

## Quickly FeCl<sub>3</sub>-catalyzed highly chemo- and stereo- selective [3+2] dipolar cycloaddition of aziridines with isothiocyanates

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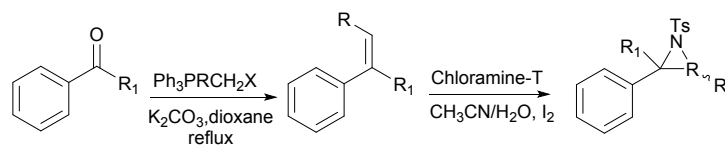
**General Remarks:** All reactions were carried out in oven-dried flask sealed with rubber septa under a positive pressure of dry nitrogen unless otherwise indicated. Reactions were run using Teflon<sup>TM</sup>-coated magnetic stir bars. Aziridines **1a-1j**, **1k** were prepared following the procedure of M. Komatsu as steps in Scheme SI-1. <sup>1</sup>H-NMR and <sup>13</sup>C-NMR were recorded on a Bruker AC-300 FT (<sup>1</sup>H: 300 and 400 MHz, <sup>13</sup>C: 75 and 100 MHz) using TMS as internal reference. The chemical shifts ( $\delta$ ) and coupling constants ( $J$ ) were expressed in ppm and Hz respectively. Infrared samples were recorded on a Perkin-Elmer 2000FTIR spectrometer. HRMS were recorded on the TOF-HRMS-EI at the Instruments' Center for Physical Science, University of Science & Technology of China. Nitromethane, 1,2-dichloroethane and dichloromethane were distilled from CaH<sub>2</sub> and stored over 4Å molsieves in screw-cap flasks. All commercially available reagents were used as received.

### Contents:

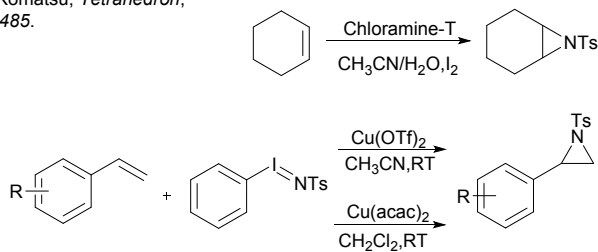
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## Synthesis of substrates 1a-1k and the results of proving experiments

### 1.1 Synthesis of substrates 1a-1k

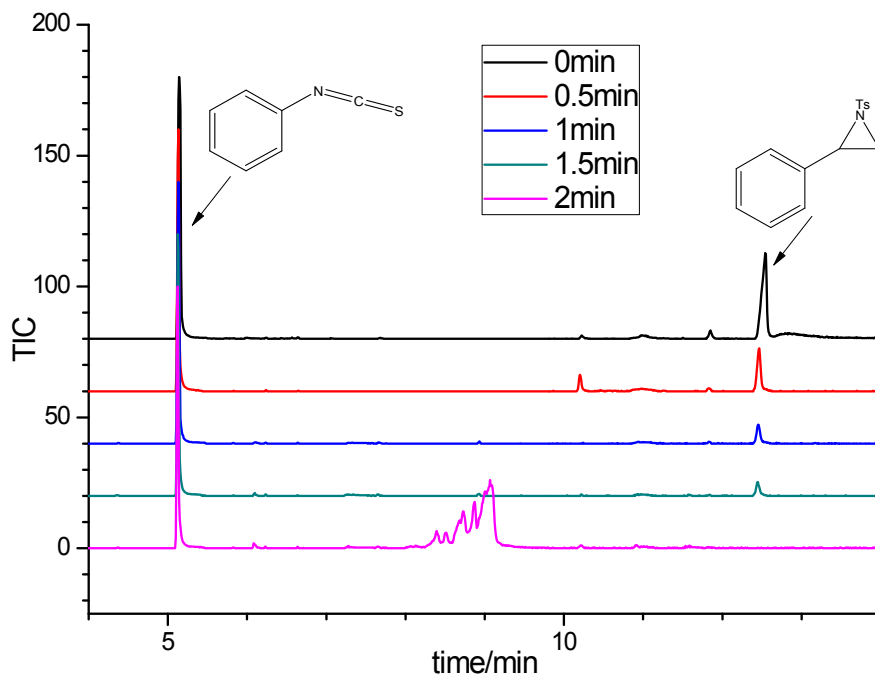


1. T. Ando, D. Kano, S. Minakata, I. Ryu and M. Komatsu, *Tetrahedron*, **1998**, *54*, 13485.



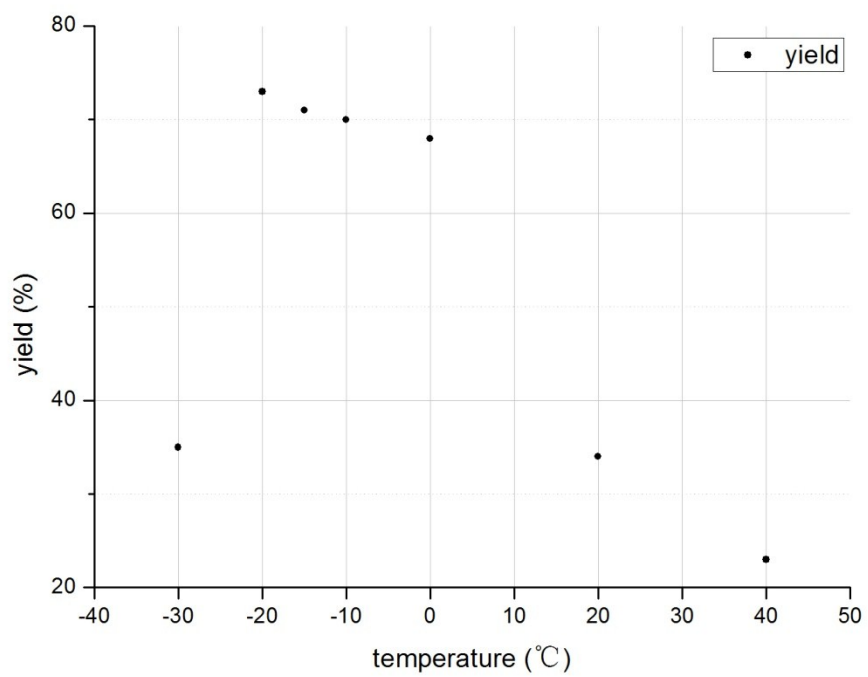
Scheme SI-1. Synthesis of substrates 1a-1k.

### 1.2 The result of tracking experiment



Scheme SI-2. Tracking of substrates 1a with GC-MS.

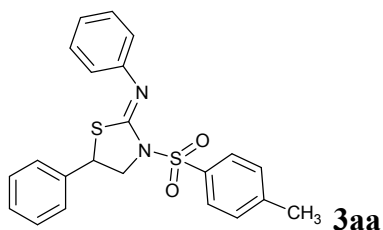
### 1.3 The temperature effect



**Scheme SI-3.** The yield of the reaction of **1a** with **2a** in different temperature

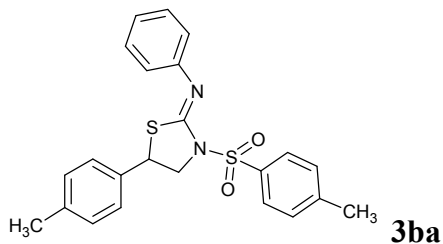
## Characterization data of all products

(Z)-N-(5-phenyl-3-tosylthiazolidin-2-ylidene) aniline



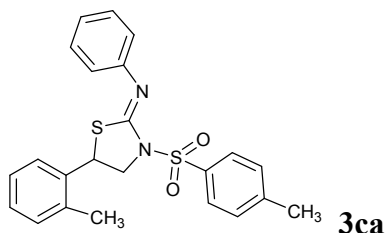
The title compound was a white solid.  $^1\text{H-NMR}$  (300 MHz,  $\text{CDCl}_3$ ):  $\delta$  (ppm) = 2.47 (3 H, s), 2.04 (1 H,  $J = 9$  Hz, t), 4.58 (1 H,  $J = 6.3$  Hz, q), 4.78 (1 H,  $J = 6.6$  Hz, q), 6.78 (2 H,  $J = 8.1$  Hz, d), 7.07 (1 H, m), 7.25 (2 H,  $J = 6.9$  Hz, d), 7.29 (7 H, m), 7.98 (2 H,  $J = 8.4$  Hz, d).  $^{13}\text{C-NMR}$  (75 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.8, 47.0, 56.9, 120.8, 124.4, 127.5, 128.8, 129.0, 129.1, 129.2, 129.3, 134.8, 136.7, 144.9, 150.1, 152.2. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 3062, 2926, 1643, 1592, 1362, 1172, 1101$ . m. p.: 136 - 138  $^\circ\text{C}$ . HRMS (EI-TOF) calc.  $\text{C}_{22}\text{H}_{20}\text{N}_2\text{O}_2\text{S}_2$ : 408.5364. Found: 408.1125.

(Z)-N-(5-p-tolyl-3-tosylthiazolidin-2-ylidene)aniline



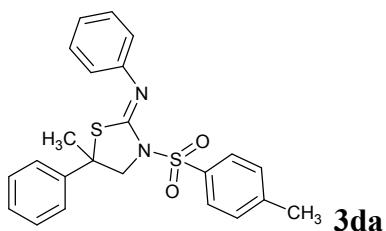
The title compound was a white solid,  $^1\text{H-NMR}$  (300 MHz,  $\text{CDCl}_3$ ):  $\delta$  (ppm) = 2.36 (3 H, s), 2.46 (3 H, s), 4.01 (1 H,  $J = 9.3$  Hz, t), 4.56 (1 H,  $J = 6.6$  Hz, q), 4.75 (1 H,  $J = 6.6$  Hz, q), 6.78 (2 H,  $J = 7.5$  Hz, d), 7.05 (1 H,  $J = 7.5$  Hz, t), 7.11 (2 H,  $J = 8.1$  Hz, d), 7.24 (4 H, m), 7.34 (2 H,  $J = 8.1$  Hz, d), 7.98 (2 H,  $J = 8.1$  Hz, d);  $^{13}\text{C-NMR}$  (75 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.2, 21.8, 46.9, 56.9, 120.8, 124.3, 127.4, 128.9, 129.2, 129.3, 129.7, 133.4, 134.6, 138.7, 144.9, 150.0, 152.4; IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 3029, 2923, 1643, 1592, 1362, 1288, 1248, 1171, 1101$ . m.p.: 133 - 134  $^\circ\text{C}$ . HRMS (EI-TOF) calc.  $\text{C}_{23}\text{H}_{22}\text{N}_2\text{O}_2\text{S}_2$ : 422.5868. Found: 422.1197.

(Z)-N-(5-o-tolyl-3-tosylthiazolidin-2-ylidene)aniline



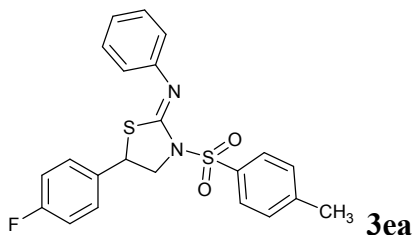
The title compound was a white solid,  $^1\text{H-NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  = 2.35 (3 H, s), 2.49 (3 H, s), 4.09 (1 H,  $J$  = 8.4 Hz, q), 4.55 (1 H,  $J$  = 6.4 Hz, q), 5.02 (1 H,  $J$  = 6.4 Hz, q), 6.77 (1 H,  $J$  = 7.2 Hz, d), 7.05 (1 H, t), 7.15 (3 H, m), 7.21 (4 H, m), 7.34 (2 H, m), 7.44 (1 H, m), 8.05 (2 H,  $J$  = 9.2 Hz, d);  $^{13}\text{C-NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 19.6, 21.8, 43.2, 55.8, 60.5, 120.9, 124.4, 126.6, 126.9, 128.5, 129.1, 129.4, 130.9, 134.6, 136.2, 145.0, 150.2. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu$  = 3029, 2925, 1735, 1641, 1358, 1169, 1095. m.p.: 147-148 °C. HRMS (EI-TOF) calc.  $\text{C}_{23}\text{H}_{22}\text{N}_2\text{O}_2\text{S}_2$ : 422.5868. Found: 422.1197.

(Z)-N-(5-methyl-5-phenyl-3-tosylthiazolidin-2-ylidene)aniline



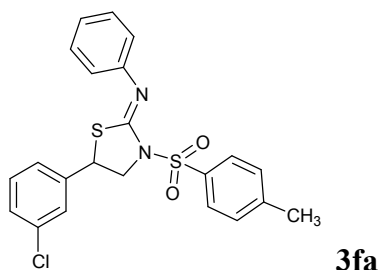
The title compound was a white solid,  $^1\text{H-NMR}$  (300 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 1.89 (3 H, s), 2.46 (3 H, s), 4.37 (2 H,  $J$  = 10.2 Hz, q), 6.75 (2 H,  $J$  = 7.5 Hz, d), 7.07 (1 H,  $J$  = 8.1 Hz, t), 7.30 (10 H, m), 7.93 (2 H,  $J$  = 8.1 Hz, d);  $^{13}\text{C-NMR}$  (75 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.8, 29.8, 55.2, 61.8, 120.9, 124.4, 126.0, 127.2, 128.1, 128.4, 128.8, 128.9, 129.1, 129.2, 134.9, 134.9, 141.8, 144.9, 150.1, 151.9; IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu$  = 2925, 1642, 1592, 1362, 1171, 1087, 662. m. p.: 103 - 104 °C; HRMS (EI-TOF) calc.  $\text{C}_{23}\text{H}_{22}\text{N}_2\text{O}_2\text{S}_2$ : 422.5868. Found: 422.1197.

(Z)-N-(5-(4-fluorophenyl)-3-tosylthiazolidin-2-ylidene)aniline



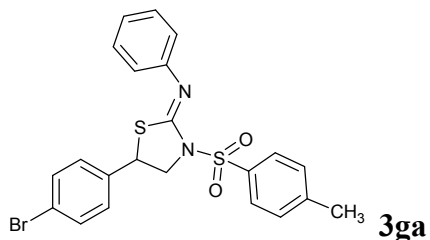
The title compound was a white solid,  $^1\text{H-NMR}$ (300MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm)=2.45 (3H, s), 4.02 (1 H,  $J = 8.4$  Hz, q), 4.54 (1 H,  $J = 6.3$  Hz, q), 4.74 (1 H,  $J = 6.9$  Hz, t), 6.77 ( 2 H,  $J = 7.2$  Hz, d), 7.02 (3 H, m), 7.31 (6 H, m), 7.97 (2 H,  $J = 8.1$  Hz, d).  $^{13}\text{C-NMR}$  (75 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.8, 46.3, 56.9, 115.9, 116.3, 120.8, 124.5, 129.1, 129.3, 129.3, 129.4, 129.4, 132.6, 124.7, 145.1, 150.1, 151.9, 161.2, 164.4; IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 3066, 2981, 1735, 1643, 1593, 1510, 1362, 1289, 1171, 1102, 763$ . m. p.: 119 - 120  $^\circ\text{C}$ . HRMS (EI-TOF) calc.  $\text{C}_{22}\text{H}_{19}\text{FN}_2\text{O}_2\text{S}_2$ : 426.5269. Found: 426.0944.

(Z)-N-(5-(3-chlorophenyl)-3-tosylthiazolidin-2-ylidene)aniline



The title compound was a white solid,  $^1\text{H-NMR}$  (300 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 2.48 (3 H, s), 4.04 (1 H,  $J = 8.1$  Hz, q), 4.58 (1 H,  $J = 6.1$  Hz, q), 4.74 (1 H,  $J = 6.6$  Hz, t), 6.78 (2 H,  $J = 7.8$  Hz, d), 7.07 (1 H,  $J = 7.2$  Hz, t), 7.30 (8 H, m), 7.96 (2 H,  $J = 7.8$  Hz, d).  $^{13}\text{C-NMR}$  (75 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 22.5, 46.3, 56.7, 120.8, 124.56, 125.9, 127.7, 129.1, 129.1, 129.3, 129.4, 130.5, 134.6, 135.0, 139.0, 145.2, 150.1. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 3061, 2927, 1735, 1643, 1592, 1491, 1368, 1293, 1170, 1098$ . m. p.: 125 - 127  $^\circ\text{C}$ . HRMS (EI-TOF) calc.  $\text{C}_{22}\text{H}_{19}\text{ClN}_2\text{O}_2\text{S}_2$ : 442.9815. Found: 442.0649.

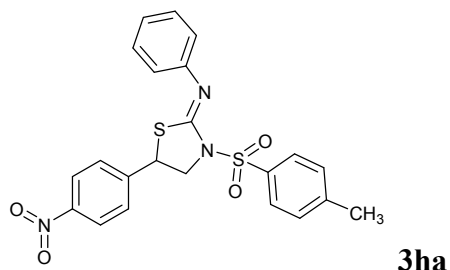
(Z)-N-(5-(4-bromophenyl)-3-tosylthiazolidin-2-ylidene)aniline



The title compound was a white solid,  $^1\text{H-NMR}$  (300 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 2.48 (3 H, s), 4.03 (1 H,  $J = 8.1$  Hz, q), 4.55 (1 H,  $J = 8.8$  Hz, q), 4.72 (1 H,  $J = 8.8$  Hz, t), 6.78 (2 H,  $J = 7.2$  Hz, d), 7.07 (1 H,  $J = 7.8$  Hz, t), 7.24 (4 H, m), 7.35 (m,  $J =$

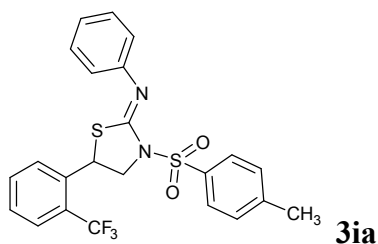
7.8 Hz, d), 7.44 (2 H,  $J = 7.8$  Hz, d), 7.96 (2 H,  $J = 8.2$  Hz, d);  $^{13}\text{C}$ -NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.8, 46.3, 56.7, 120.8, 122.8, 124.5, 129.1, 129.2, 129.4, 132.2, 134.5, 135.9, 145.2, 150.0, 151.8. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 3063, 2925, 1644, 1592, 1488, 1170, 1099, 908$ . m. p.: 137 - 138 °C. HRMS (EI-TOF) calc.  $\text{C}_{22}\text{H}_{19}\text{N}_2\text{O}_2\text{S}_2$ : 487.4325. Found: 486.0144.

(Z)-N-(5-(4-nitrophenyl)-3-tosylthiazolidin-2-ylidene)aniline



The title compound was a yellow solid,  $^1\text{H}$ -NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 2.48 (3 H, s), 4.15 (1 H,  $J = 6.9$  Hz, q), 4.58 (1 H,  $J = 6.6$  Hz, q), 4.84 (1 H,  $J = 6.6$  Hz, t), 6.78 (2 H,  $J = 7.2$  Hz, d), 7.08 (1 H,  $J = 7.5$  Hz, t), 7.26 (2 H, m), 7.36 (2 H,  $J = 7.4$  Hz, d), 7.50 (2 H,  $J = 8.7$  Hz, q), 7.68 (2 H,  $J = 8.1$  Hz, d), 7.97 (2 H,  $J = 8.4$  Hz, d).  $^{13}\text{C}$ -NMR (75 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.8, 45.8, 56.2, 120.69, 124.0, 124.3, 124.7, 127.0, 128.6, 129.2, 129.4, 129.9, 134.4, 144.8, 145.8, 145.4, 147.9, 149.8, 151.04. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 2924, 1644, 1592, 1348, 1170, 1101$ . m.p.: 177-179 °C; HRMS (EI-TOF) calc.  $\text{C}_{22}\text{H}_{19}\text{N}_3\text{O}_4\text{S}_2$ : 453.5310. Found: 452.4719.

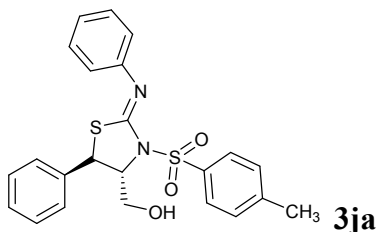
(Z)-N-(3-tosyl-5-(2-(trifluoromethyl)phenyl)thiazolidin-2-ylidene)aniline



The title compound was a white solid,  $^1\text{H}$ -NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 2.49 (3 H, s), 4.19 (1 H,  $J = 6$  Hz, q), 4.52 (1 H,  $J = 6.4$  Hz, q), 5.14 (1 H,  $J = 1.6$  Hz, t), 6.79 (2 H,  $J = 7.2$  Hz, d), 7.05 (1 H,  $J = 7.2$  Hz, t), 7.27 (2 H, m), 7.36 (2 H,  $J = 8$  Hz, d), 7.42 (2 H, m), 7.56 (1 H,  $J = 4$  Hz, d), 7.64 (1 H,  $J = 8$  Hz, d), 7.89 (2 H,  $J = 8.4$  Hz, d).  $^{13}\text{C}$ -NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.9, 41.5, 41.5, 56.8, 120.8,

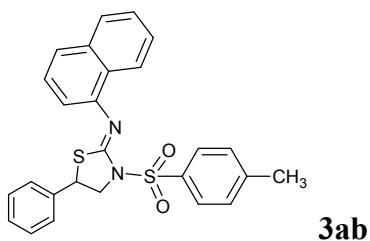
122.8, 124.6, 126.2, 126.3, 128.2, 128.5, 128.7, 128.9, 129.1, 132.1, 132.2, 132.3, 132.9, 134.7, 136.9, 145.2, 150.0. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 3058, 2927, 1736, 1638, 1592, 1312, 1166, 1101$ . m. p.: 160 - 161°C. HRMS (EI-TOF) calc.  $\text{C}_{22}\text{H}_{19}\text{N}_3\text{O}_4\text{S}_2$ : 476.5344, Found: 476.0913.

((4R, 5S, Z)-5-phenyl-2-(phenylimino)-3-tosylthiazolidin-4-yl)methanol



The title compound was a light yellow oil,  $^1\text{H-NMR}$  (300 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 2.48 (3 H, s), 3.76 (2 H, m), 5.03 (1 H,  $J = 5.1$  Hz, d), 5.18 (1 H,  $J = 6.3$  Hz, d), 6.78 (2 H,  $J = 7.5$  Hz, d), 7.08 (1 H,  $J = 7.5$  Hz, t), 7.28 (2 H,  $J = 7.8$  Hz, t), 7.74 (7 H, m), 8.07 (2 H,  $J = 7.8$  Hz, d).  $^{13}\text{C-NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.7, 51.5, 61.2, 65.9, 120.7, 124.4, 127.6, 127.8, 128.2, 128.7, 129.0, 129.2, 129.3, 129.3, 129.8, 132.7, 136.1, 144.8, 149.9, 151.5; IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 3519, 3064, 3031, 2925, 2250, 1937, 1642, 1592, 1489, 1450, 1384, 1306, 1237, 1167, 1106, 1089, 909, 813, 764, 732, 697, 663, 596, 544$ . m. p.: 177 - 178 °C; HRMS (EI-TOF) calc.  $\text{C}_{23}\text{H}_{22}\text{N}_2\text{O}_3\text{S}_2$ : 438.5624. Found: 438.1144.

(Z)-N-(naphthalen-1-yl)-5-phenyl-3-tosylthiazolidin-2-imine

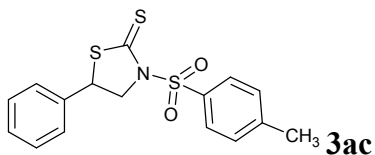


The title compound was a light yellow oil,  $^1\text{H-NMR}$  (300 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 2.49 (3 H, s), 3.76 (2 H, m), 4.16 - 4.21 (1 H,  $J = 9$  Hz, t), 4.68 - 4.71 (1 H,  $J = 9$  Hz, t), 4.79 - 4.83 (1 H,  $J = 8$  Hz, t), 6.83 (1 H,  $J = 6$  Hz, d), 7.31 (9 H, m), 7.44 (2 H, m), 7.47 (1 H,  $J = 6$  Hz, d), 7.55 (1 H,  $J = 6$  Hz, d), 7.62 (1 H,  $J = 6$  Hz, d).  $^{13}\text{C-NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.9, 47.0, 57.0, 114.9, 124.02, 124.6, 125.4, 126.3, 127.6, 127.8, 128.9, 129.2, 129.3, 129.64, 134.2, 135.6, 136.7, 144.9, 146.9,



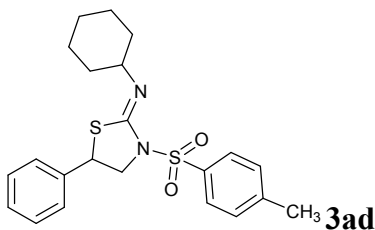
152.5. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 3519, 3064, 3031, 2925, 2250, 1937, 1642, 1592, 1489, 1450, 1384, 1306, 1237, 1167, 1106, 1089, 909, 813, 764, 732, 697, 663, 596, 544$ . m. p.: 177 - 178  $^{\circ}\text{C}$ ; HRMS (EI-TOF) calc.  $\text{C}_{23}\text{H}_{22}\text{N}_2\text{O}_3\text{S}_2$ : 458.5951. Found: 458.1146.

5-phenyl-3-tosylthiazolidine-2-thione



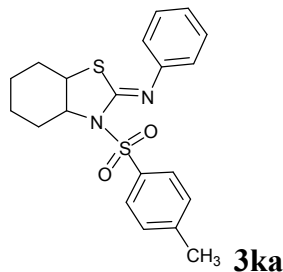
The title compound was a light yellow oil,  $^1\text{H-NMR}$  (300 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) 2.45 (3 H, s), 3.44 (2 H, m), 4.78 (1 H,  $J = 6.3$  Hz, t), 4.87 (1 H,  $J = 6$  Hz, q), 7.31 (7 H, m), 7.72 (2 H,  $J = 6$  Hz, d);  $^{13}\text{C-NMR}$  (75 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.9, 48.8, 63.7, 127.5, 128.6, 128.9, 129.2, 129.4, 129.6, 129.9, 131.1. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 3286, 2925, 1721, 1598, 1494, 1330, 1161$ . HRMS (EI-TOF) calc.  $\text{C}_{16}\text{H}_{15}\text{NO}_2\text{S}_3$ : 349.4810. Found: 349.9874.

(Z)-N-(5-phenyl-3-tosylthiazolidin-2-ylidene)cyclohexanamine

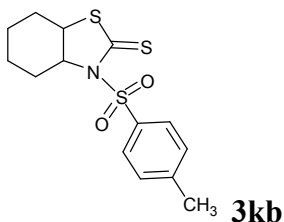


The title compound was a white solid,  $^1\text{H-NMR}$  (300 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 1.39 (5 H, m), 1.63 (5 H, m), 2.44 (3 H, s), 2.79 (1 H, m), 3.87 (1 H,  $J = 9$  Hz, t), 4.46 (1 H,  $J = 6.3$  Hz, q), 4.76 (1 H,  $J = 6.9$  Hz, t), 7.29 (7 H, m), 7.91 (2 H,  $J = 8.1$  Hz, d);  $^{13}\text{C-NMR}$  (75 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.7, 24.5, 25.7, 33.4, 33.6, 46.9, 56.1, 65.5, 127.6, 128.7, 128.9, 129.1, 129.3, 135.1, 137.2, 144.4, 147.2. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 2925, 1639, 1356, 1166, 1100, 661$ . m. p.: 177 - 178  $^{\circ}\text{C}$ . HRMS (EI-TOF) calc.  $\text{C}_{22}\text{H}_{26}\text{N}_2\text{O}_2\text{S}_2$ : 414.5840. Found: 414.1508.

(Z)-N-phenyl-3-tosylhexahydrobenzo[d]thiazol-2(3H)-imine

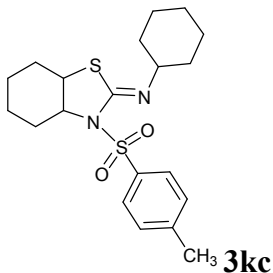


The title compound was a white solid,  $^1\text{H-NMR}$ (400MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 1.50 (4H, m), 1.74 (1H, m), 1.84 (1H, m), 2.02 (2H, m), 2.46 (3H, s), 3.18 (1H, m), 3.64 (1H, m), 6.56(2H,  $J = 8.4\text{Hz}$ , q), 7.05 (1 H, m), 7.23 (3 H, m), 7.32 (2 H,  $J = 8$  Hz, d), 7.90 (2 H,  $J = 7.2$  Hz, d),  $^{13}\text{C-NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.8, 24.6, 25.4, 29.6, 29.8, 32.9, 49.3, 70.7, 120.7, 124.4, 129.0, 129.1, 129.3, 135.5, 144.6, 150.2, 154.9. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 2939, 2862, 1639, 1594, 1320, 1156, 1090, 964, 667, 574$ . m. p.: 126-128  $^\circ\text{C}$ . HRMS (EI-TOF) calc.  $\text{C}_{20}\text{H}_{22}\text{N}_2\text{O}_2\text{S}_2$ : 386.5309. Found: 386.1195.



The title compound was a light yellow oil,  $^1\text{H-NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 1.25 (5 H, m), 1.53 (2 H, m), 1.61 (2 H,  $J = 6.8$  Hz, d), 2.04 (1 H,  $J = 4.8$  Hz, d), 2.42 (1 H, s), 2.49 (3 H, s), 3.38 (1 H, m), 4.82 (1 H,  $J = 4.8$  Hz, d), 4.88 (1 H,  $J = 4.8$  Hz, d), 7.35 (2 H,  $J = 8$  Hz, d), 7.69 (2 H,  $J = 8$  Hz, d);  $^{13}\text{C-NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.7, 23.5, 24.1, 24.5, 28.1, 29.3, 29.7, 29.8, 63.9, 81.2, 83.9, 128.1, 130.0, 132.9, 144.2. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 2939, 2870, 1724, 1598, 1448, 1347, 1165, 983, 669$ . HRMS (EI-TOF) calc.  $\text{C}_{14}\text{H}_{17}\text{NO}_2\text{S}_3$ : 392.5785. Found: 392.1437.

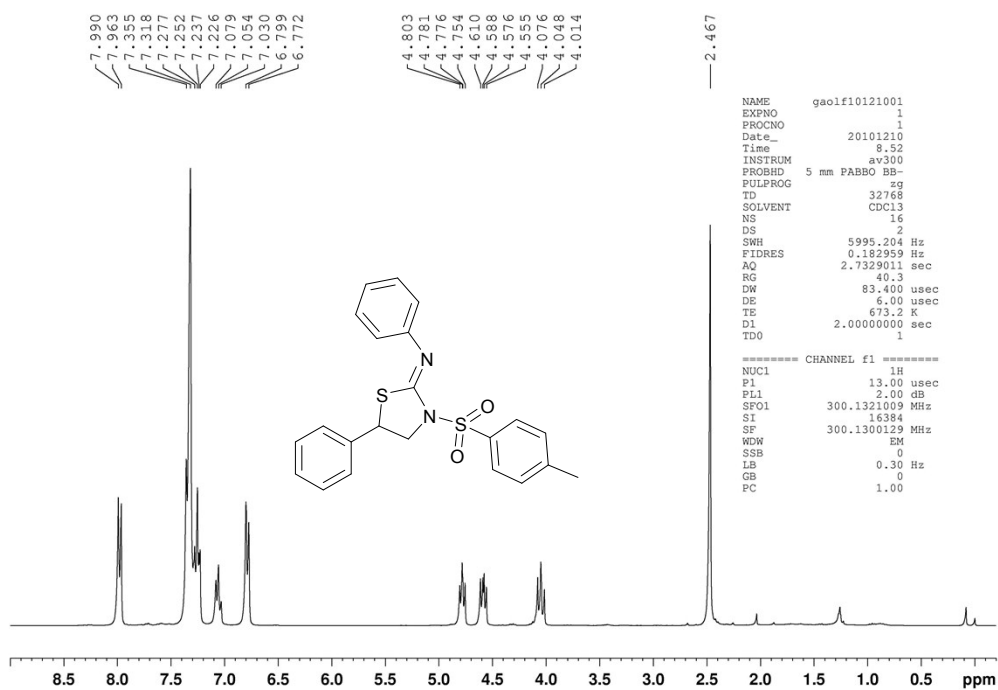
(Z)-N-cyclohexyl-3-tosylhexahydrobenzo[d]thiazol-2(3H)-imine

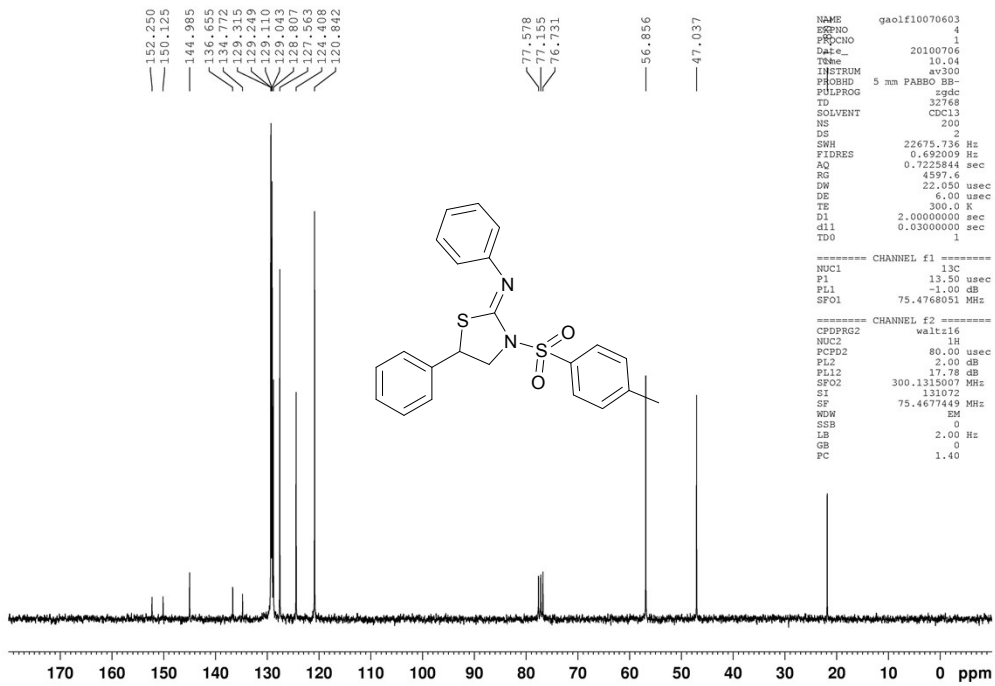


The title compound was a light yellow oil,  $^1\text{H-NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 1.19 (4 H, m), 1.24 (2 H, m), 1.39 (2 H, m), 1.48 (1 H, m), 1.52 (2 H, m), 1.64 (4 H, m), 1.89 (2 H,  $J = 5.2$  Hz, q), 2.41 (3 H, s), 2.75 (1 H, m), 3.14 (1 H, m), 3.19 (1 H, m), 3.49 (1 H, m), 7.26 (2 H,  $J = 8$  Hz, d), 7.83 (2 H,  $J = 8$  Hz, d);  $^{13}\text{C-NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 21.7, 24.5, 24.6, 24.7, 25.7, 29.9, 32.8, 33.3, 49.0, 65.4, 69.6, 128.9, 129.1, 136.0, 143.9, 149.5. IR (liquid film,  $\text{cm}^{-1}$ ):  $\nu = 2930, 2855, 1649, 1448, 1362, 1170, 1085$ . m. p.: 113 - 115°C. HRMS (EI-TOF) calc.  $\text{C}_{20}\text{H}_{28}\text{N}_2\text{O}_2\text{S}_2$ : 392.5785. Found: 392.1661.

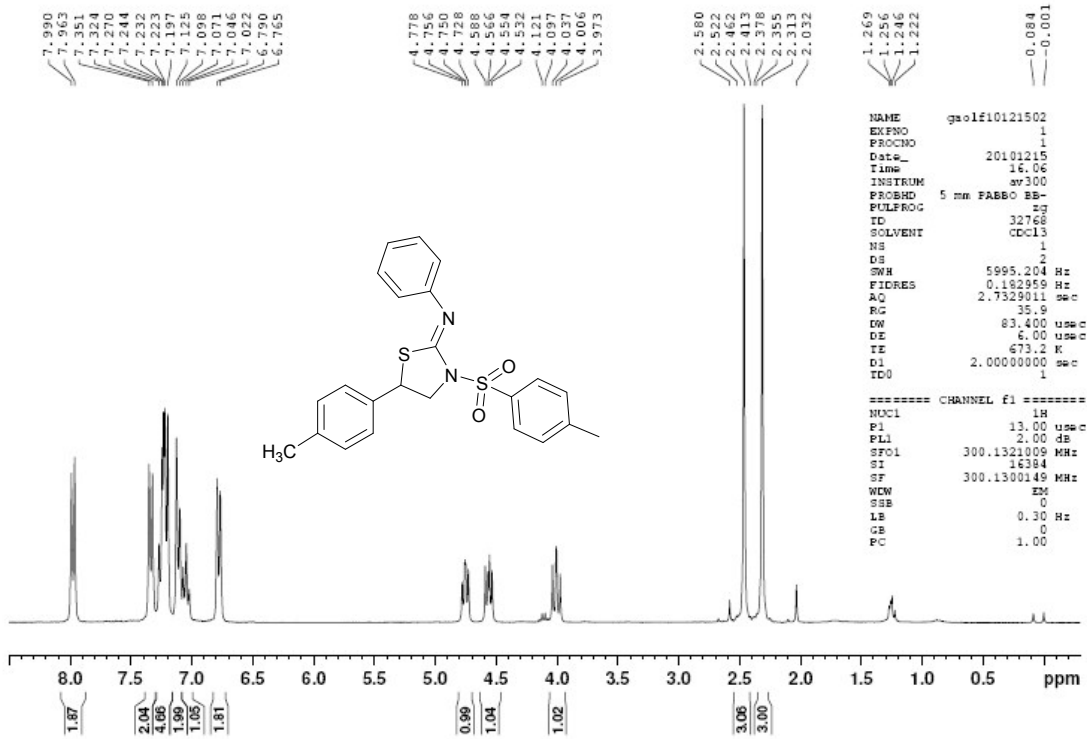
## The spectral data of all products

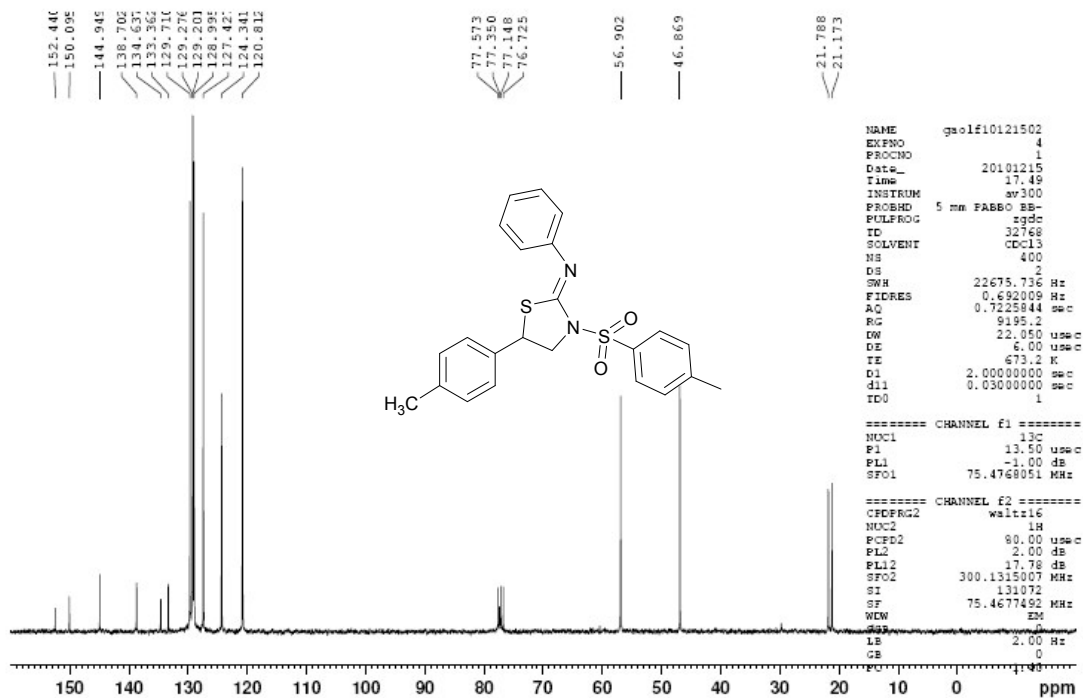
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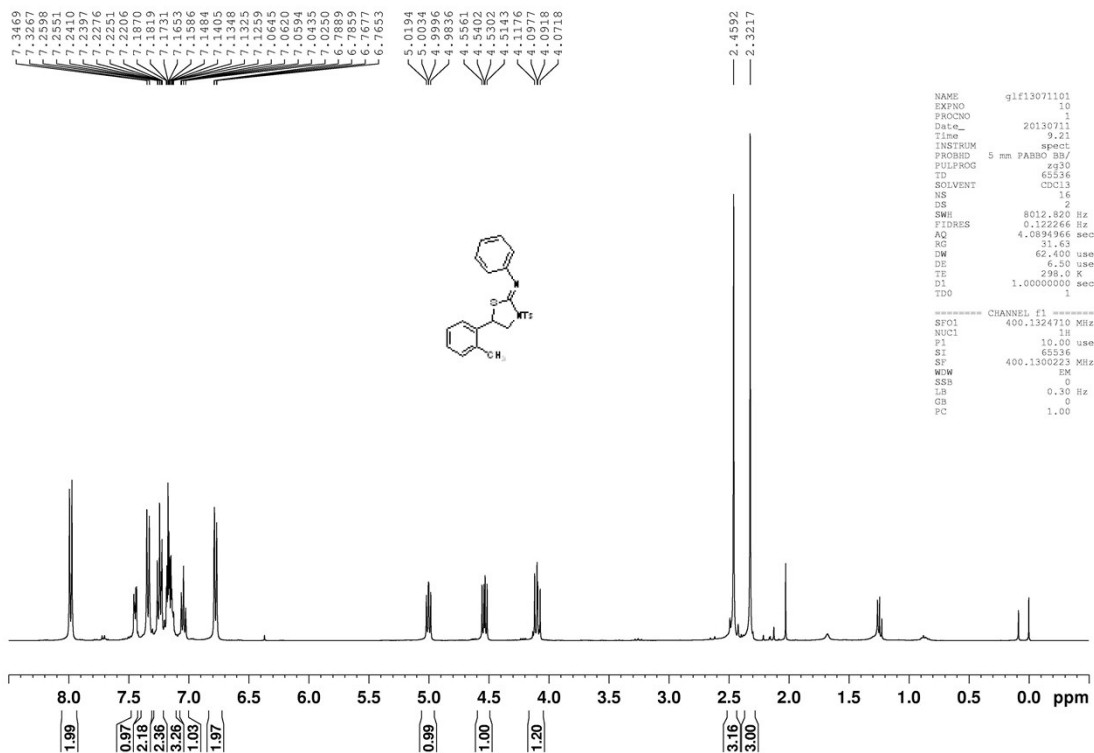


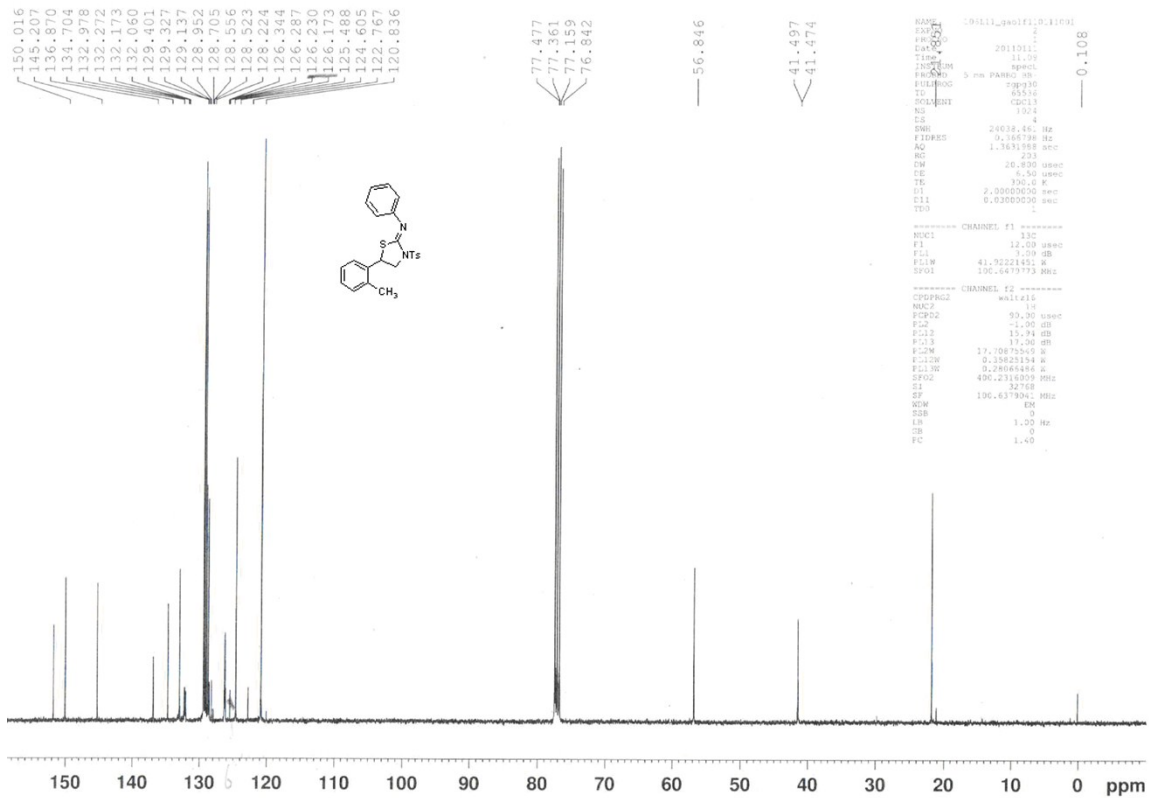
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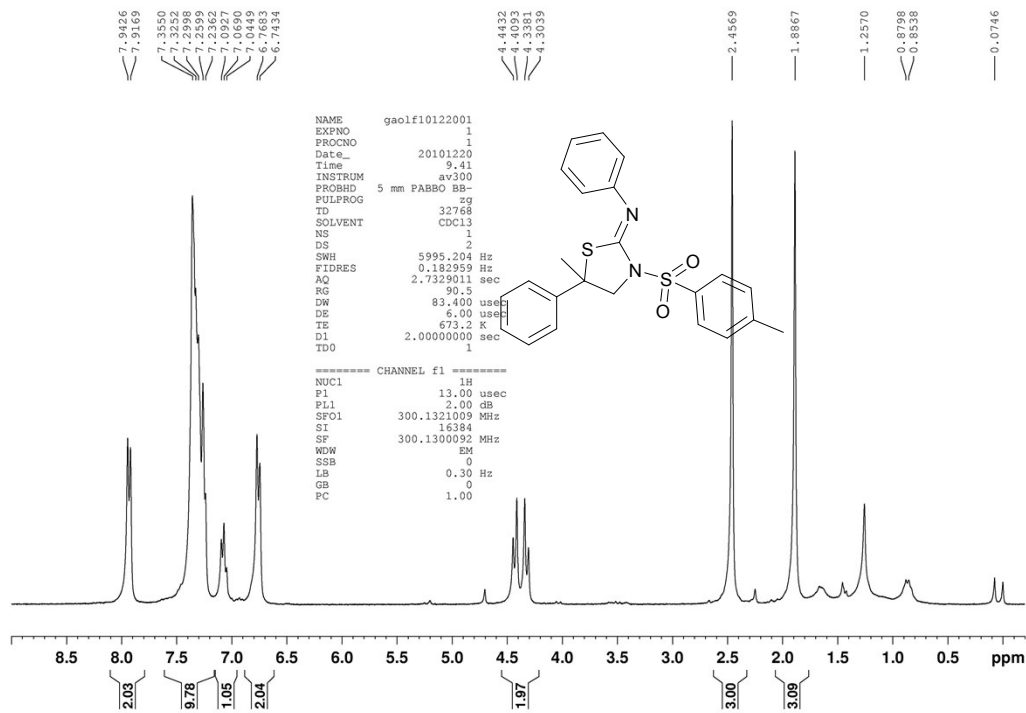


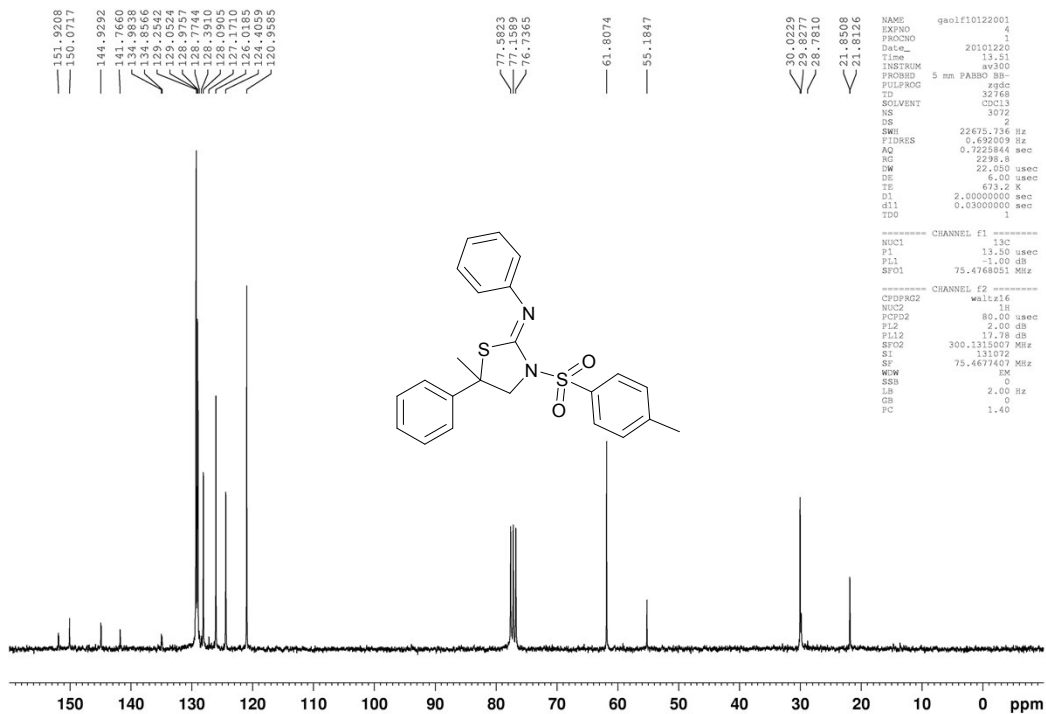
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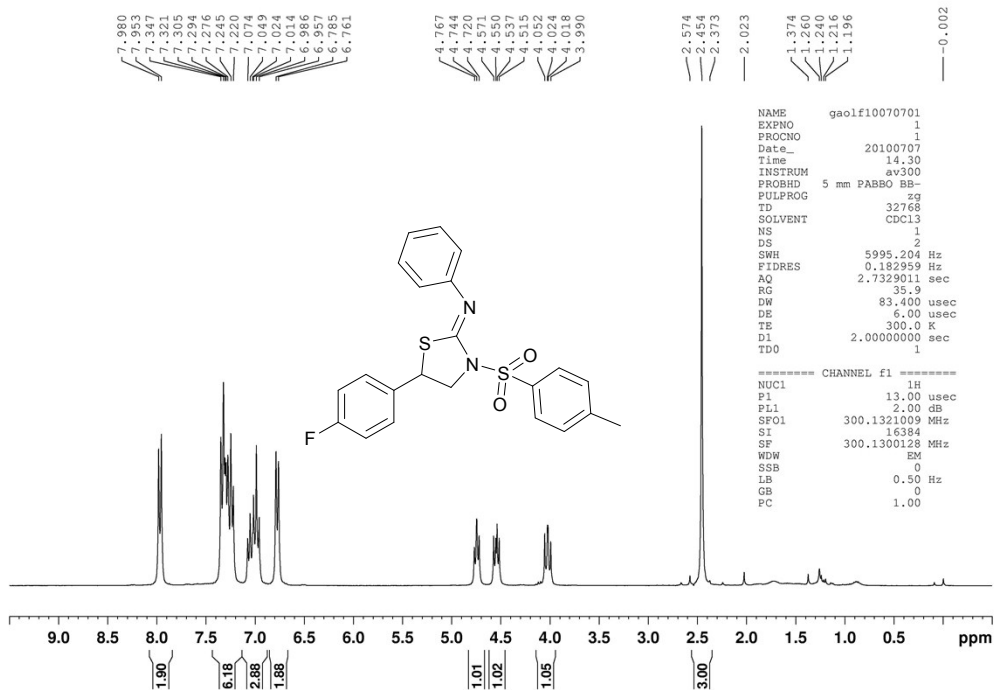


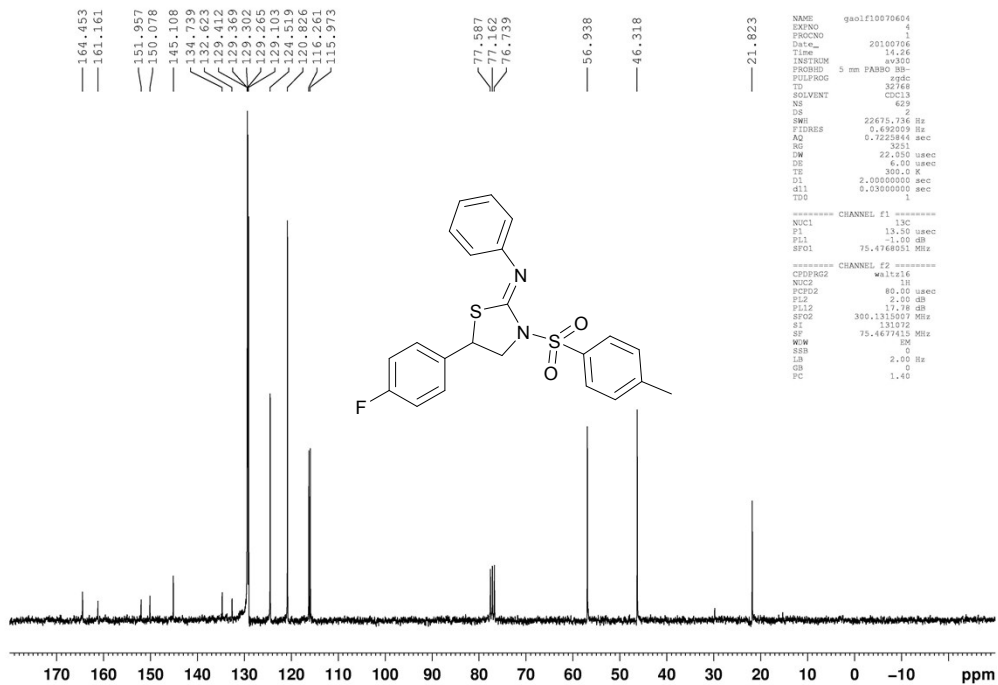
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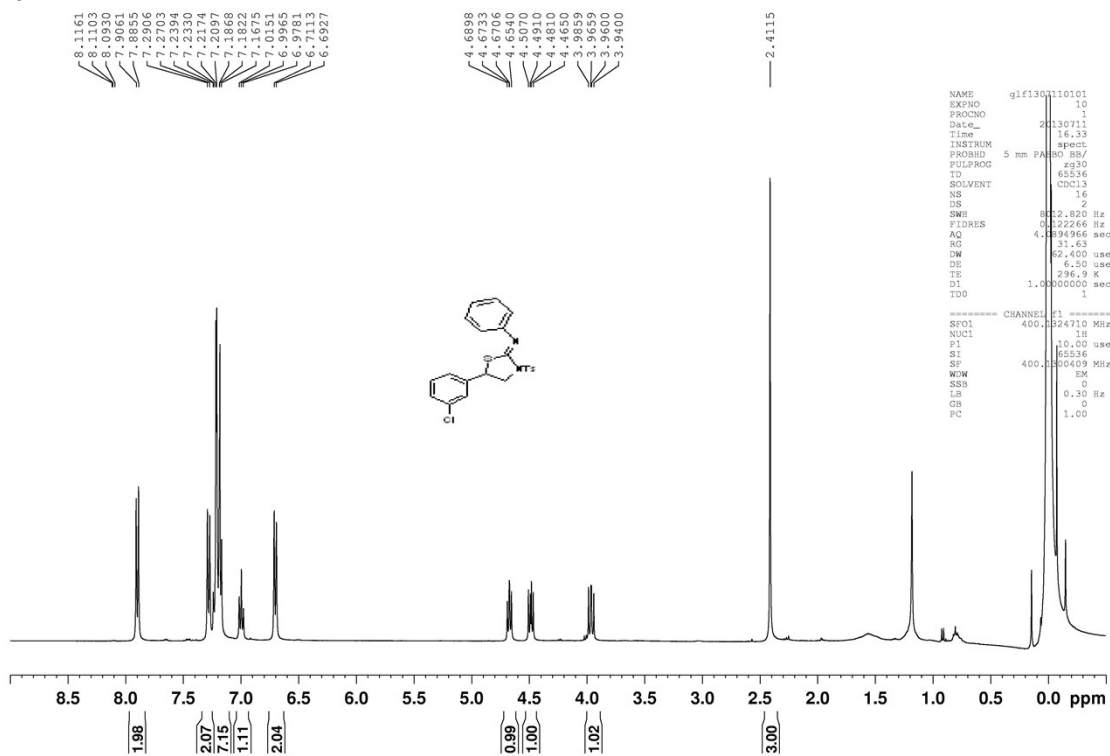


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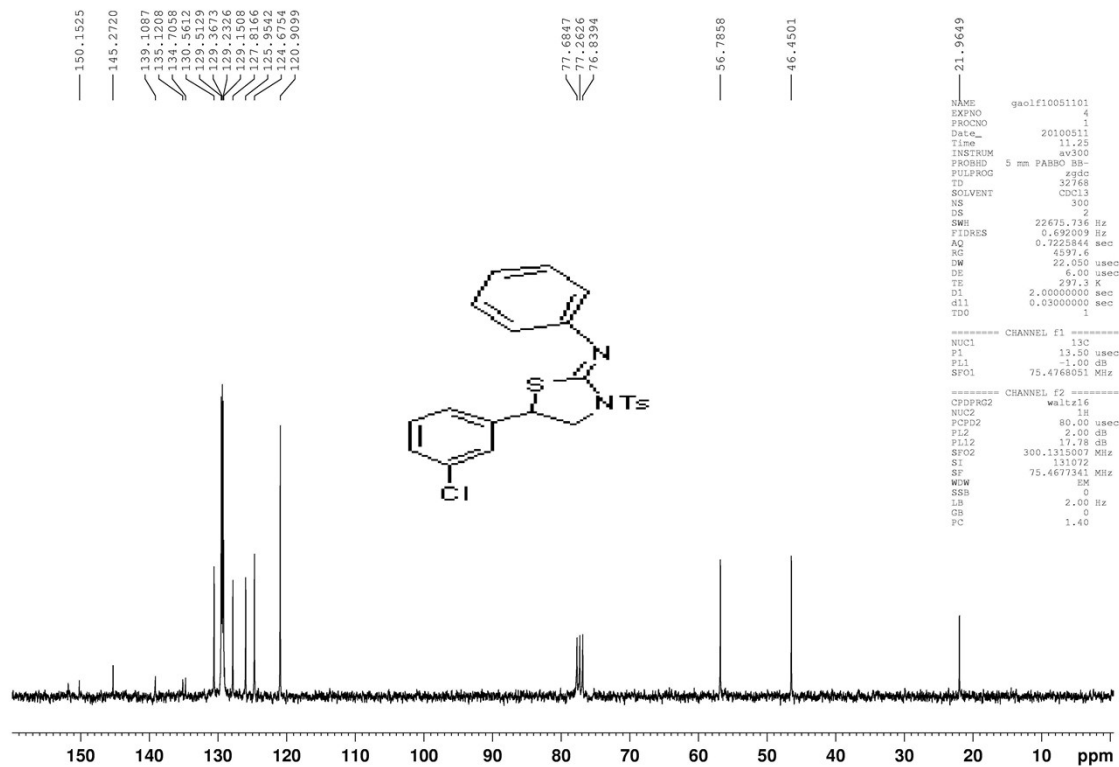




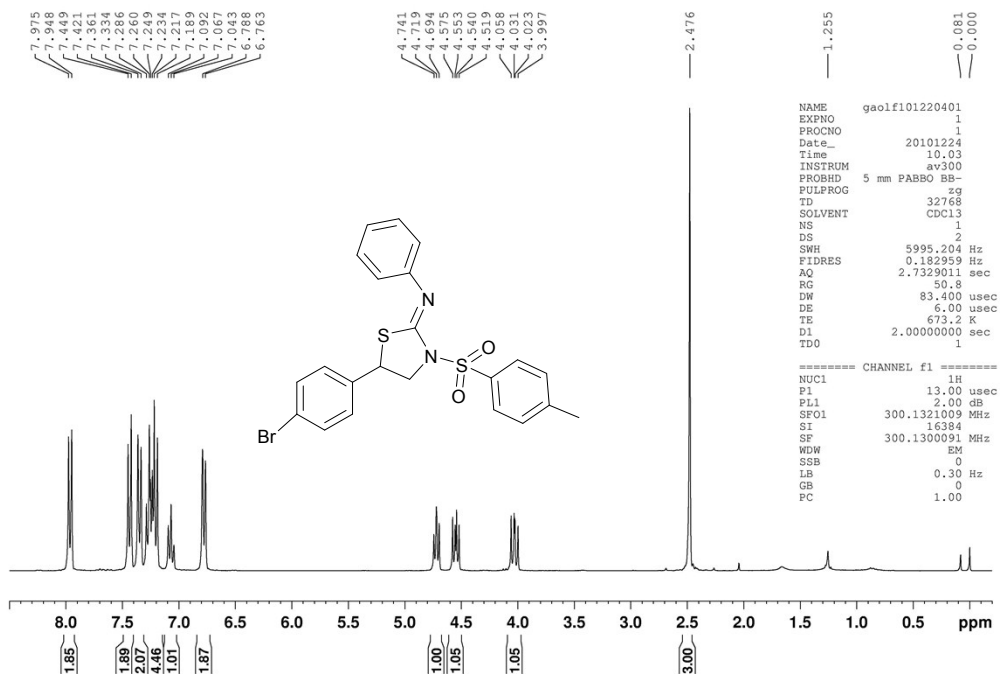
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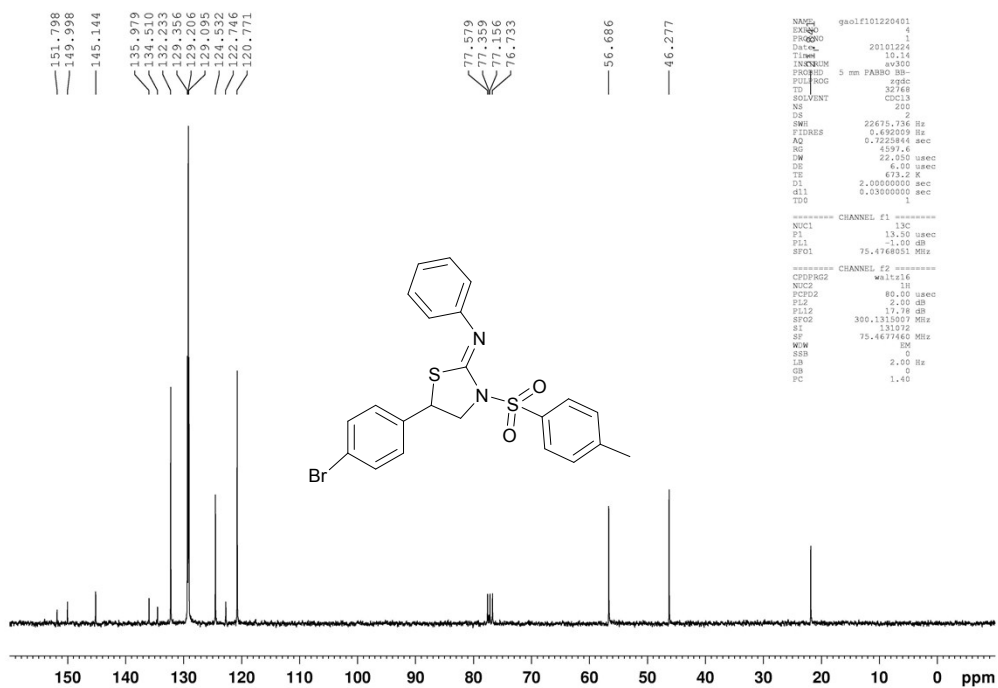




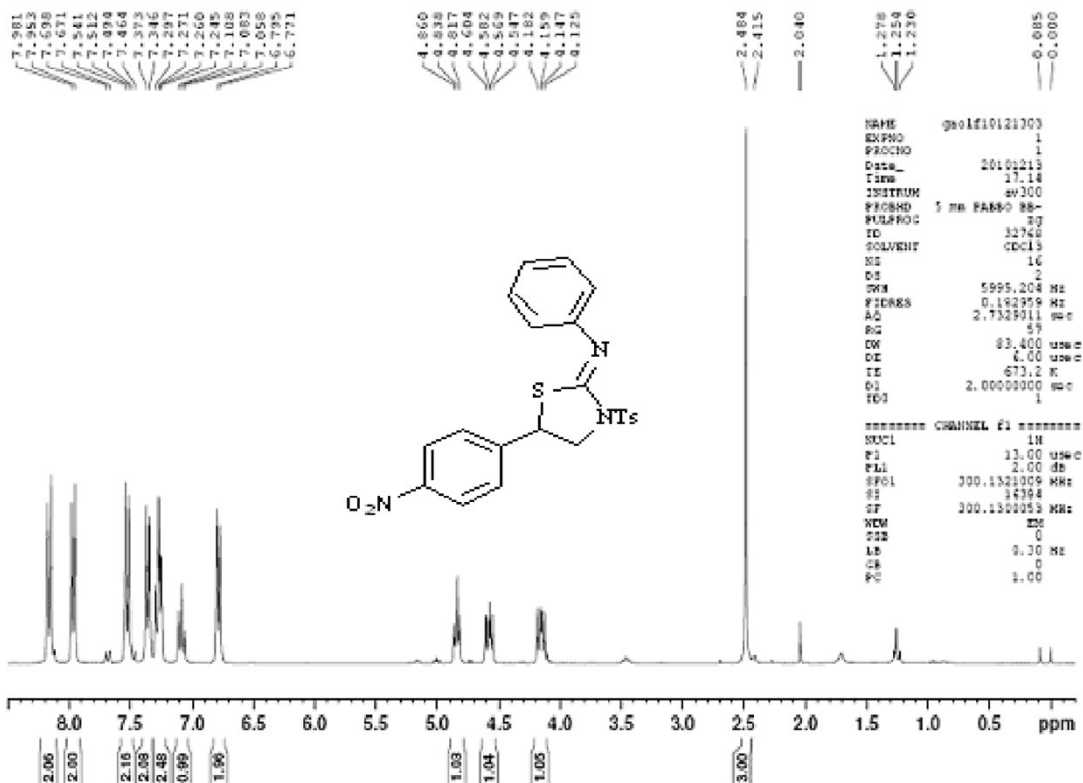


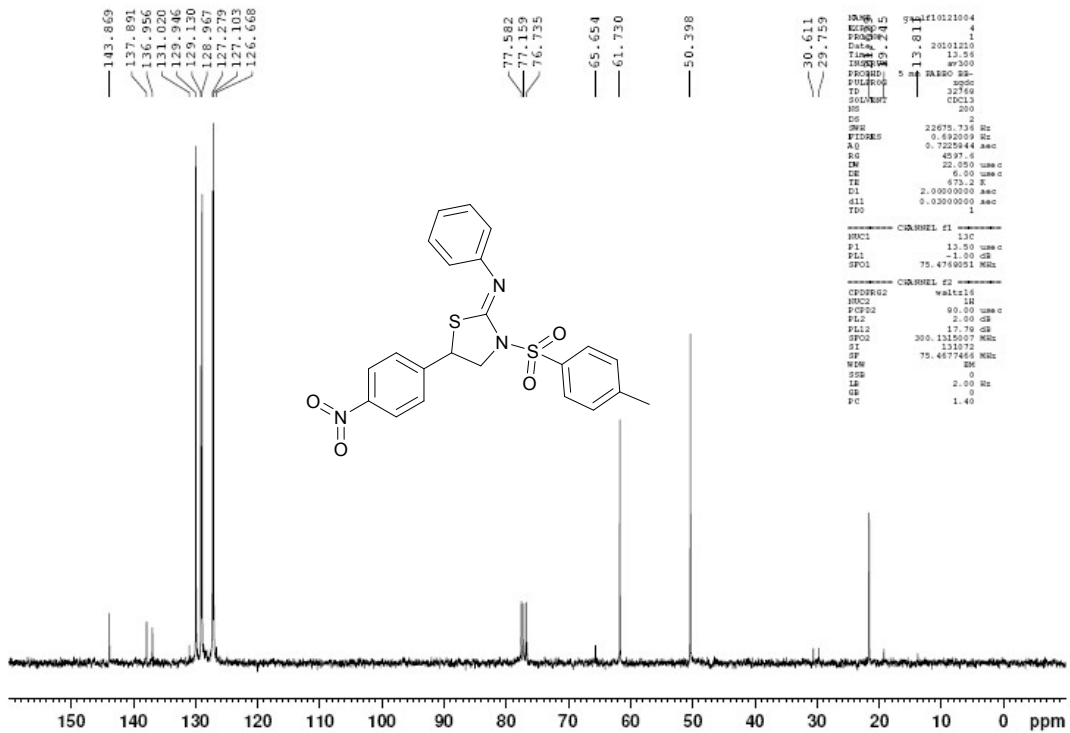
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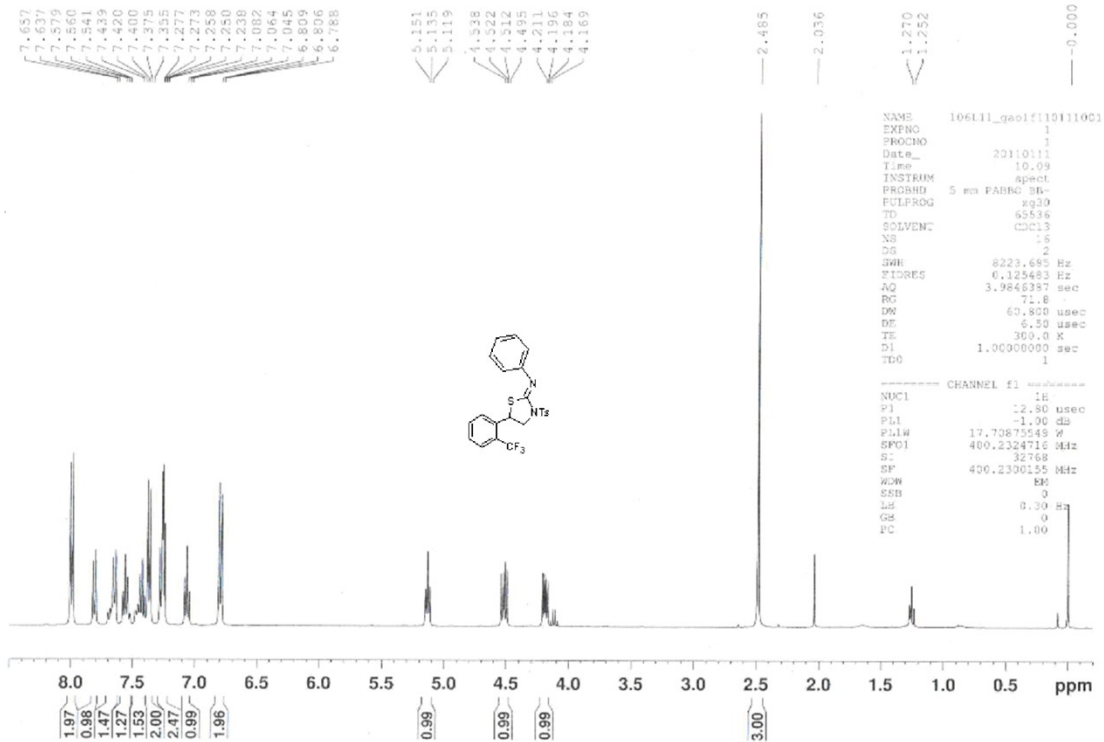


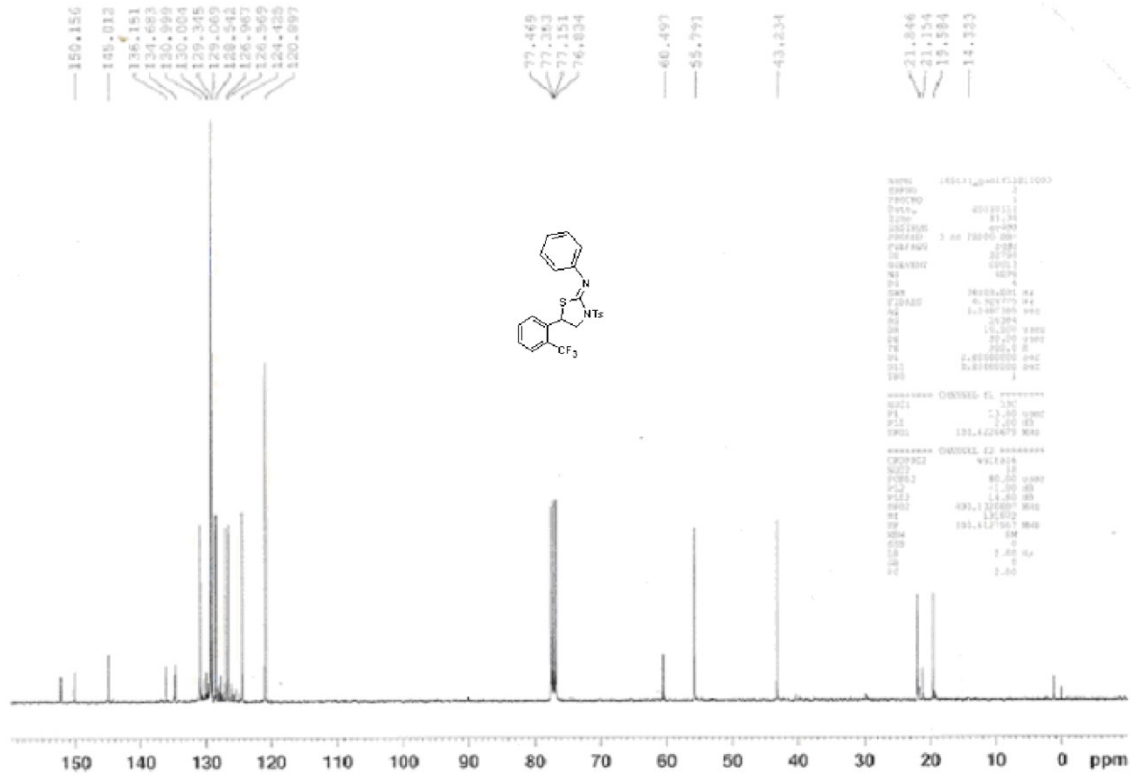
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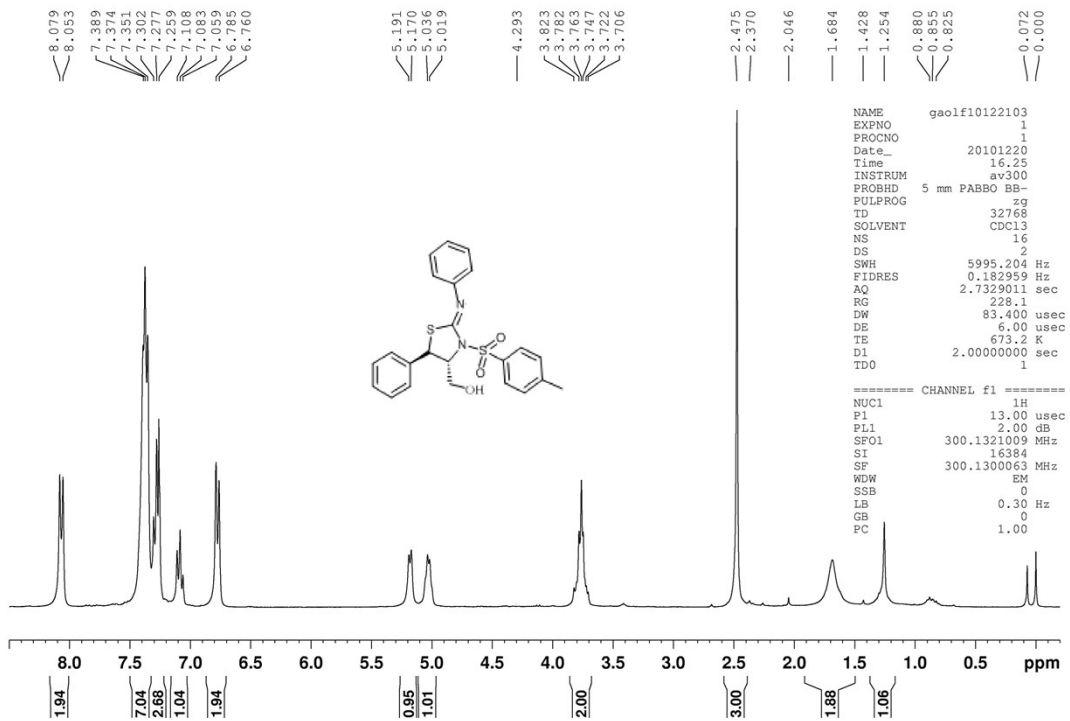


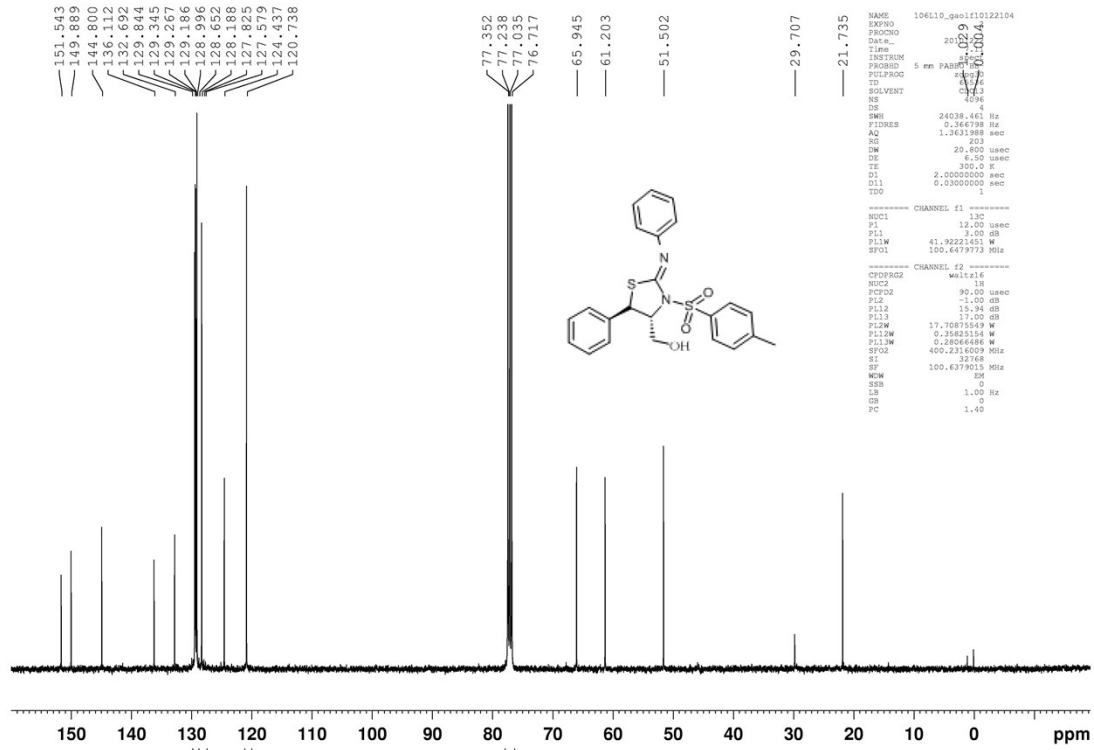
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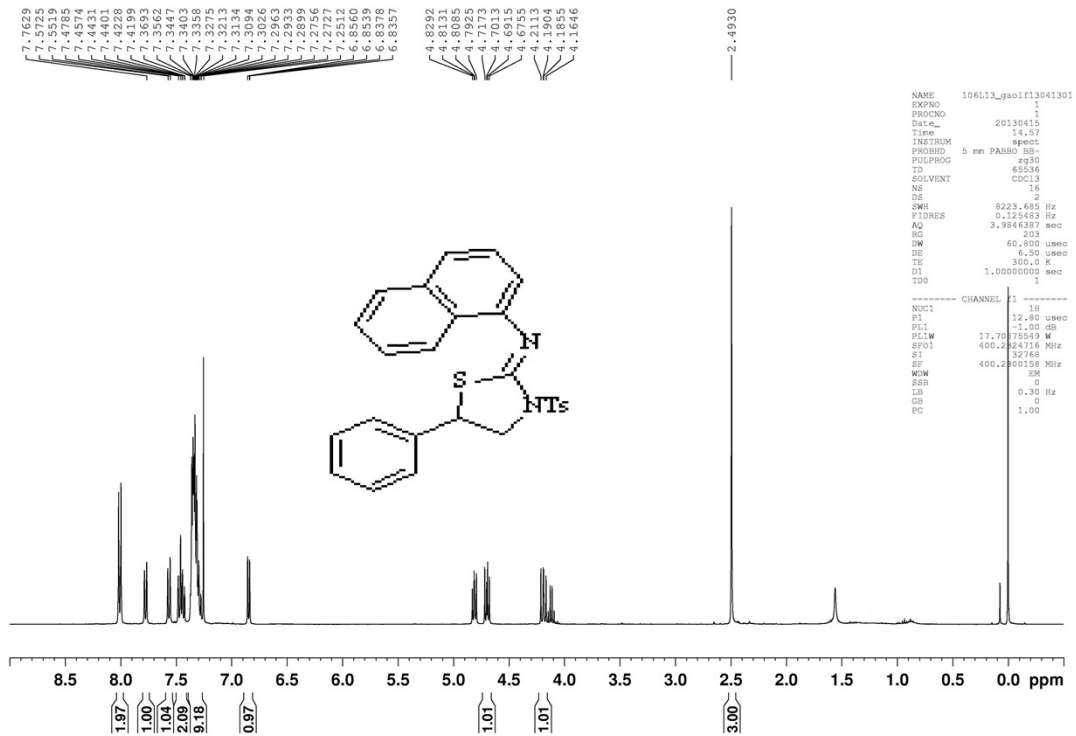


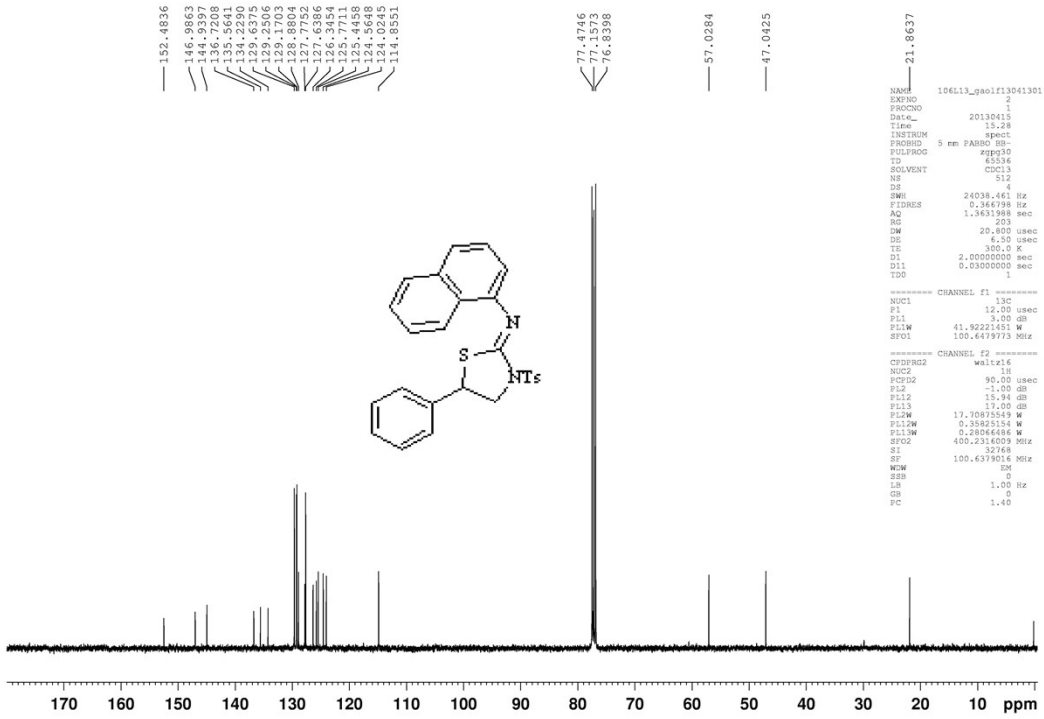
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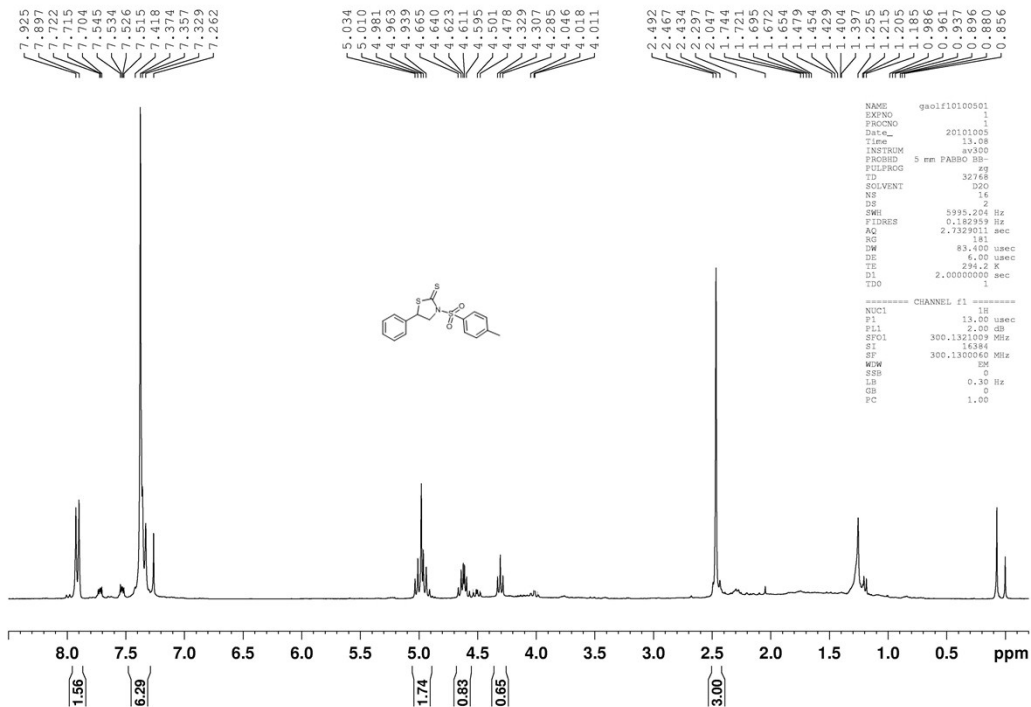


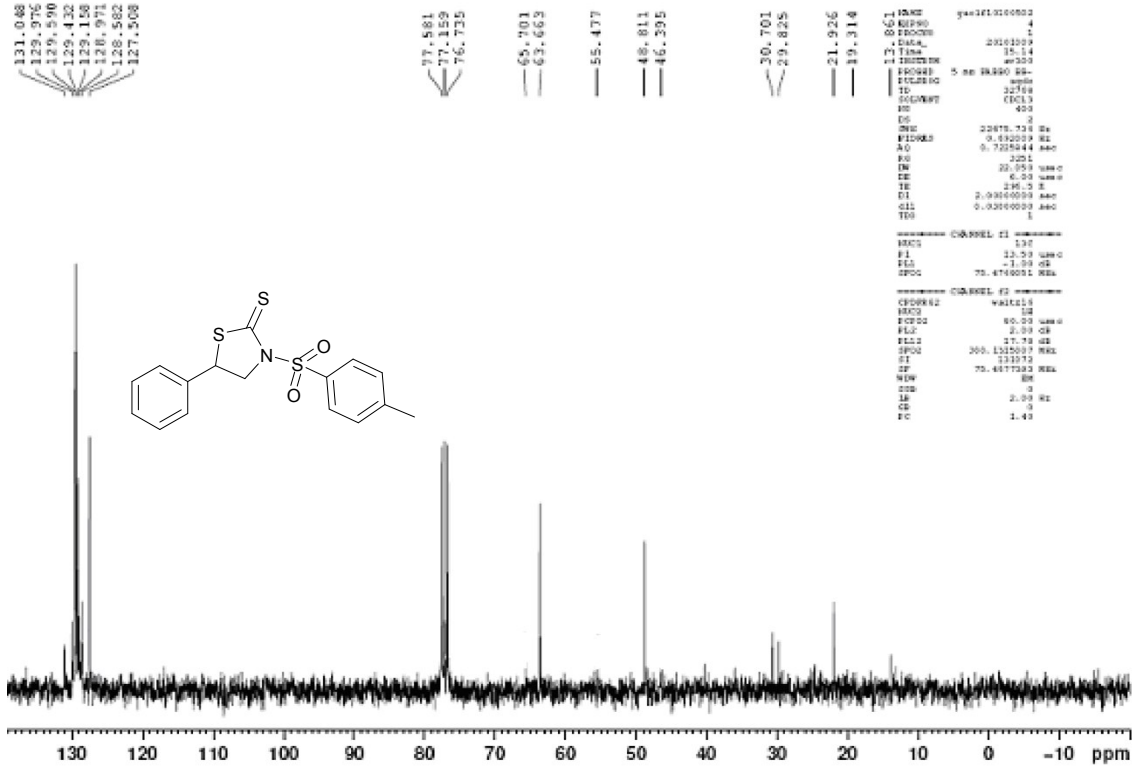
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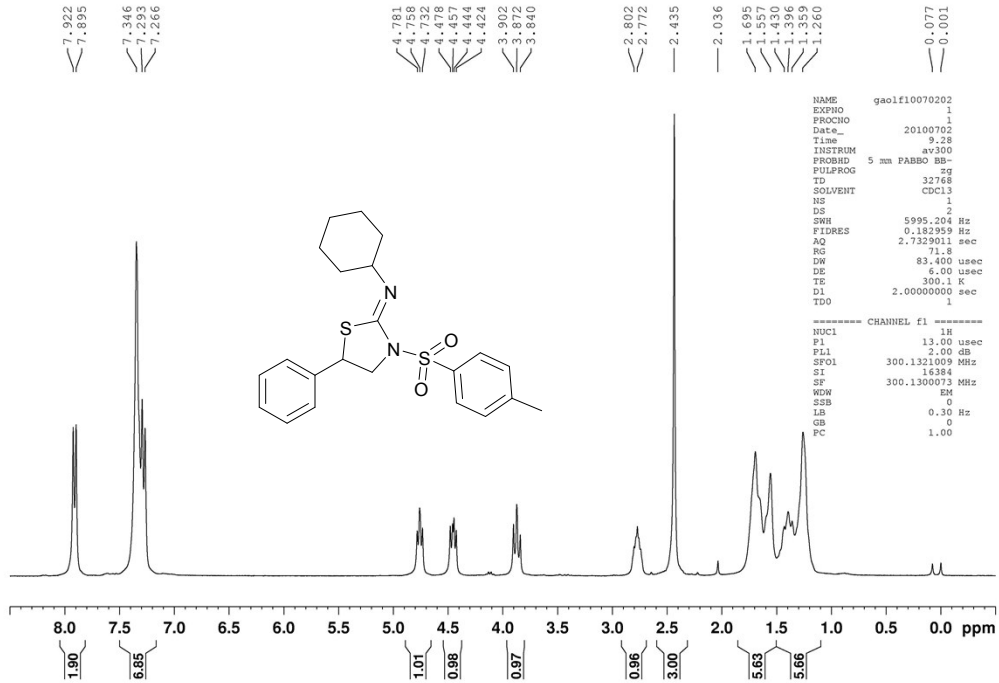


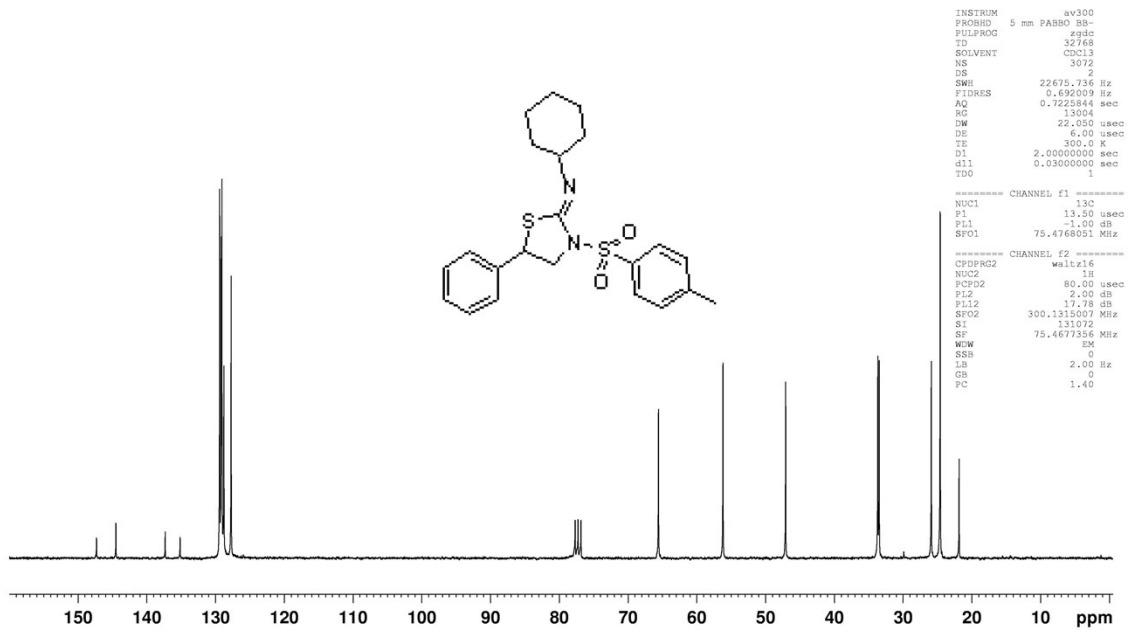
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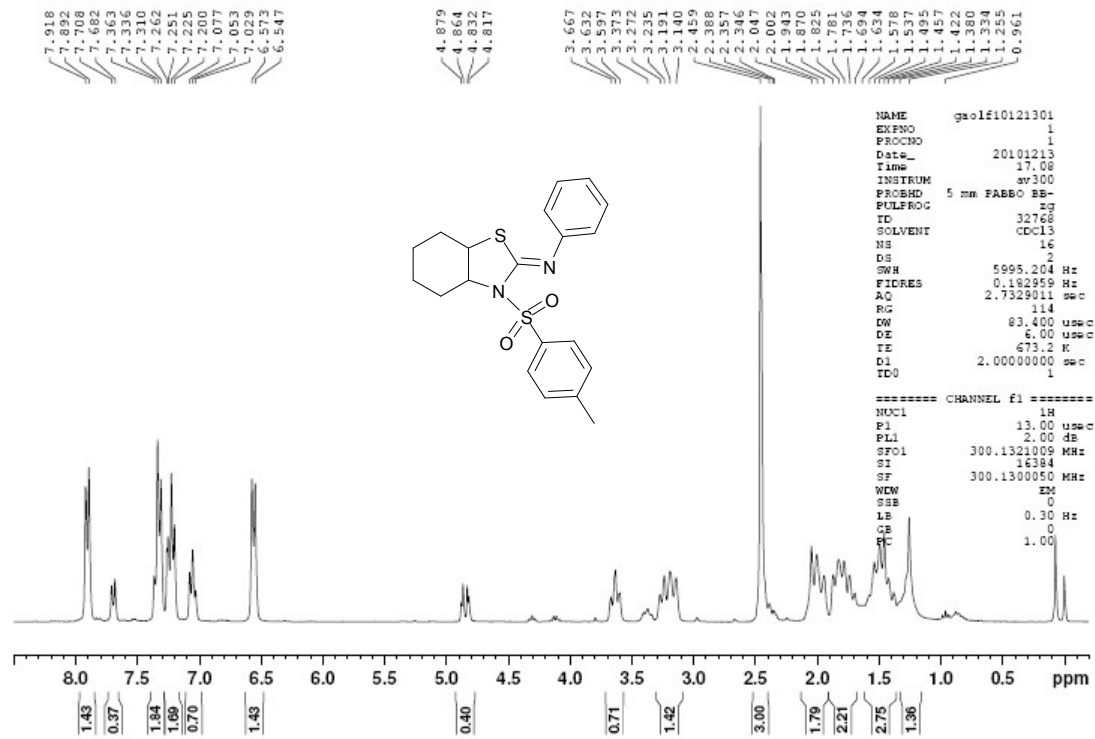


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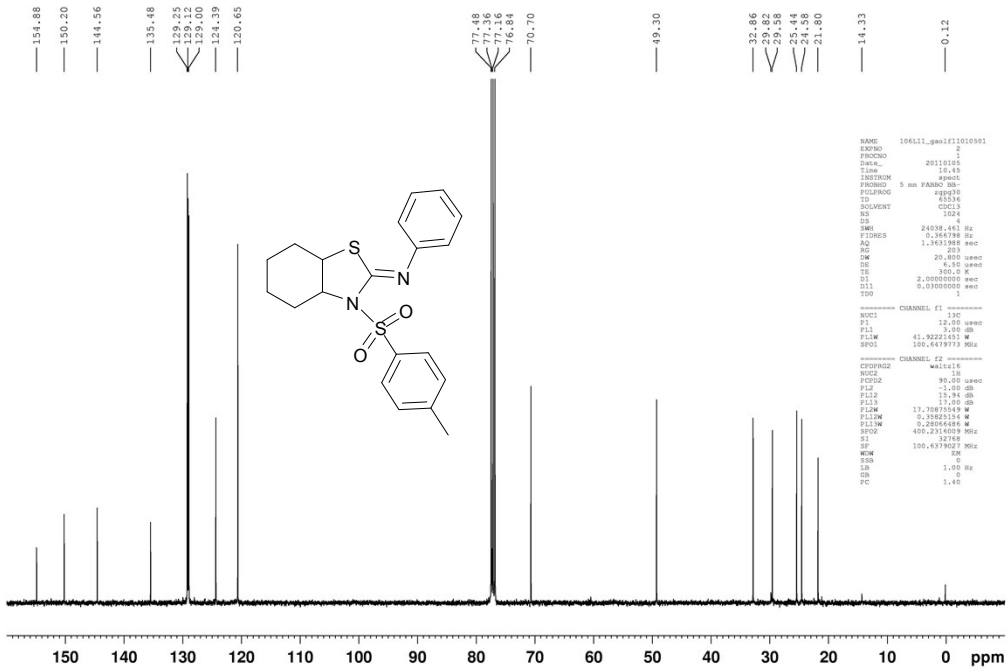




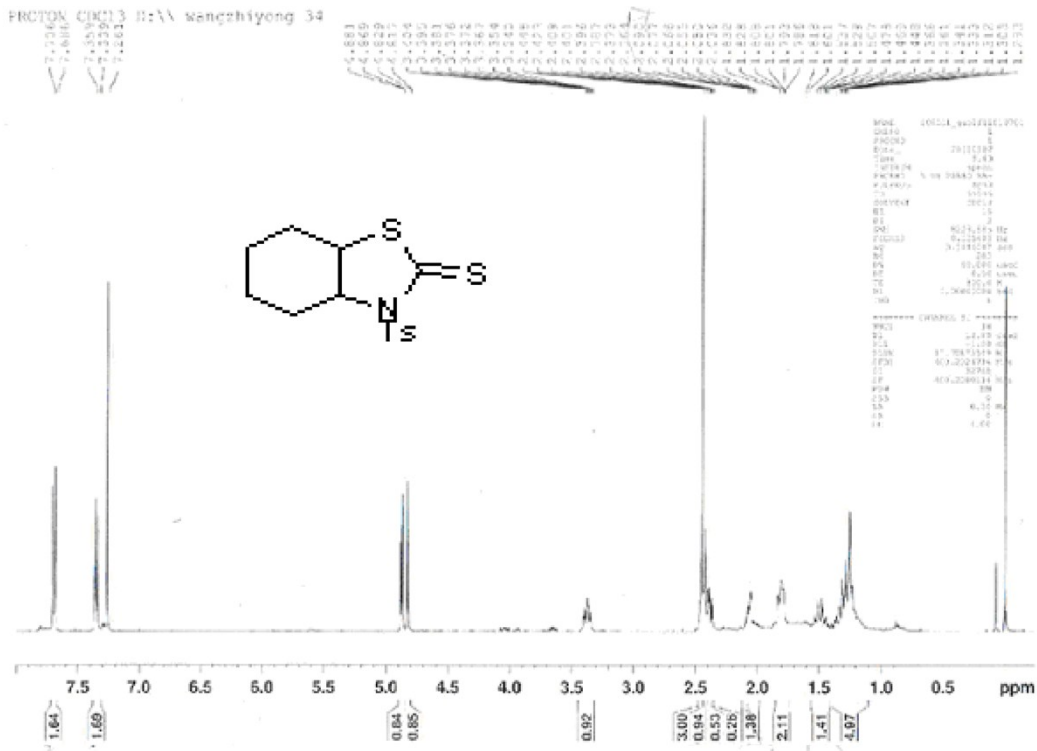
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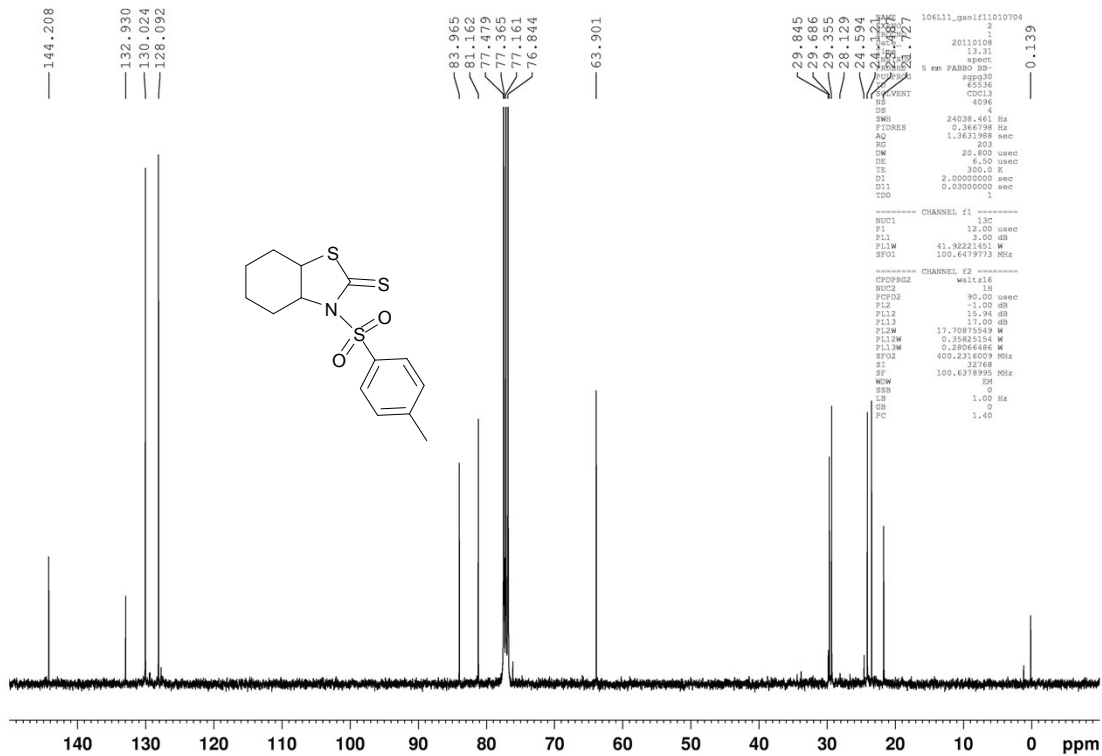




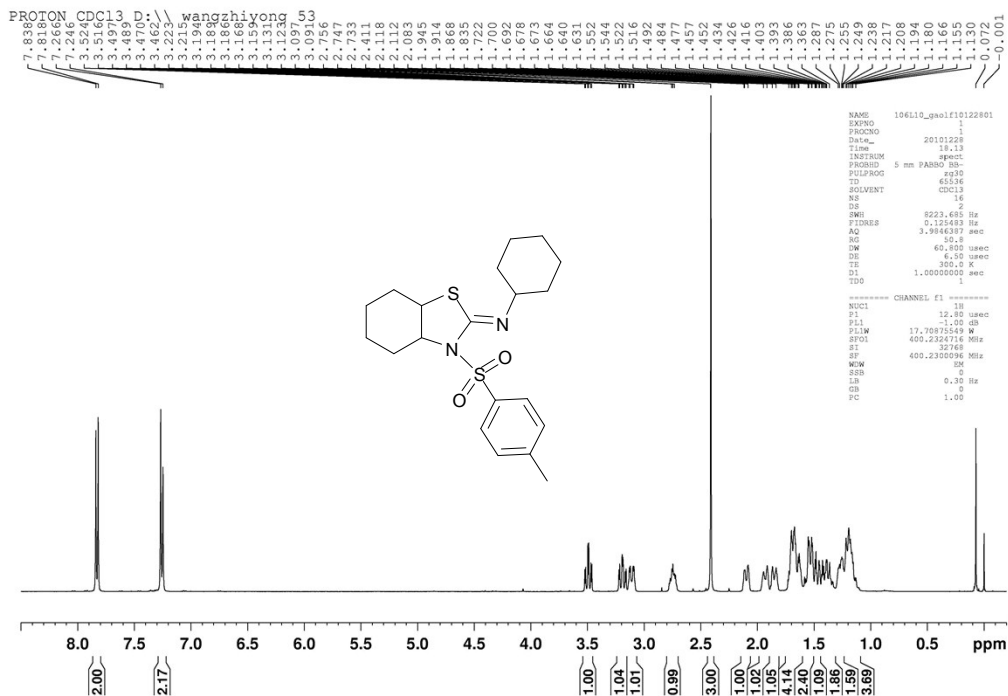


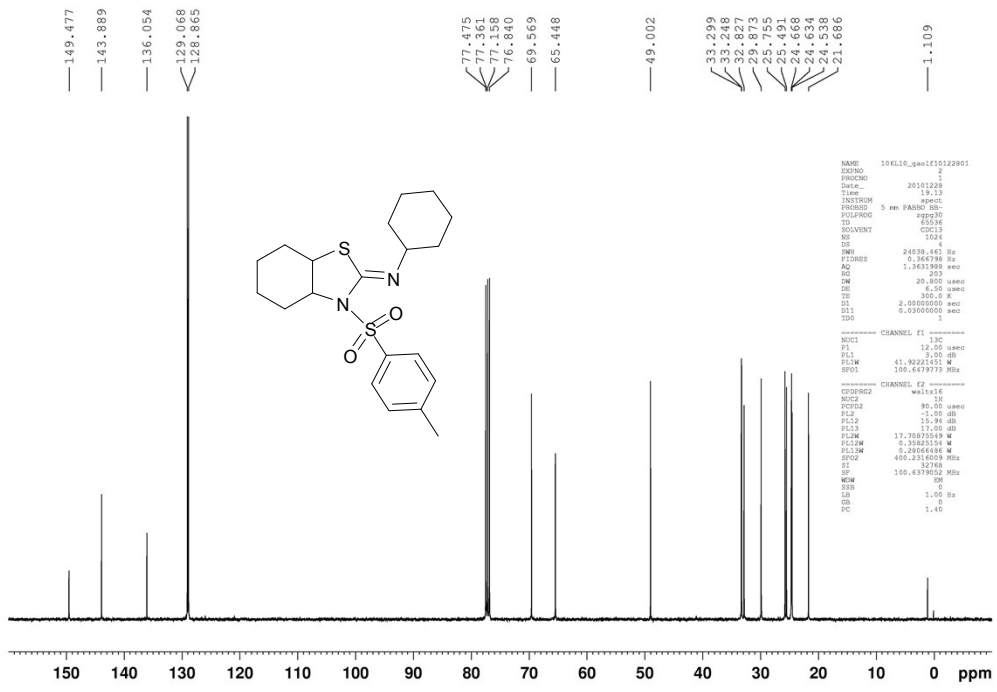
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3k





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Time 19.13
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PULPROG zgpg30
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DS 4
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F2 (MHz) 101.625378
AQ 1.3631988 sec
RG 303
SQ 20.300 usec
DE 6.00 usec
TE 300.2 K
D1 2.0000000 sec
d11 0.0300000 sec
TD0 1

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PL1 0.00 dB
PL1M 41.0022155 W
PL1W 100.6479773 MHz

===== CHANNEL f2 =====
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PCYC2 90.00 usec
PL2 -1.00 dB
PL12 15.06 dB
PL13 17.00 dB
PL1M 17.78879549 W
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