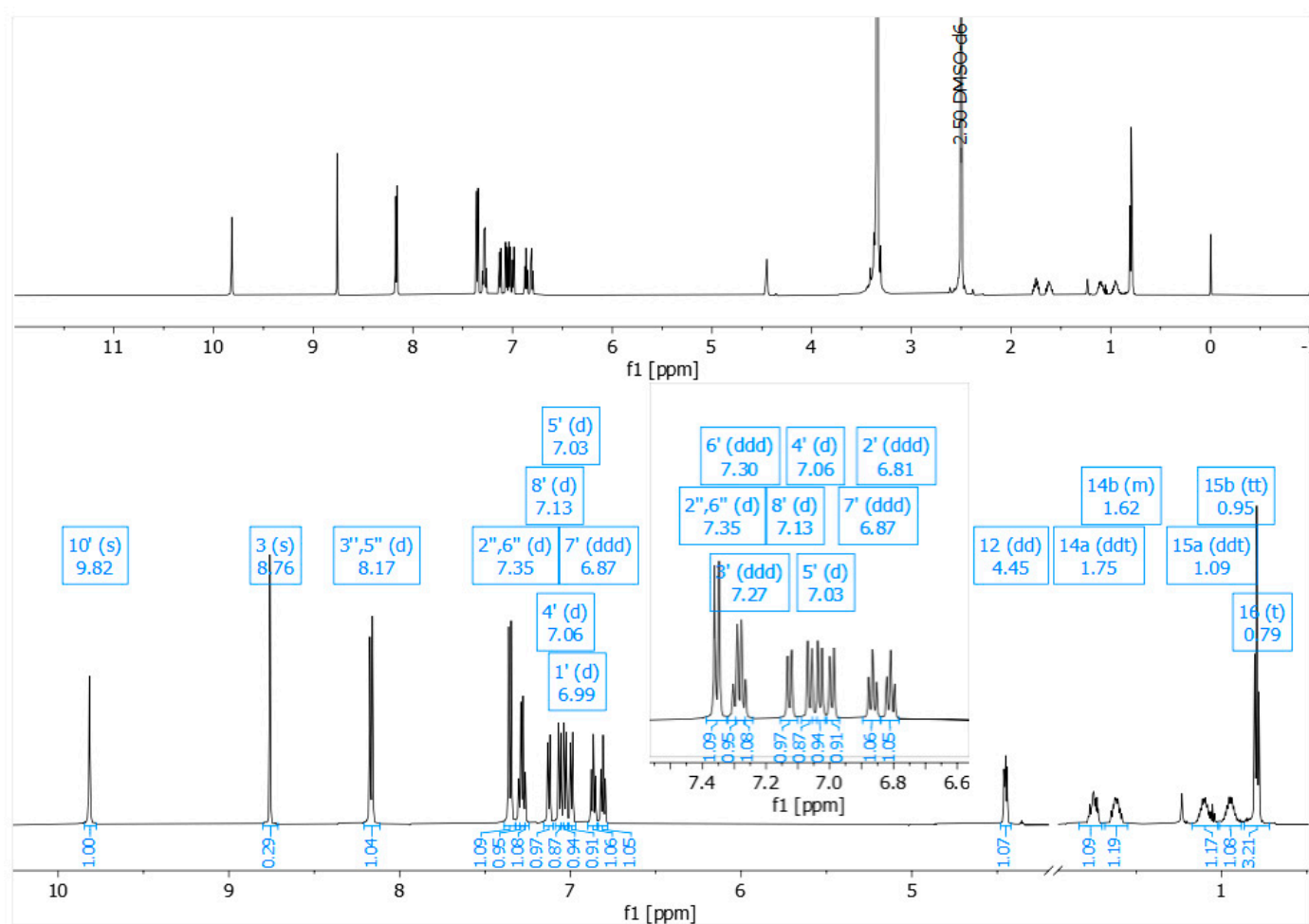
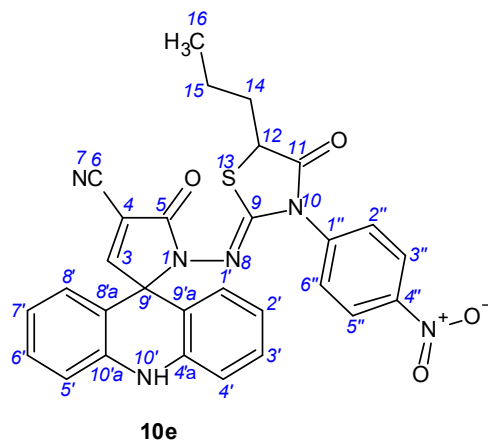
Peak#	Ret. Time	Area	Height	Conc.	Unit	Area%
1	43,296	331678	2660	49,784		49,784
2	49,773	334556	2349	50,216		50,216
Total		666233	5009			100,000

Chiral HPLC chromatogram of compound **10d**. Chiralpak IA column; flow rate of 0.5 mL/min; temperature 25 °C; *n*-hexane/acetone (85/15, v/v)

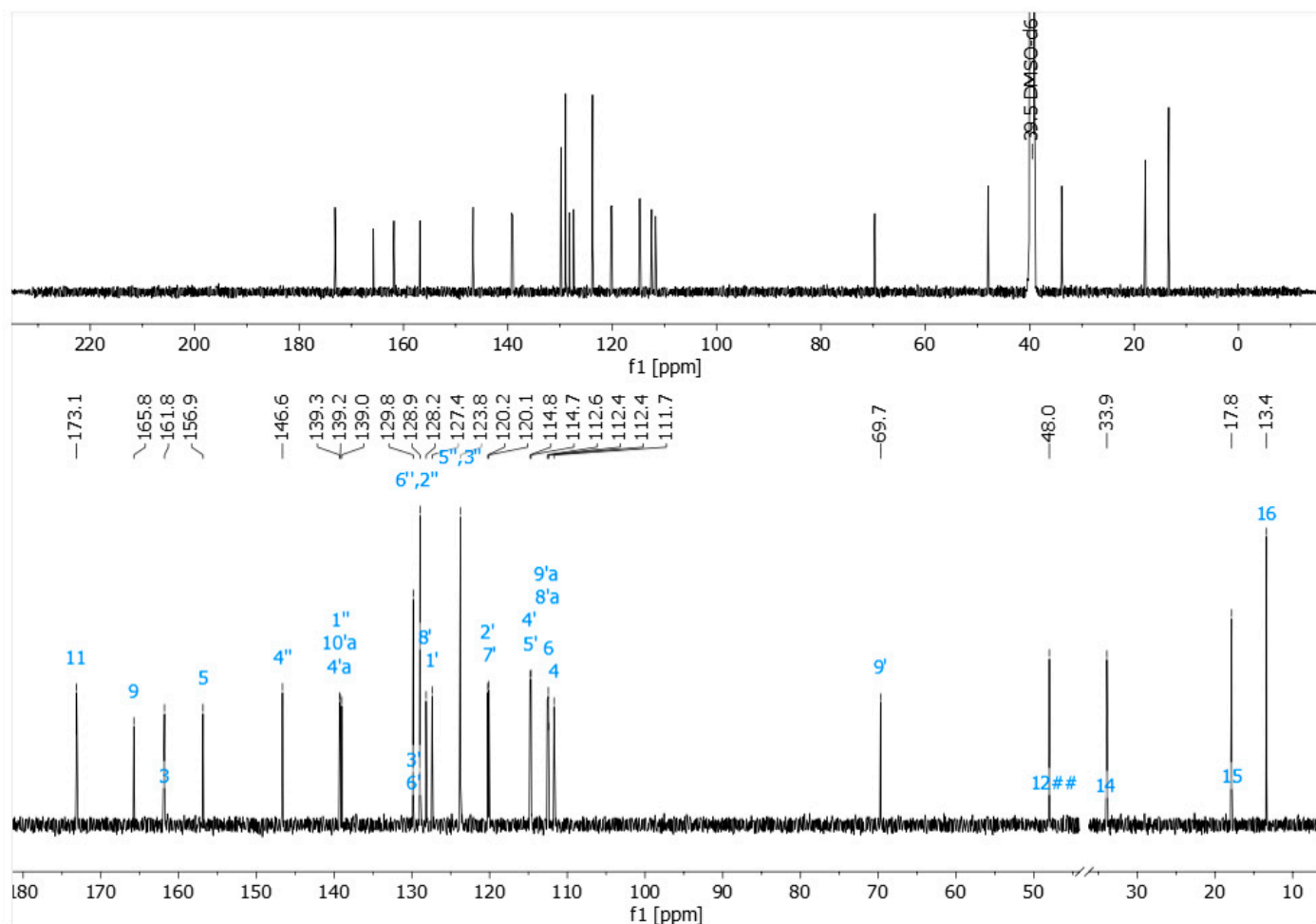


MS2 spectrum of derivative **10d**.

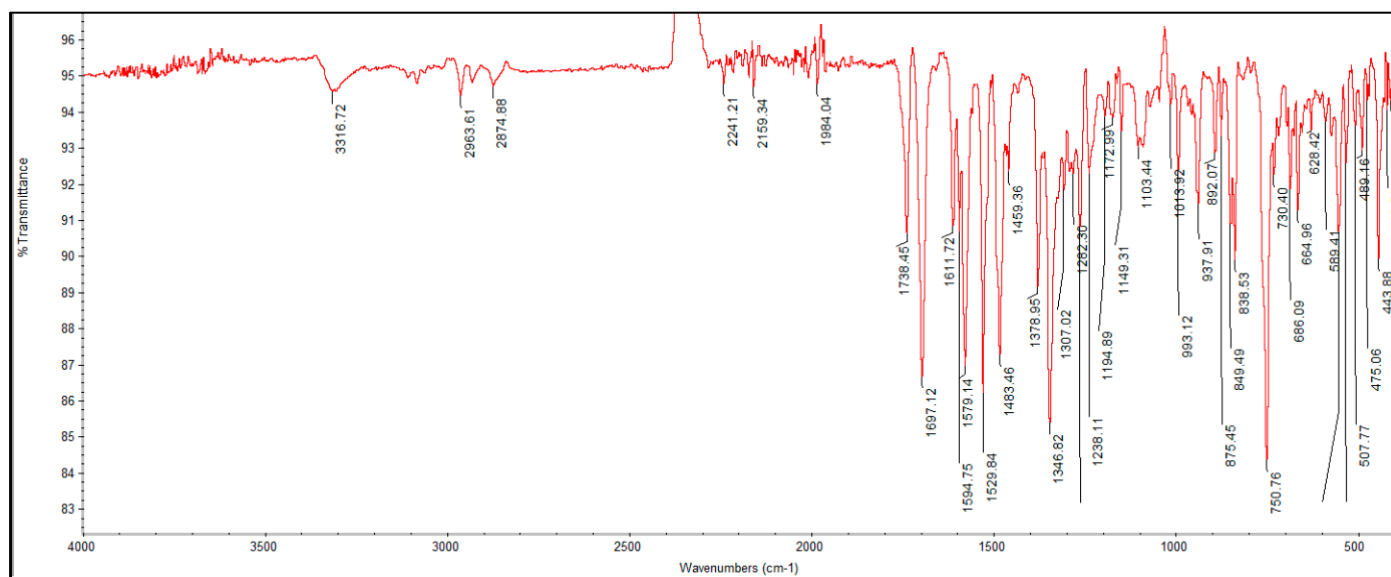
2.25 1'-{[(2Z)-3-(4-Nitrophenyl)-4-oxo-5-propyl-1,3-thiazolidin-2-ylidene]amino}-5'-oxo-1',5'-dihydro-10*H*-spiro[acridine-9,2'-pyrrole]-4'-carbonitrile (**10e**)



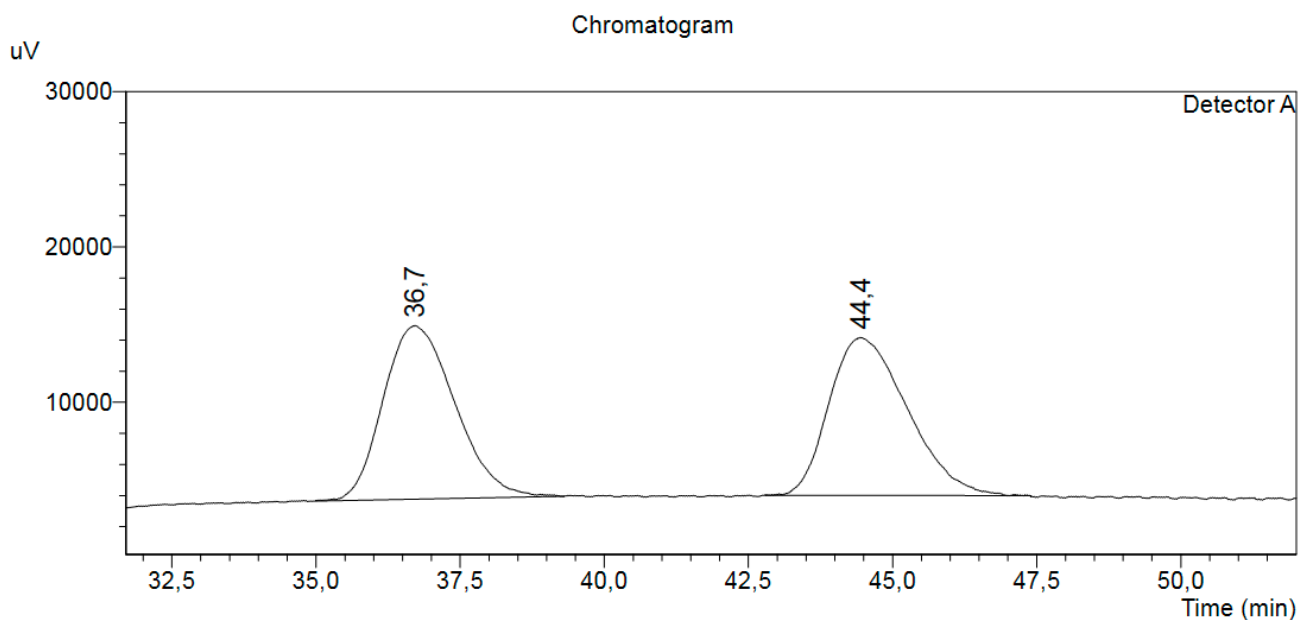
<sup>1</sup>H NMR (600 MHz, DMSO-d<sub>6</sub>) spectrum of derivative **10e**.



**<sup>13</sup>C NMR (150 MHz, DMSO-d<sub>6</sub>) spectrum of derivative 10e.**



**FTIR spectrum of derivative 10e.**

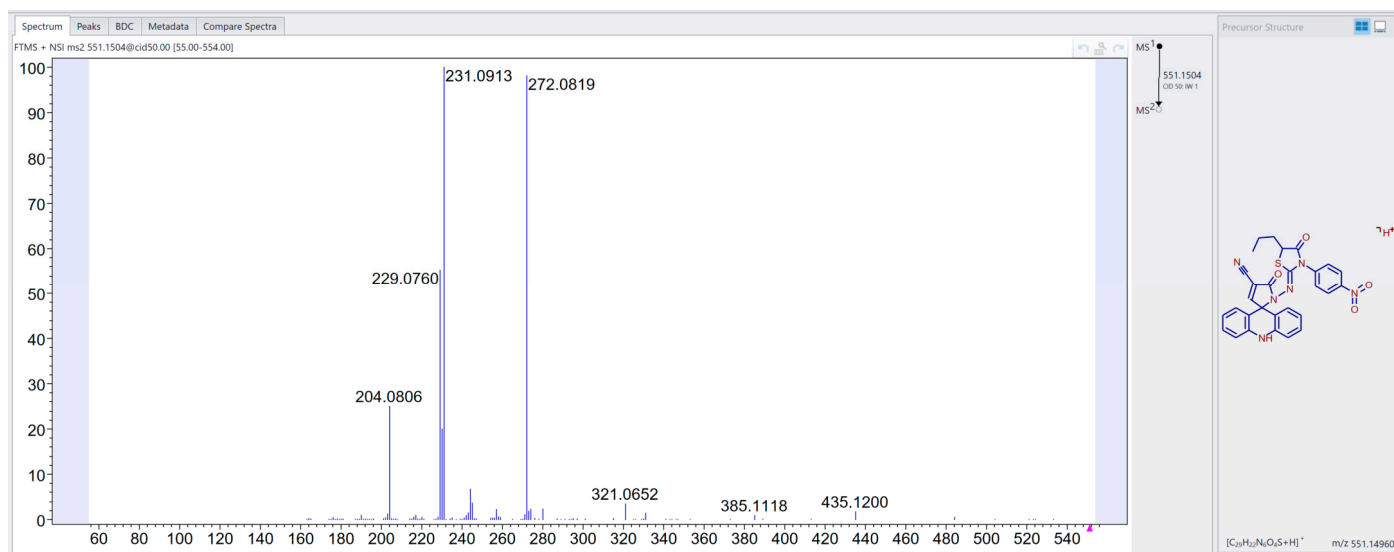


### <Peak Table>

Detector A

Peak#	Ret. Time	Area	Height	Conc.	Unit	Area%
1	36,713	965921	11103	50,198		50,198
2	44,447	958295	10137	49,802		49,802
Total		1924216	21239			100,000

Chiral HPLC chromatogram of compound **10e**. Chiralpak IA column; flow rate of 0.5 mL/min; temperature 25 °C; *n*-hexane/acetone (75/25, v/v)



MS2 spectrum of derivative **10e**.