Electronic Supplementary Material (ESI) for RSC Advances.

Copper-Catalyzed Synthesis of 2-Aminobenzothiazoles from Carbodiimide and Sodium Hydrosulfide

Weilan Zeng,[a] Pan Dang,[a] Xiaoyun Zhang,[a] Yun Liang,*[,a] Caiyun Peng*[,b]

[a] Key Laboratory of Chemical Biology and Traditional Chinese Medicine Research, Ministry of Education, Key Laboratory of Resource Fine-Processing and Advanced Materials of Hunan Province, Hunan Normal University, Changsha, Hunan 410081, China. E-mail: yliang@hunnu.edu.cn, paudy@126.com. Fax: +86(0731)88872533

[b] School of Pharmaceutical Science, Hunan University of Chinese Medicine, Changsha, Hunan, 410208, China.

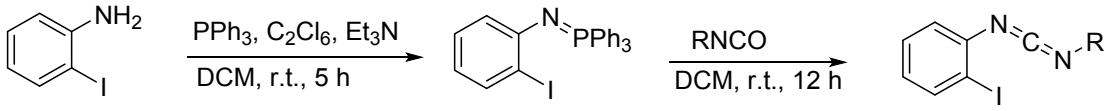
Supporting Information

1) General Information

NMR spectra of the products **2a, 2k** were obtained using Bruker Avance-500 instruments, calibrated to TMS (^{1}H NMR spectra) and $CD(H)Cl_3$ (^{13}C NMR spectra) as the internal reference (0.00 ppm for ^{1}H NMR spectra and 77.00 ppm for ^{13}C NMR spectra). NMR spectra of the product **2b-2t** was recorded using Bruker Avance-500 instruments, calibrated to residual DMSO-d_6 as the internal reference (2.50 ppm for ^{1}H NMR spectra and 40.00 ppm for ^{13}C NMR spectra). High-resolution massspectra (HRMS) were recorded on a Bruker Apex IV FTMS mass spectrometer using ESI (electrospray ionization). Reactions were monitored by thin-layer chromatography. Column chromatography (petroleum ether/ethyl acetate) was performed on silica gel (200-300 mesh). Unless otherwise noted, all reactions were run under nitrogen atmosphere.

2) Synthesis of Starting Materials

Preparation of 1a-1t:



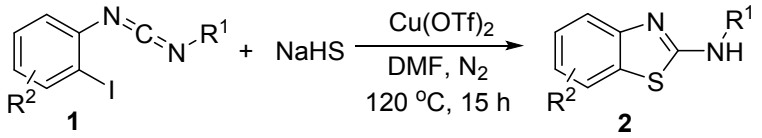
General Procedure for the Synthesis of Aza-Wittig Reagents

To a mixture of 2-iodoaniline (1.00 g, 4.57 mmol), PPh_3 (1.80 g, 6.86 mmol) and C_2Cl_6 (1.62 g, 6.86 mmol) in dry CH_2Cl_2 (40 mL), Et_3N (1.40 g, 13.84 mmol) was added dropwise at 25 °C. After being stirred for 5 h, the reaction mixture was concentrated under reduced pressure. The residue was extracted by EtOAc (100 mL), filtered through Celite (5 cm). All the volatiles were removed under reduced pressure. Isolation by silica gel column chromatography with EtOAc/ petroleum ether (v/v = 1:6) as the eluant afforded white solid (1.30 g, 98 %).

General Procedure for the Synthesis of *O*-iodoarylcarbodiimides 1a-1t.

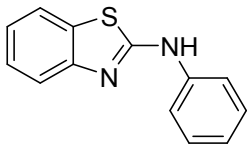
To a stirred solution of an aza-Wittig reagent (10 mmol) in CH_2Cl_2 (50 mL), an isocyanate R_2-NCO (10 mmol) was added dropwise, and then the resulting mixture was stirred at room temperature for 12 h. The solvent was evaporated under reduced pressure. Isolation by silica gel column chromatography with EtOAc/ petroleum ether (v/v = 1:12) as the eluent afforded the corresponding o-iodoarylcarbodiimides 1a-1t.

3) Typical Procedures

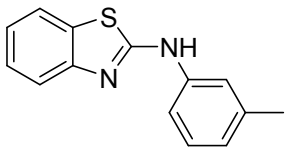


To a schlenk tube were added *o*-iodoarylcarbodiimides (0.3 mmol), NaHS (3equiv), $Cu(OTf)_2$ (20 mol%), and DMF (2 mL). Then under the protection of nitrogen,the mixture was stirred at 120 °C (oil bath temperature) for the indicated time until complete consumption of starting material as monitored by TLC. After the reaction was finished, the reaction mixture was cooled to room temperature, diluted in ethyl acetate, and washed with water. The aqueous phase was re-extracted with ethyl acetate. The combined organic extracts were dried over Na_2SO_4 and concentrated in vacuum, and the resulting residue was purified by silica gel column chromatography (petroleum ether/ethyl acetate = 5:1) to afford the desired product.

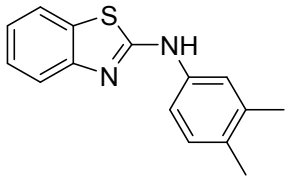
4) Characterization Data



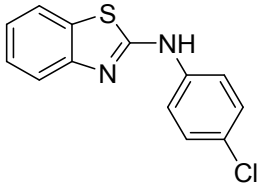
N-phenylbenzo[d]thiazol-2-amine(2a):[1] The product was purified by flash chromatography to give 63 mg (74%) as a yellow solid. ^{1}H NMR ($CDCl_3$, 500 MHz) δ = 7.60 (d, *J* = 8.0 Hz, 1H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.49 (d, *J* = 8.0 Hz, 2H), 7.38 (t, *J* = 7.8 Hz, 2H), 7.30 (t, *J* = 7.5 Hz, 1H), 7.17-7.11 (m, 2H). ^{13}C NMR ($CDCl_3$, 125 MHz) δ = 165.2, 151.3, 140.0, 129.8, 129.5, 126.1, 124.4, 122.3, 120.8, 120.5, 119.2.



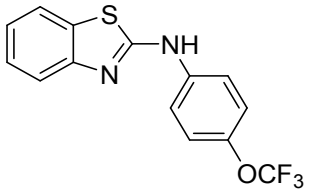
N-(m-tolyl)benzo[d]thiazol-2-amine(2b):[1] The product was purified by flash chromatography to give 66 mg (93%) as a yellow solid. ^{1}H NMR (DMSO-*D6*, 500 MHz) δ = 10.42 (s, 1H), 7.79 (d, *J* = 7.5 Hz, 1H), 7.66 (d, *J* = 8.0 Hz, 1H), 7.62 (d, *J* = 8.0 Hz, 2H), 7.32 (td, *J* = 7.5 Hz, 1.0 Hz, 1H), 7.24 (t, *J* = 7.8 Hz, 1H), 7.14 (td, *J* = 8.0 Hz, 1.0 Hz, 1H), 6.84 (d, *J* = 7.5 Hz, 1H), 2.32 (s, 3H). ^{13}C NMR (DMSO-*D6*, 125 MHz) δ = 162.2, 152.6, 141.1, 138.7, 130.5, 129.3, 126.3, 123.4, 122.7, 121.5, 119.7, 118.8, 115.6, 21.8.



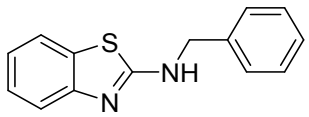
N-(3,4-dimethylphenyl)benzo[d]thiazol-2-amine(2c):[8] The product was purified by flash chromatography to give 75 mg (95%) as a yellow solid. ^{1}H NMR (DMSO-*D6*, 500 MHz) δ = 10.30 (s, 1H), 7.76 (dd, *J* = 7.5 Hz, 1.0 Hz, 1H), 7.59-7.56 (m, 2H), 7.49 (d, *J* = 2.0 Hz, 1H), 7.30 (td, *J* = 8.0 Hz, 1.0 Hz, 1H), 7.14-7.10 (m, 2H), 2.22 (s, 3H), 2.17 (s, 3H). ^{13}C NMR (DMSO-*D6*, 125 MHz) δ = 162.4, 152.7, 139.0, 137.1, 130.5, 130.4, 130.3, 126.3, 122.5, 121.4, 119.8, 119.5, 116.1, 20.2, 19.2.



N-(4-chlorophenyl)benzo[d]thiazol-2-amine(2d):[1] The product was purified by flash chromatography to give 76 mg (82%) as a yellow solid. ^{1}H NMR (DMSO-*D6*, 500 MHz) δ = 10.62 (s, 1H), 7.84-7.81 (m, 3H), 7.62 (d, *J* = 7.5 Hz, 1H), 7.41 (d, *J* = 9.0 Hz, 2H), 7.34 (td, *J* = 8.0 Hz, 1.0 Hz, 1H), 7.16 (td, *J* = 8.0 Hz, 1.0 Hz, 1H). ^{13}C NMR (DMSO-*D6*, 125 MHz) δ = 161.8, 152.4, 140.0, 130.5, 129.3, 126.5, 126.0, 123.0, 121.6, 119.9, 119.7.

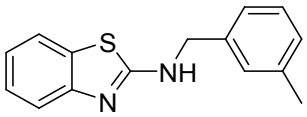


N-(4-(trifluoromethoxy)phenyl)benzo[d]thiazol-2-amine(2e): The product was purified by flash chromatography to give 72 mg (82%) as a yellow solid. mp: 168.7-170.0 ^{o}C. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 10.68 (s, 1H), 7.94-7.91 (m, 2H), 7.80 (dd, *J* = 8.0 Hz, 1.0 Hz, 1H), 7.63 (d, *J* = 7.5 Hz, 1H), 7.36-7.31 (m, 3H), 7.16 (td, *J* = 8.0 Hz, 1.0 Hz, 1H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 161.9, 152.4, 143.2, 140.3, 130.6, 126.4, 123.0, 122.3, 121.5, 120.7 (q, *J* = 254 Hz), 119.9, 119.4. HRMS (ESI, m/z) calcd for $[C_{14}H_{10}F_3N_2OS]H^+$: 311.0460; found 311.0462.

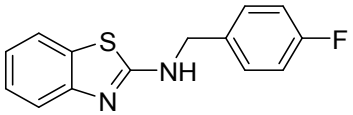


N-benzylbenzo[d]thiazol-2-amine(2f):[5] The product was purified by flash chromatography to give 61 mg (95%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 8.53 (s, 1H), 7.67 (d, *J* = 7.5 Hz,

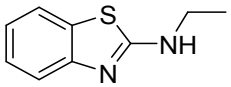
1H), 7.41 (t, *J* = 8.5 Hz, 3H), 7.34 (t, *J* = 7.5 Hz, 2H), 7.27-7.21 (m, 2H), 7.02 (td, *J* = 7.5 Hz, 0.5 Hz, 1H),, 4.62 (d, *J* = 5.0 Hz, 2H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 166.8, 153.0, 139.4, 131.0, 128.8, 127.9, 127.5, 126.0, 121.5, 121.4, 118.6, 47.7.



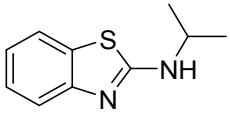
N-(3-methylbenzyl)benzo[d]thiazol-2-amine(2g):[7] The product was purified by flash chromatography to give 73 mg (91%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 8.53 (s, 1H), 7.66 (d, *J* = 7.5 Hz, 1H), 7.41 (d, *J* = 8.0 Hz, 1H), 7.23-7.16 (m, 4H), 7.07-7.00 (m, 2H), 4.57 (d, *J* = 5.0 Hz, 2H), 2.27 (s, 3H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 166.9, 153.1, 139.4, 138.1, 131.0, 129.0, 128.6, 128.3, 126.2, 125.1, 121.6, 121.6, 118.7, 47.9, 21.7.



N-(4-fluorobenzyl)benzo[d]thiazol-2-amine(2h):[7] The product was purified by flash chromatography to give 63 mg (84%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 8.52 (s, 1H), 7.66 (dd, *J* = 8.0 Hz, 1.0 Hz, 1H), 7.44-7.40 (m, 3H), 7.22 (td, *J* = 7.5 Hz, 1.5 Hz, 1H), 7.16 (td, *J* = 6.5 Hz, 2.0 Hz, 2H), 7.02 (td, *J* = 7.5 Hz, 1.0 Hz, 1H), 4.59 (d, *J* = 5.0 Hz, 2H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 166.7, 161.8 (d, *J* = 241.3 Hz), 152.9, 135.6 (d, *J* = 3.0 Hz), 130.9, 129.9 (d, *J* = 8.1 Hz), 126.0, 121.5, 121.4, 118.6, 115.5 (d, *J* = 21.3 Hz), 47.0.

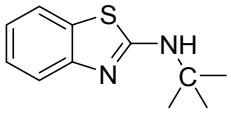


N-ethylbenzo[d]thiazol-2-amine(2i):[3] The product was purified by flash chromatography to give 44 mg (90%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 7.98 (s, 1H), 7.64 (dd, *J* = 7.5 Hz, 1.0 Hz, 1H), 7.38 (d, *J* = 7.5 Hz, 1H), 7.20 (td, *J* = 8.0 Hz, 1.5 Hz, 1H), 7.00 (td, *J* = 8.0 Hz, 1.0 Hz, 1H), 3.40-3.36 (m, 2H), 1.19 (t, *J* = 7.0 Hz, 3H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 166.5, 153.2, 130.7, 126.0, 121.3, 121.2, 118.4, 39.2, 14.9.

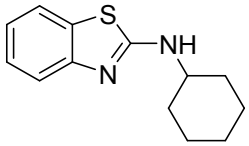


N-isopropylbenzo[d]thiazol-2-amine(2j):[4] The product was purified by flash chromatography to give 52 mg (87%) as a

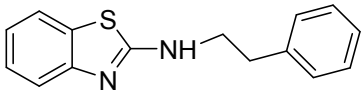
yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 7.90 (s, 1H), 7.63 (d, *J* = 7.5 Hz, 1H), 7.38 (d, *J* = 8.0 Hz, 1H), 7.20 (t, *J* = 7.5 Hz, 1H), 7.00 (t, *J* = 7.5 Hz, 1H), 4.02-3.96 (m, 1H), 1.21 (d, *J* = 6.5 Hz, 6H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 165.8, 153.3, 130.7, 125.9, 121.2, 121.2, 118.4, 46.3, 22.8.



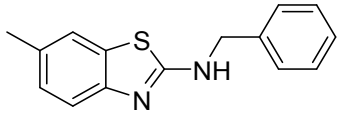
2-(tert-butyl)benzo[d]thiazole(2k):[5] The product was purified by flash chromatography to give 57 mg (93%) as a yellow solid. ^{1}H NMR (CDCl3, 500 MHz) δ = 7.55 (t, *J* = 7.8 Hz, 2H), 7.28-7.23 (m, 1H), 7.05 (t, *J* = 7.5 Hz, 1H), 5.41 (s, 1H), 1.47 (s, 9H). ^{13}C NMR (CDCl3, 125 MHz) δ = 164.6, 152.3, 130.7, 125.6, 121.4, 120.3, 119.0, 53.2, 29.0.



N-cyclohexylbenzo[d]thiazol-2-amine(2l):[5] The product was purified by flash chromatography to give 63 mg (92%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 7.92 (s, 1H), 7.18 (dd, *J* = 7.5 Hz, 1.0 Hz, 1H), 7.72 (dd, *J* = 8.0 Hz, 0.5 Hz, 1H), 7.19 (td, *J* = 8.0 Hz, 1.0 Hz, 1H), 6.98 (td, *J* = 7.5 Hz, 1.0 Hz, 1H), 3.70 (t, *J* = 3.3 Hz, 1H), 1.99 (d, *J* = 7 Hz, 2H), 1.73-1.70 (m, 2H), 1.58-1.55 (m, 1H), 1.34-1.25 (m, 4H), 1.20-1.15 (m, 1H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 165.6, 153.2, 130.6, 125.8, 121.1, 121.1, 118.3, 53.3, 32.8, 25.7, 24.9.

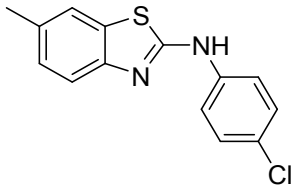


N-phenethylbenzo[d]thiazol-2-amine(2m):[4] The product was purified by flash chromatography to give 68 mg (77%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 8.12 (s, 1H), 7.65 (dd, *J* = 8.0 Hz, 1.0 Hz, 1H), 7.43 (dd, *J* = 8.0 Hz, 0.5 Hz, 1H), 7.31-7.26 (m, 4H), 7.24-7.20 (m, 2H), 7.01 (td, *J* = 8.0 Hz, 1.0 Hz, 1H), 3.64-3.60 (m, 2H), 2.93 (t, *J* = 7.3 Hz, 2H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 166.5, 153.2, 139.8, 130.8, 129.2, 128.8, 126.6, 126.0, 121.4, 118.5(2C), 45.9, 35.2.

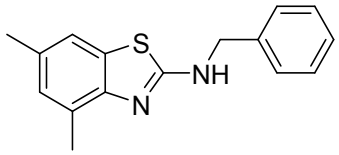


N-benzyl-6-methylbenzo[d]thiazol-2-amine(2n):[6] The product was purified by flash chromatography to give 65

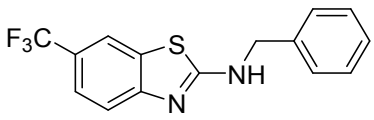
mg (85%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 8.38 (s, 1H), 7.45 (s, 1H), 7.38 (d, *J* = 7.0 Hz, 2H), 7.34 (t, *J* = 7.5 Hz, 2H), 7.28-7.24 (m, 2H), 7.02 (d, *J* = 8.0 Hz, 1H), 4.58 (d, *J* = 5.5 Hz, 2H), 2.30 (s, 3H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 166.1, 150.8, 139.5, 131.0, 130.7, 128.9, 127.9, 127.5, 127.1, 121.4, 118.3, 47.7, 21.3.



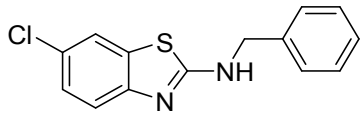
N-(4-chlorophenyl)-6-methylbenzo[d]thiazol-2-amine(2o):[1] The product was purified by flash chromatography to give 79 mg (96%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 10.52 (s, 1H), 7.81 (d, *J* = 8.5 Hz, 2H), 7.60 (s, 1H), 7.50 (d, *J* = 8.5 Hz, 1H), 7.41-7.39 (m, 2H), 7.14 (dd, *J* = 8.0 Hz, 1.0 Hz, 1H), 2.34(s, 3H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 160.8, 150.0, 139.9, 132.1, 130.3, 129.0, 127.3, 125.6, 121.2, 119.4, 119.3, 21.1.



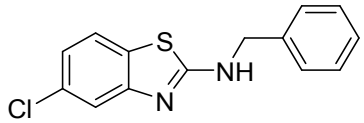
N-benzyl-4,6-dimethylbenzo[d]thiazol-2-amine(2p):[7] The product was purified by flash chromatography to give 70 mg (87%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 8.37 (s, 1H), 7.40 (d, *J* = 7.5 Hz, 2H), 7.33 (t, *J* = 7.8 Hz, 2H), 7.25 (t, *J* = 5.0 Hz, 2H), 6.85 (s, 1H), 4.57 (d, *J* = 5.0 Hz, 2H), 2.41 (s, 3H), 2.26 (s, 3H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 165.5, 149.8, 139.6, 130.5, 130.4, 128.8, 128.2, 128.0, 127.6, 127.4, 118.8, 48.0, 21.3, 18.6.



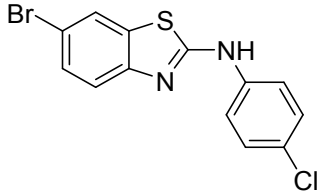
N-benzyl-6-(trifluoromethyl)benzo[d]thiazol-2-amine(2q): The product was purified by flash chromatography to give 83 mg (89%) as a yellow solid. mp: 192.5-194.7 °C. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 8.88 (s, 1H), 8.11 (s, 1H), 7.52 (s, 2H), 7.40-7.33 (m, 4H), 7.26 (t, *J* = 7.0 Hz, 1H), 4.65 (d, *J* = 5.0 Hz, 2H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 169.4, 156.0, 139.0, 131.6, 129.0, 128.0, 127.7, 125.3 (q, *J* = 269.5 Hz), 123.2 (q, *J* = 3.6 Hz), 121.7 (q, *J* = 31.6 Hz), 119.1 (q, *J* = 3.8 Hz), 118.4, 47.9. HRMS (ESI, m/z) calcd for $[C_{15}H_{12}F_3N_2S]H^+$: 309.0668; found 309.0666.



N-benzyl-6-chlorobenzo[d]thiazol-2-amine(2r):[7] The product was purified by flash chromatography to give 75 mg (90%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 8.60 (s, 1H), 7.78 (d, *J* = 2.0 Hz, 1H), 7.38-7.32 (m, 5H), 7.27-7.21 (m, 2H), 4.59 (d, *J* = 5.5 Hz, 2H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 167.4, 151.9, 139.2, 132.6, 128.9, 127.9, 127.6, 126.2, 125.2, 121.1, 119.4, 47.8.



N-benzyl-5-chlorobenzo[d]thiazol-2-amine(2s):[6] The product was purified by flash chromatography to give 75 mg (92%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 8.72 (s, 1H), 7.67 (d, *J* = 8.0 Hz, 1H), 7.42 (s, 1H), 7.39-7.32 (m, 4H), 7.26 (td, *J* = 8.0 Hz, 1.5 Hz, 1H), 7.04 (dd, *J* = 8.5 Hz, 2.0 Hz, 1H), 4.61 (d, *J* = 5.5 Hz, 2H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 168.4, 154.2, 139.1, 130.8, 129.7, 128.9, 127.9, 127.6, 122.7, 121.2, 118.0, 47.8.

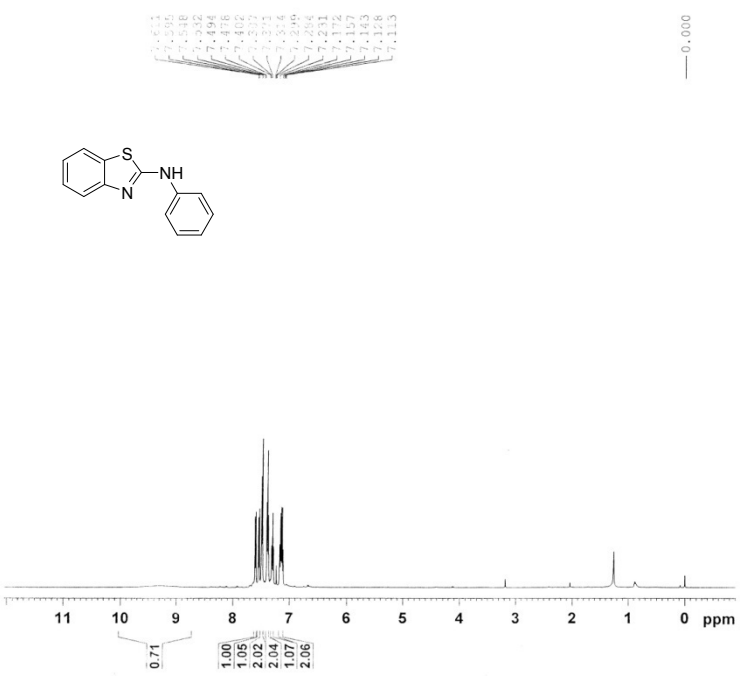


6-bromo-N-(4-chlorophenyl)benzo[d]thiazol-2-amine(2t):[2] The product was purified by flash chromatography to give 68 mg (66%) as a yellow solid. ^{1}H NMR (DMSO-D6, 500 MHz) δ = 10.70 (s, 1H), 8.06 (d, *J* = 2.0 Hz, 1H), 7.80 (d, *J* = 8.5 Hz, 2H), 7.53 (d, *J* = 8.5 Hz, 1H), 7.45 (dd, *J* = 8.5 Hz, 2.0 Hz, 1H), 7.41 (d, *J* = 8.5 Hz, 2H). ^{13}C NMR (DMSO-D6, 125 MHz) δ = 162.5, 151.6, 139.7, 132.7, 129.3(2C), 126.3, 124.1, 121.3, 119.9, 114.5.

5) References

1. W. Zhang, Y. Yue, D. Yu, L. Song, Y. Y. Xu, Y. J. Tian, and Y. J. Guo, *Adv. Synth. Catal.,* 2012, **354,** 2283.
2. G. Shen, X. Lv, and W. Bao, *Eur. J. Org. Chem.,* 2009, 5897.
3. Q. Ding, X. He and J. Wu, *J. Comb. Chem.*, 2009, **11**, 587.
4. S. Toulot, T. Heinrich, and F. R. Lerouxa, *Adv. Synth. Catal.,* 2013, **355**, 3263.
5. T. H. Zhu, S. Y. Wang, G. N. Wang, and S. J. Ji, *Chem. Eur. J.,* 2013, **19**, 5850.
6. X. Zhang, X. Jia, J. Wang and X. Fan, *Green Chem*., 2011, **13**, 413.
7. F. Li, H. Shan, Q. Kang and L. Chen, *Chem. Commun.*, 2011, **47**, 5058.
8. S. K. Rout, S. Guin, J. Nath and B. K. Patel, *Green Chem*., 2012, **14**, 2491.

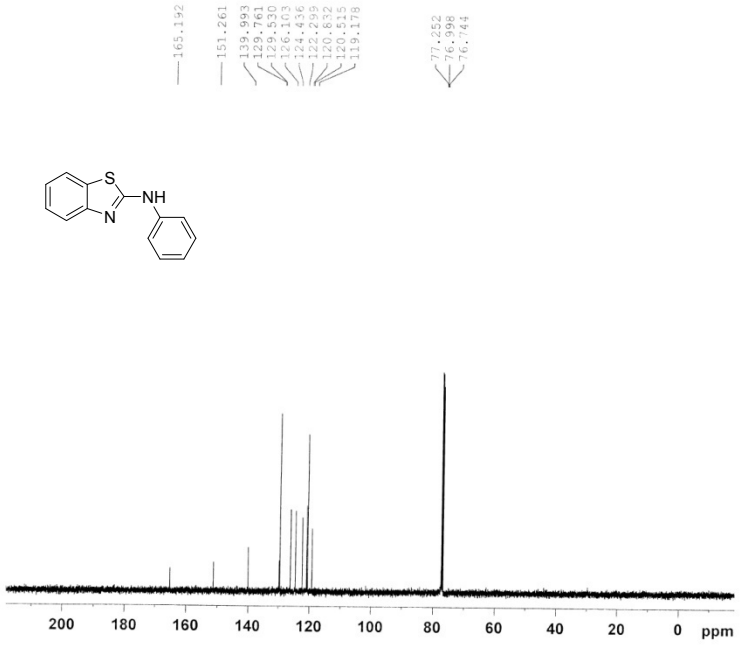
6) Scanned ^{1}H NMR and ^{13}C NMR Spectra of All New Compounds



BRUKER

h-308

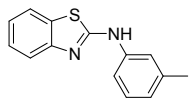
NAME	zengweilan20130702
EXPNO	3
PROCNO	1
Date_	20130702
Time	16.06
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	203
DW	48.400 usec
DE	6.50 usec
TE	301.2 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.60 usec
PL1	2.00 dB
PL1W	9.90558243 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300268 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

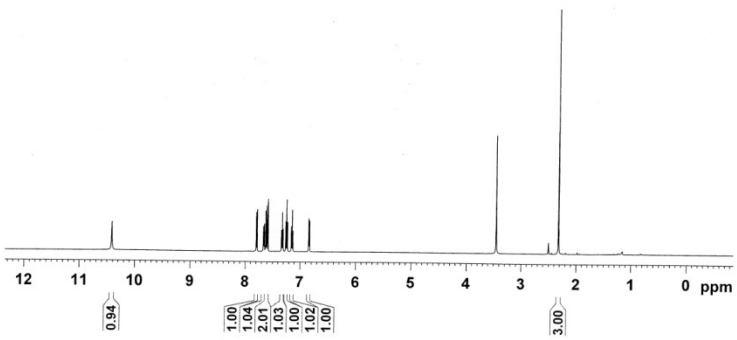


BRUKER

C-308

NAME	zengweilan20130702
EXPNO	4
PROCNO	1
Date_	20130702
Time	16.01
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	77
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	301.6 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.80 usec
PL1	2.80 dB
PL1W	52.46661758 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	2.00 dB
PL12	16.89 dB
PL13	16.70 dB
PL2W	9.90558243 W
PL12W	0.32127732 W
PL13W	0.33564481 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577959 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40





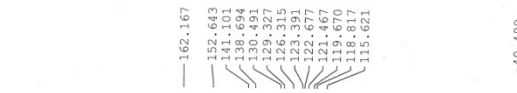
BRUKER

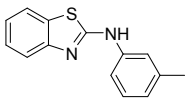
384

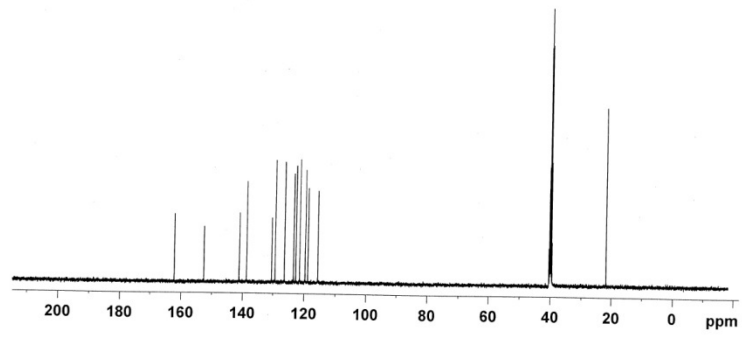
NAME	zengweilan20131005
EXPNO	3
PROCNO	1
Date_	20131005
Time	11.05
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	45.2
DW	48.400 usec
DE	6.50 usec
TE	268.8 K
D1	1.00000000 sec
TD0	1

======== CHANNEL f1 ========

NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300035 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00







BRUKER

384

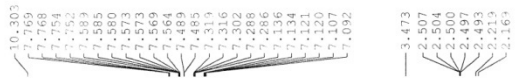
NAME	zengweilan20131005
EXPNO	4
PROCNO	1
Date_	20131005
Time	11.08
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	127
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	269.7 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

======== CHANNEL f1 ========

NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz

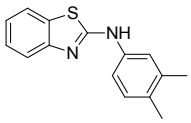
======== CHANNEL f2 ========

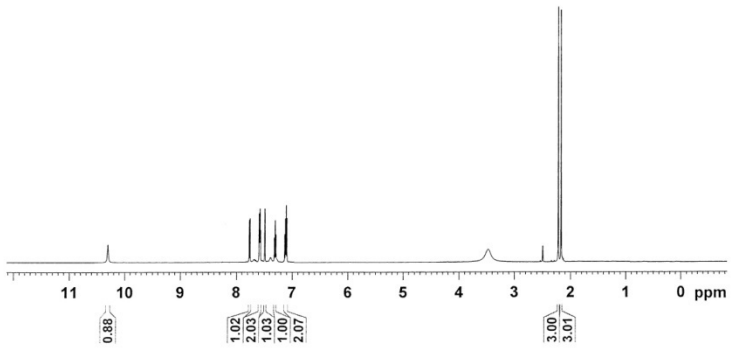
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577866 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



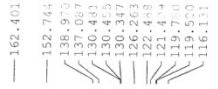
BRUKER

403



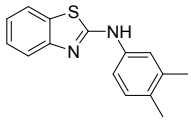


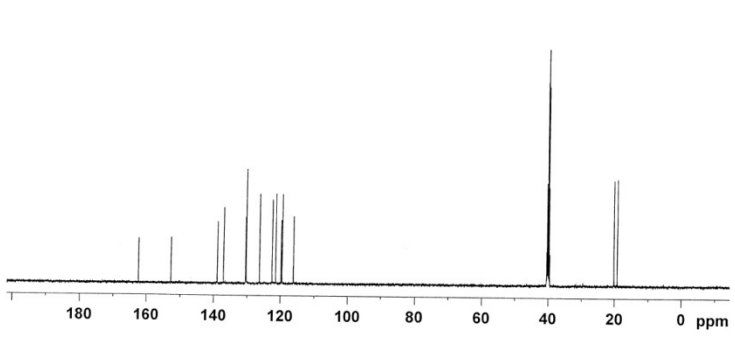
NAME	zengweilan20131013
EXPNO	1
PROCNO	1
Date_	20131013
Time	16.12
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	40.3
DW	48.400 usec
DE	6.50 usec
TE	268.7 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300030 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



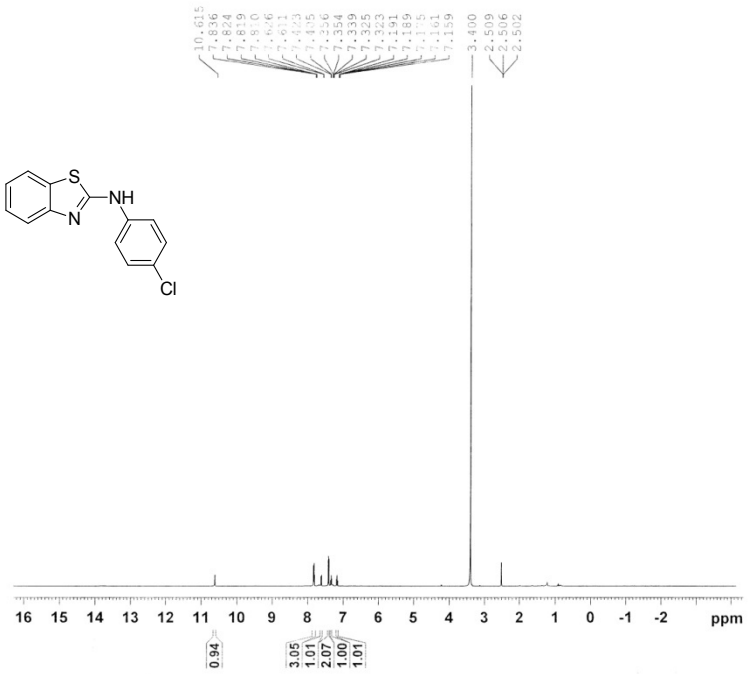
BRUKER

403





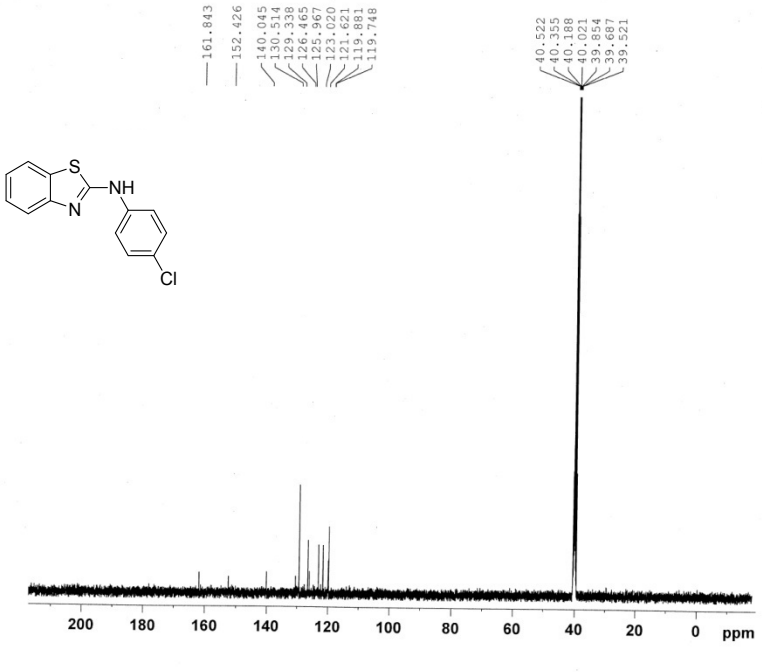
NAME	zengweilan20131013
EXPNO	2
PROCNO	1
Date_	20131013
Time	16.40
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	150
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	271.1 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577858 MHz
WDW	EM
SSB	0
LB	1.00 Hz



BRUKER

H-340

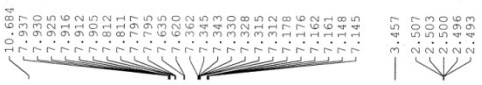
NAME	zengweilan20130827
EXPNO	1
PROCNO	1
Date_	20130827
Time	15.31
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	181
DW	48.400 usec
DE	6.50 usec
TE	268.7 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300010 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

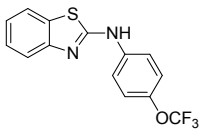


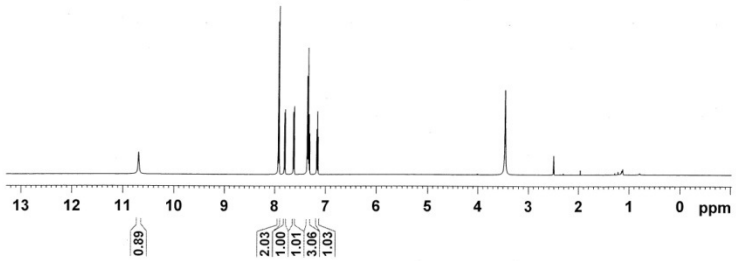
BRUKER

C-340

NAME	zengweilan20130827
EXPNO	2
PROCNO	1
Date_	20130827
Time	15.35
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	205
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	270.9 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577832 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



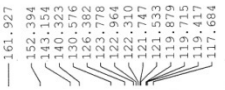


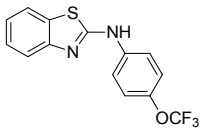


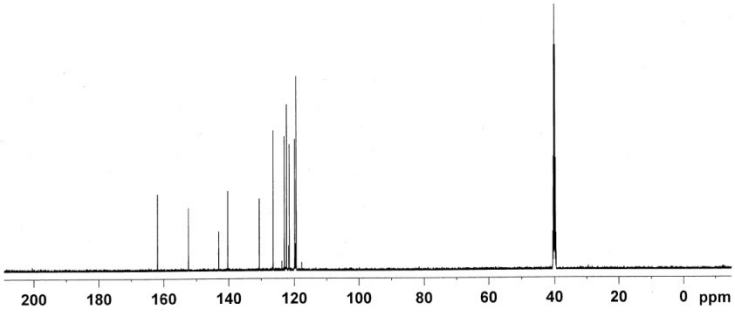
389

NAME	zengweilan20131005
EXPNO	7
PROCNO	1
Date_	20131005
Time	11.31
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	50.8
DW	48.400 usec
DE	6.50 usec
TE	268.7 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300038 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

-

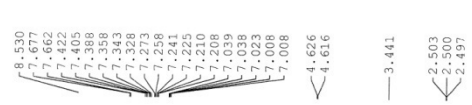


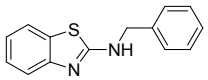


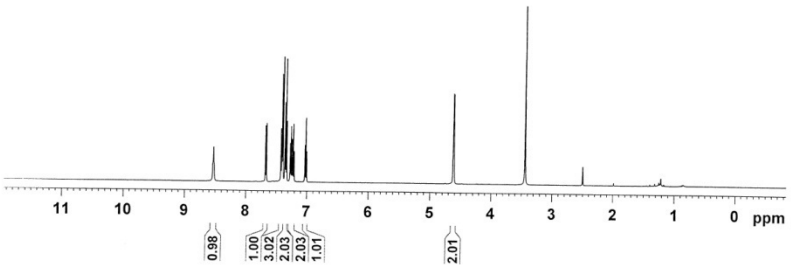


389

NAME	zengweilan20131005
EXPNO	8
PROCNO	1
Date_	20131005
Time	11.37
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	194
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	270.6 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577849 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

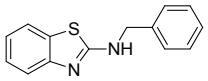


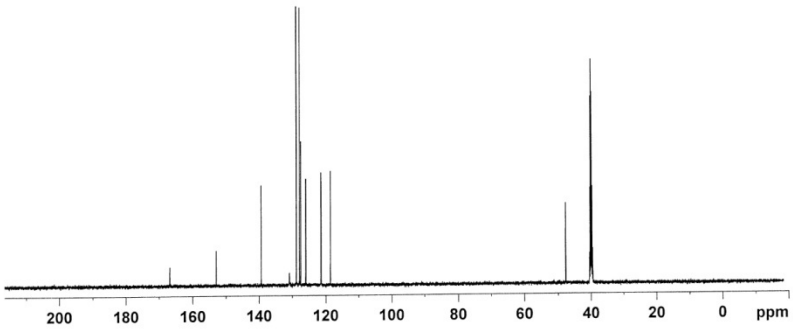




368

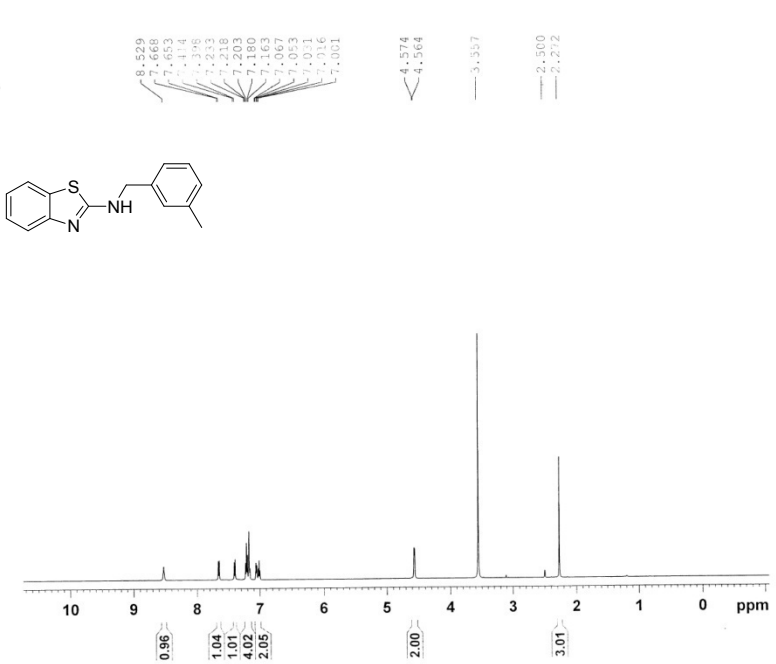
NAME	zengweilan20130915
EXPNO	5
PROCNO	1
Date_	20130915
Time	20.38
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	50.8
DW	48.400 usec
DE	6.50 usec
TE	270.2 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300033 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00





368

NAME	zengweilan20130915
EXPNO	6
PROCNO	1
Date_	20130915
Time	20.41
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	152
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	271.1 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577877 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



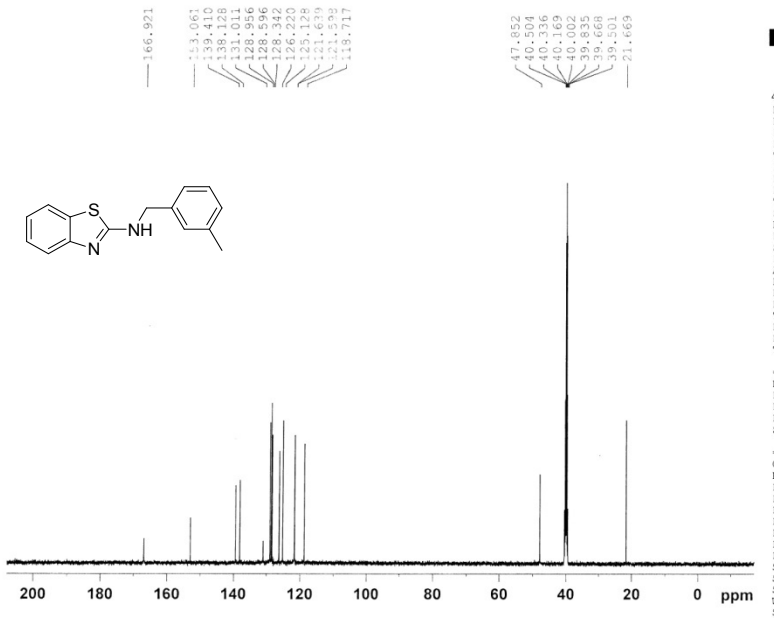
BRUKER

424

NAME	zengweilan20131216
EXPNO	5
PROCNO	1
Date_	20131216
Time	19.13
INSTRUM	spect
PROBHD	5 mm TXI 1H/D-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	25.4
DW	48.400 usec
DE	6.50 usec
TE	673.2 K
D1	1.00000000 sec
TD0	1

======== CHANNEL f1 ========

NUC1	1H
P1	6.80 usec
PL1	0.80 dB
PL1W	13.05810070 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300019 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



BRUKER

424

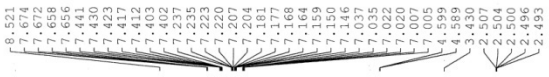
NAME	zengweilan20131216
EXPNO	6
PROCNO	1
Date_	20131216
Time	19.18
INSTRUM	spect
PROBHD	5 mm TXI 1H/D-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	165
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	322
DW	16.800 usec
DE	6.50 usec
TE	673.2 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

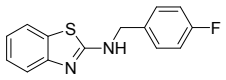
======== CHANNEL f1 ========

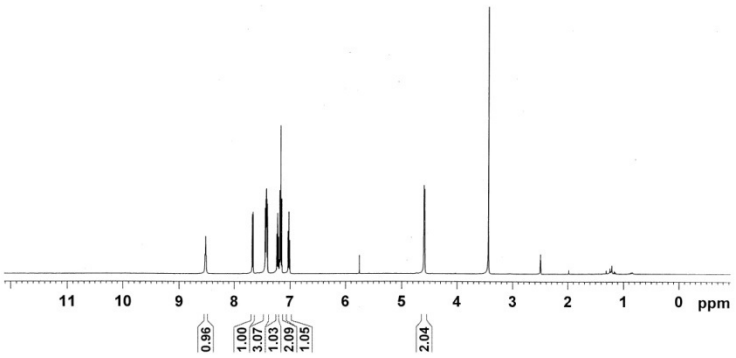
NUC1	13C
P1	11.90 usec
PL1	-3.50 dB
PL1W	223.81184387 W
SFO1	125.7703643 MHz

======== CHANNEL f2 ========

CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	4.15 dB
PL12	22.13 dB
PL13	22.13 dB
PL2W	6.03781796 W
PL12W	0.09613468 W
PL13W	0.09613468 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577677 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

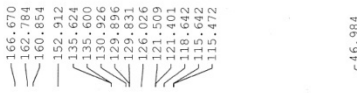


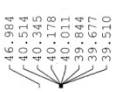


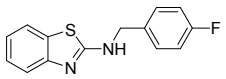


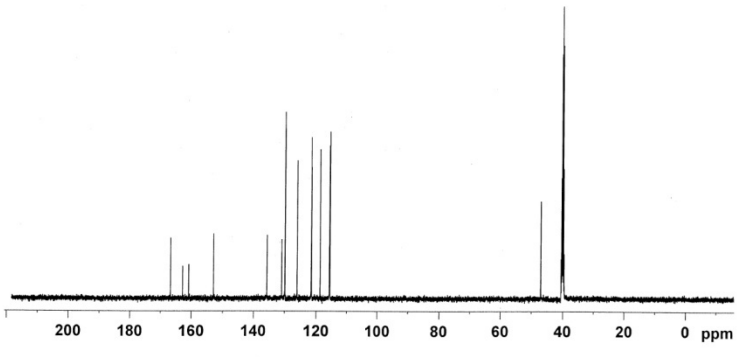
376

NAME	zengweilan20130915
EXPNO	3
PROCNO	1
Date_	20130915
Time	20.26
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	90.5
DW	48.400 usec
DE	6.50 usec
TE	269.9 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300032 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



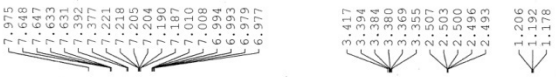


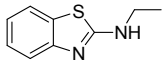


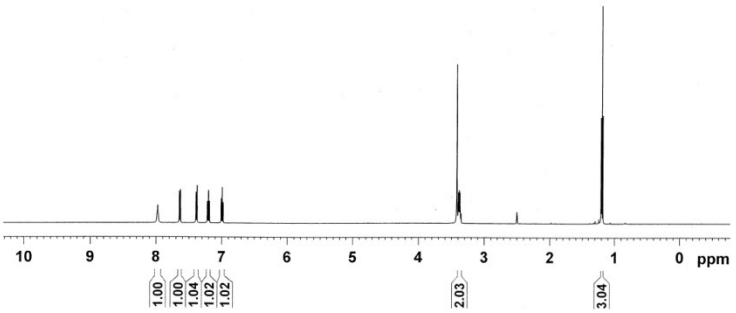


376

NAME	zengweilan20130915
EXPNO	4
PROCNO	1
Date_	20130915
Time	20.31
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	138
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	271.5 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577881 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

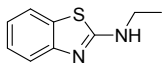


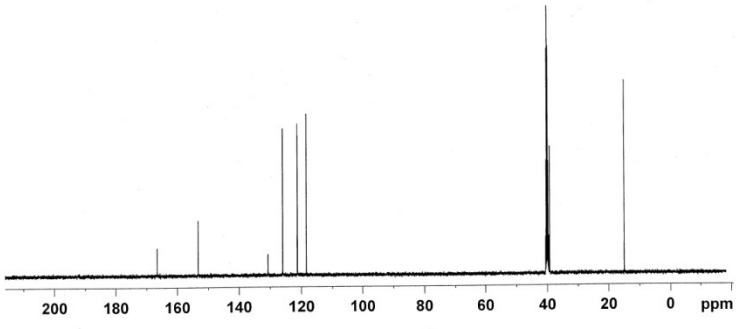




393

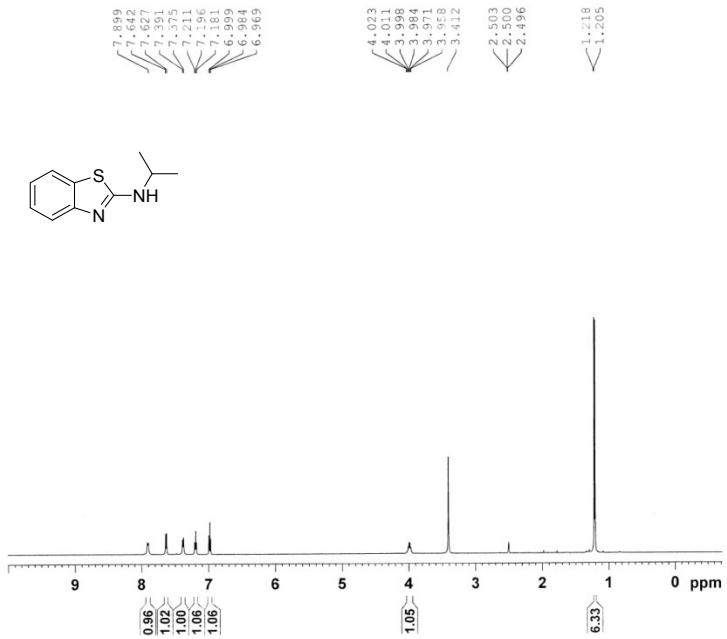
NAME	zengweilan20131005
EXPNO	9
PROCNO	1
Date_	20131005
Time	18.52
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	50.8
DW	48.400 usec
DE	6.50 usec
TE	269.4 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300038 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00





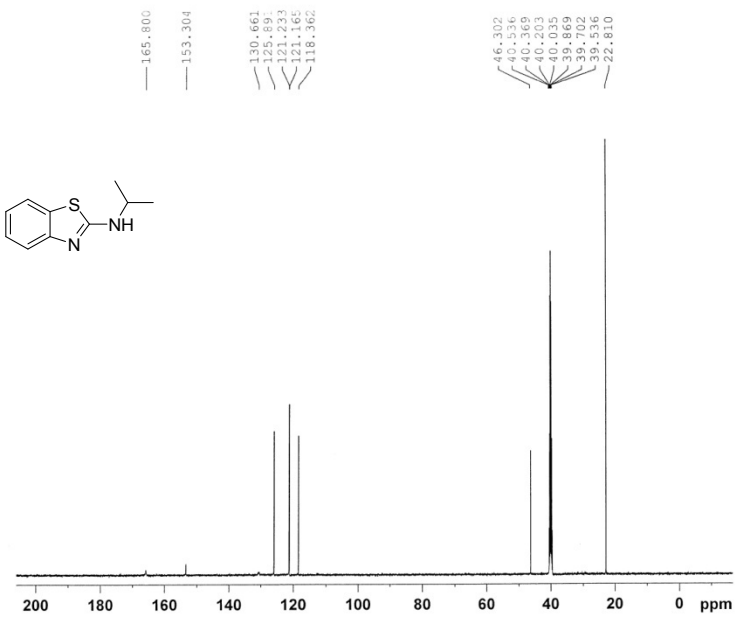
393

NAME	zengweilan20131005
EXPNO	10
PROCNO	1
Date_	20131005
Time	18.55
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	100
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	270.1 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577850 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



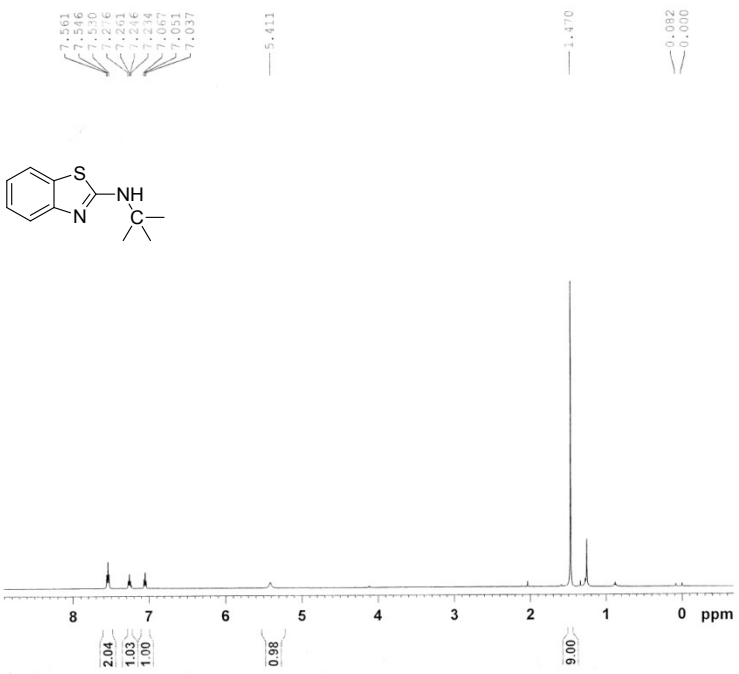
392

```
NAME          zengweilan20131005
EXPNO                          5
PROCNO                         1
Date_                   20131005
Time_                      11.16
INSTRUM                    spect
PROBHD       5 mm PABBO BB-
PULPROG                     zg30
TD                         65536
SOLVENT                     DMSO
NS                            16
DS                             2
SWH                   10330.578 Hz
FIDRES                0.157632 Hz
AQ                    3.1719923 sec
RG                           181
DW                        48.400 usec
DE                         6.50 usec
TE                        268.7 K
D1                    1.00000000 sec
TD0                            1

======== CHANNEL f1 ========
NUC1                          1H
P1                        14.00 usec
PL1                        1.00 dB
PL1W                 12.47038937 W
SFO1                 500.1330885 MHz
SI                         32768
SF                   500.1300038 MHz
WDW                           no
SSB                            0
LB                          0.00 Hz
GB                             0
PC                          1.00
```



392

```
NAME          zengweilan20131005
EXPNO                          6
PROCNO                         1
Date_                   20131005
Time_                      18.29
INSTRUM                    spect
PROBHD       5 mm PABBO BB-
PULPROG                   zgpg30
TD                         65536
SOLVENT                     DMSO
NS                           304
DS                             4
SWH                   29761.904 Hz
FIDRES                0.454131 Hz
AQ                    1.1010548 sec
RG                          2050
DW                        16.800 usec
DE                         6.50 usec
TE                        269.4 K
D1                    2.00000000 sec
D11                   0.03000000 sec
TD0                            1

======== CHANNEL f1 ========
NUC1                         13C
P1                         9.00 usec
PL1                        1.00 dB
PL1W                79.41143799 W
SFO1                125.7703643 MHz

======== CHANNEL f2 ========
CPDPRG2                 waltz16
NUC2                          1H
PCPD2                     80.00 usec
PL2                        1.00 dB
PL12                      16.14 dB
PL13                      16.14 dB
PL2W                 12.47038937 W
PL12W                 0.38183883 W
PL13W                 0.38183883 W
SFO2                 500.1320005 MHz
SI                         32768
SF                   125.7577886 MHz
WDW                           EM
SSB                            0
LB                          1.00 Hz
GB                             0
PC                          1.40
```



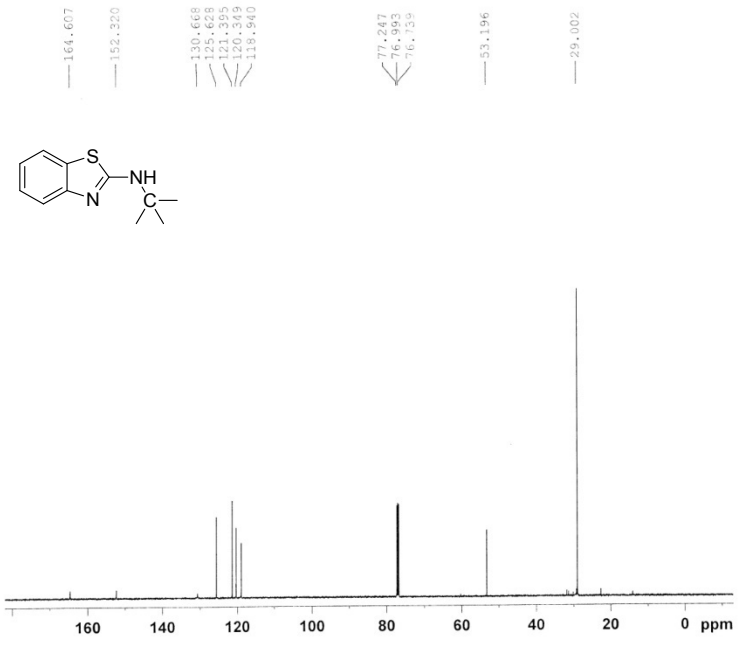
BRUKER

H-W223

NAME	zengweilan20130503
EXPNO	1
PROCNO	1
Date_	20130503
Time	14.59
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	45.2
DW	48.400 usec
DE	6.50 usec
TE	297.8 K
D1	1.00000000 sec
TD0	1

======== CHANNEL f1 ========

NUC1	1H
P1	14.60 usec
PL1	2.00 dB
PL1W	9.90558243 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300252 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



BRUKER

C-W223

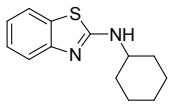
NAME	zengweilan20130503
EXPNO	2
PROCNO	1
Date_	20130503
Time	15.04
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	129
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	299.2 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

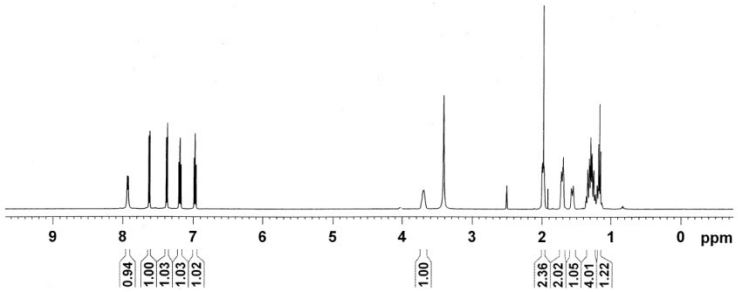
======== CHANNEL f1 ========

NUC1	13C
P1	9.80 usec
PL1	2.80 dB
PL1W	52.46661758 W
SFO1	125.7703643 MHz

======== CHANNEL f2 ========

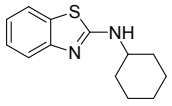
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	2.00 dB
PL12	16.89 dB
PL13	16.70 dB
PL2W	9.90558243 W
PL12W	0.32127732 W
PL13W	0.33564481 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7578022 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

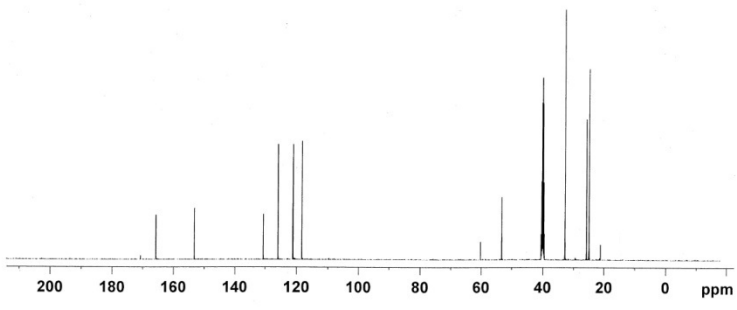




396

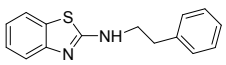
NAME	zengweilan20131005
EXPNO	11
PROCNO	1
Date_	20131005
Time	19.02
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	40.3
DW	48.400 usec
DE	6.50 usec
TE	269.0 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300035 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

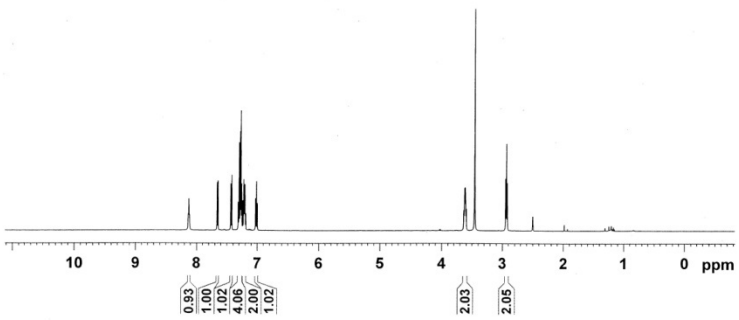




396

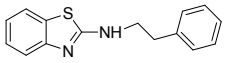
NAME	zengweilan20131005
EXPNO	12
PROCNO	1
Date_	20131005
Time	19.11
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	198
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	271.5 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577913 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

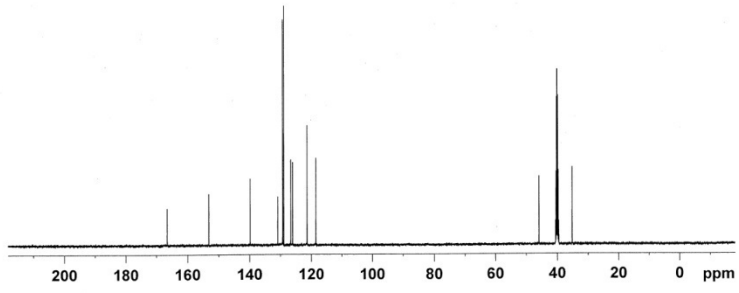




387

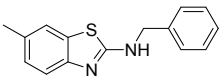
NAME	zengweilan20131005
EXPNO	1
PROCNO	1
Date_	20131005
Time	10.52
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	40.3
DW	48.400 usec
DE	6.50 usec
TE	268.6 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300035 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

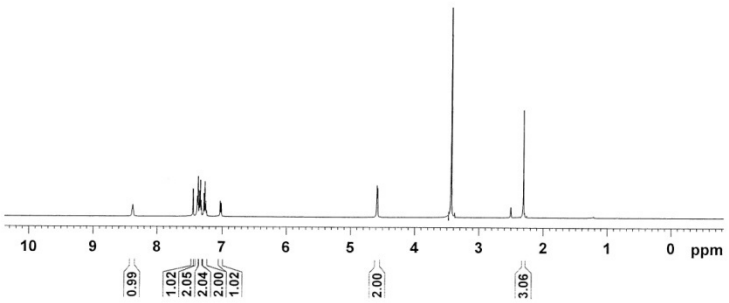




387

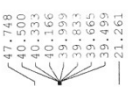
NAME	zengweilan20131005
EXPNO	2
PROCNO	1
Date_	20131005
Time	10.56
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	127
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	269.4 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577859 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

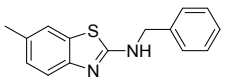


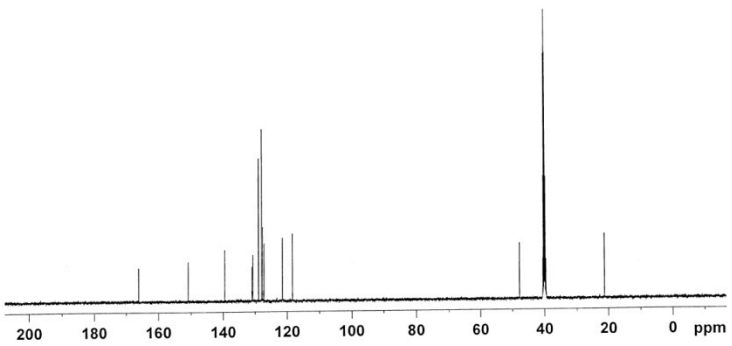


414

```
NAME          zengweilan20131020
EXPNO                          3
PROCNO                         1
Date_                   20131020
Time                       11.59
INSTRUM                    spect
PROBHD       5 mm PABBO BB-
PULPROG                     zg30
TD                         65536
SOLVENT                     DMSO
NS                            16
DS                             2
SWH                   10330.578 Hz
FIDRES                0.157632 Hz
AQ                    3.1719923 sec
RG                           228
DW                        48.400 usec
DE                         6.50 usec
TE                        269.9 K
D1                    1.00000000 sec
TD0                            1

======== CHANNEL f1 ========
NUC1                          1H
P1                         14.00 usec
PL1                         1.00 dB
PL1W                12.47038937 W
SFO1                500.1330885 MHz
SI                         32768
SF                  500.1300032 MHz
WDW                           no
SSB                            0
LB                          0.00 Hz
GB                             0
PC                          1.00
```

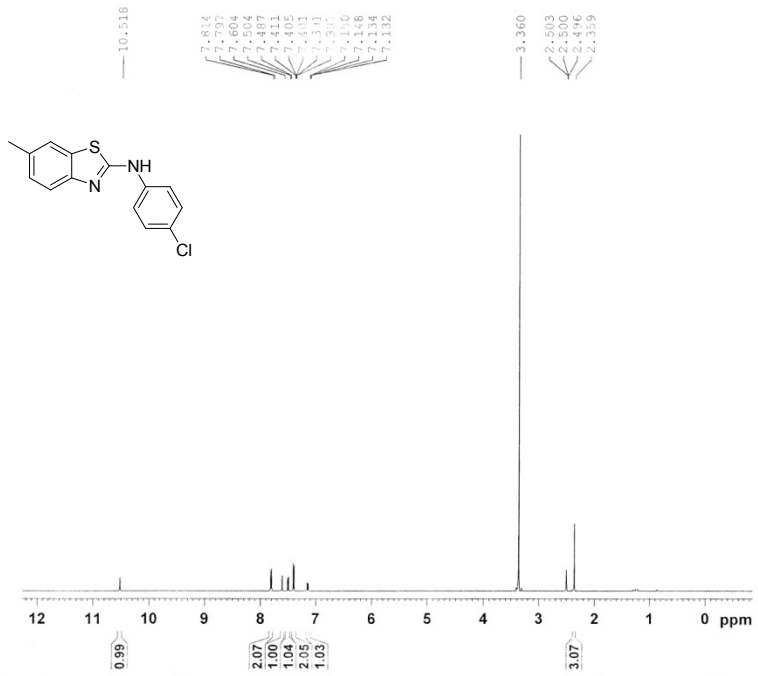






414

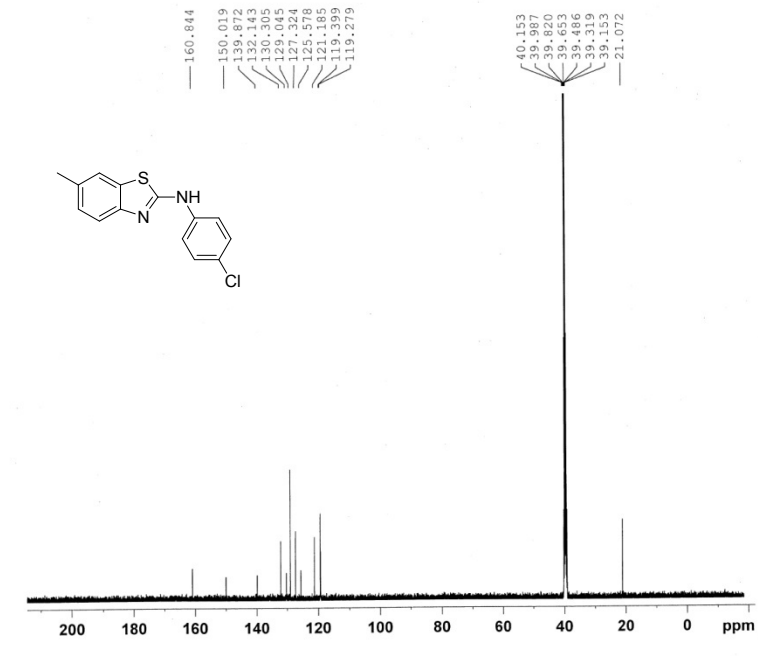
```
NAME          zengweilan20131020
EXPNO                          4
PROCNO                         1
Date_                   20131020
Time                       12.08
INSTRUM                    spect
PROBHD       5 mm PABBO BB-
PULPROG                   zgpg30
TD                         65536
SOLVENT                     DMSO
NS                           193
DS                             4
SWH                   29761.904 Hz
FIDRES                0.454131 Hz
AQ                    1.1010548 sec
RG                          2050
DW                        16.800 usec
DE                         6.50 usec
TE                        271.0 K
D1                    2.00000000 sec
D11                   0.03000000 sec
TD0                            1

======== CHANNEL f1 ========
NUC1                         13C
P1                          9.00 usec
PL1                         1.00 dB
PL1W                79.41143799 W
SFO1                125.7703643 MHz

======== CHANNEL f2 ========
CPDPRG2                 waltz16
NUC2                          1H
PCPD2                      80.00 usec
PL2                         1.00 dB
PL12                       16.14 dB
PL13                       16.14 dB
PL2W                12.47038937 W
PL12W                0.38183883 W
PL13W                0.38183883 W
SFO2                500.1320005 MHz
SI                         32768
SF                  125.7577814 MHz
WDW                           EM
SSB                            0
```



BRUKER

H-344

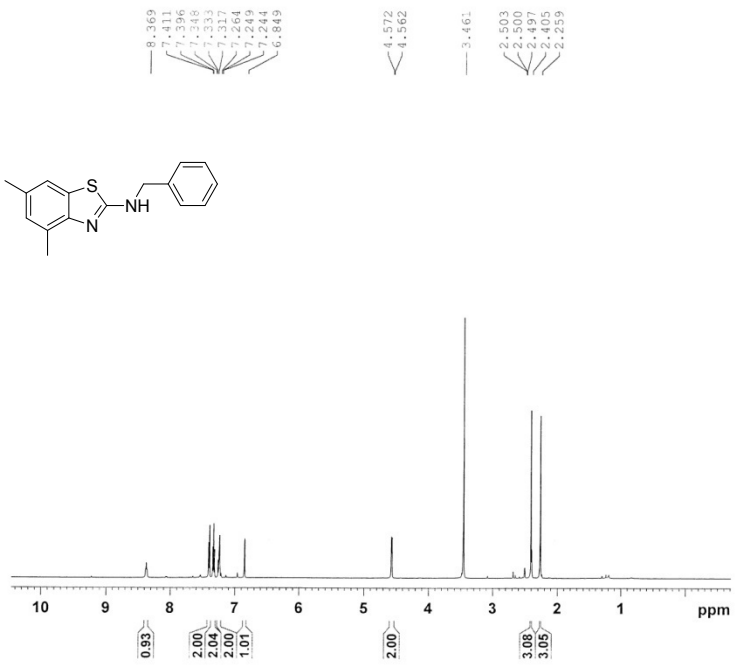
NAME	zengweilan20130827
EXPNO	3
PROCNO	1
Date_	20130827
Time	15.52
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	228
DW	48.400 usec
DE	6.50 usec
TE	269.0 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300038 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



BRUKER

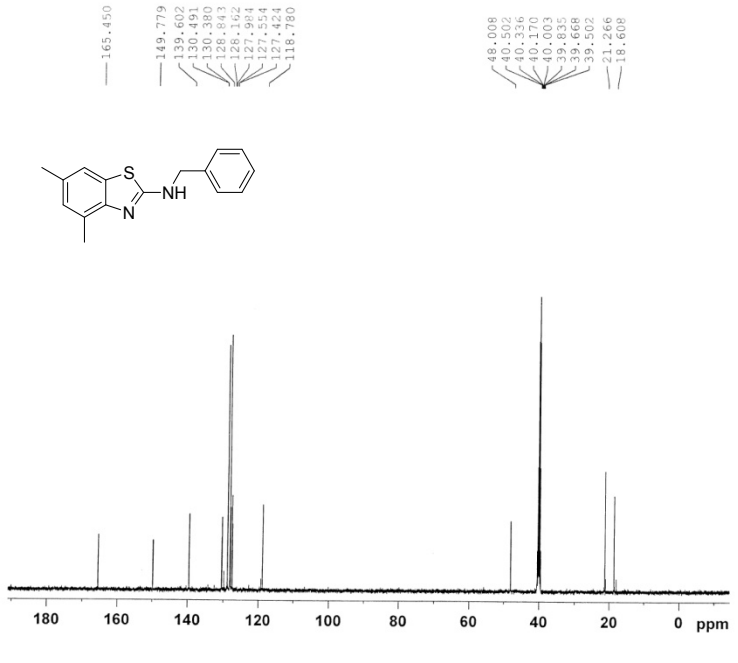
H-344

NAME	zengweilan20130827
EXPNO	4
PROCNO	1
Date_	20130904
Time	21.03
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	210
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	272.7 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7578149 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



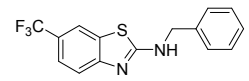
415

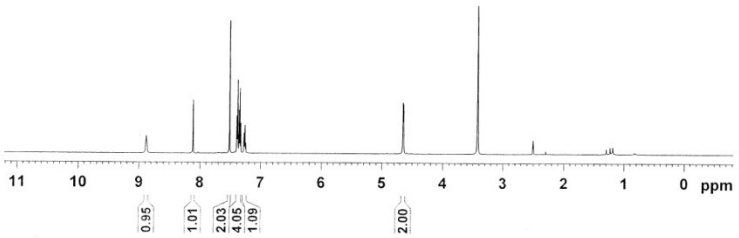
```
NAME          zengweilan20131020
EXPNO                          1
PROCNO                         1
Date_                   20131020
Time                       11.46
INSTRUM                    spect
PROBHD       5 mm PABBO BB-
PULPROG                     zg30
TD                         65536
SOLVENT                     DMSO
NS                            16
DS                             2
SWH                   10330.578 Hz
FIDRES                0.157632 Hz
AQ                    3.1719923 sec
RG                          40.3
DW                        48.400 usec
DE                         6.50 usec
TE                        269.8 K
D1                    1.00000000 sec
TD0                            1

======== CHANNEL f1 ========
NUC1                          1H
P1                         14.00 usec
PL1                         1.00 dB
PL1W                12.47038937 W
SFO1                500.1330885 MHz
SI                         32768
SF                  500.1300035 MHz
WDW                           no
SSB                            0
LB                          0.00 Hz
GB                             0
PC                          1.00
```



415

```
NAME          zengweilan20131020
EXPNO                          2
PROCNO                         1
Date_                   20131020
Time                       11.52
INSTRUM                    spect
PROBHD       5 mm PABBO BB-
PULPROG                  zgpg30
TD                         65536
SOLVENT                     DMSO
NS                           141
DS                             4
SWH                   29761.904 Hz
FIDRES                0.454131 Hz
AQ                    1.1010548 sec
RG                          2050
DW                        16.800 usec
DE                         6.50 usec
TE                        270.5 K
D1                    2.00000000 sec
D11                   0.03000000 sec
TD0                            1

======== CHANNEL f1 ========
NUC1                         13C
P1                          9.00 usec
PL1                         1.00 dB
PL1W                79.41143799 W
SFO1                125.7703643 MHz

======== CHANNEL f2 ========
CPDPRG2                  waltz16
NUC2                          1H
PCPD2                      80.00 usec
PL2                         1.00 dB
PL12                       16.14 dB
PL13                       16.14 dB
PL2W                12.47038937 W
PL12W                0.38183883 W
PL13W                0.38183883 W
SFO2                500.1320005 MHz
SI                         32768
SF                  125.7577804 MHz
WDW                           EM
SSB                            0
LB                          1.00 Hz
```



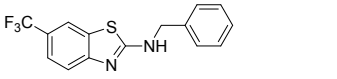


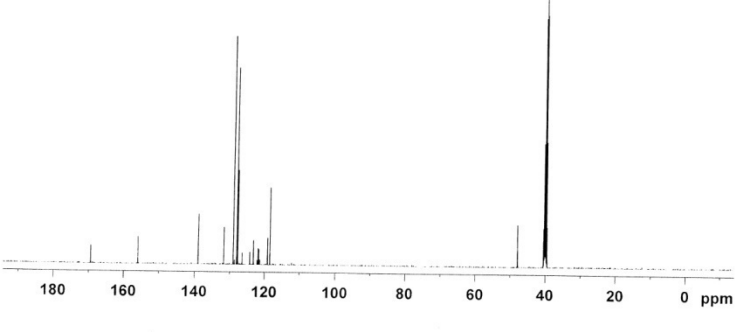
417

NAME	zengweilan20131020
EXPNO	11
PROCNO	1
Date_	20131020
Time	12.34
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	228
DW	48.400 usec
DE	6.50 usec
TE	269.8 K
D1	1.00000000 sec
TD0	1

======== CHANNEL f1 ========

NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300035 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00





417

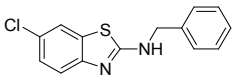
NAME	zengweilan20131020
EXPNO	12
PROCNO	1
Date_	20131020
Time	12.39
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	172
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	270.7 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

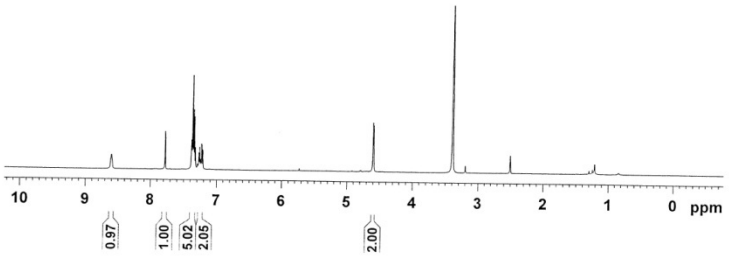
======== CHANNEL f1 ========

NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz

======== CHANNEL f2 ========

CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577823 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

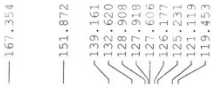


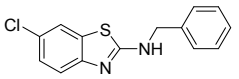


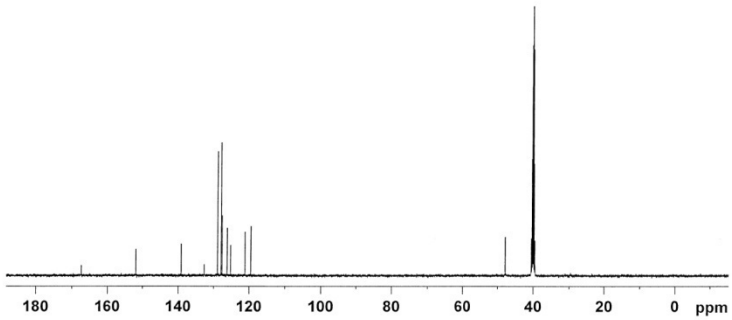
BRUKER

420

NAME	zengweilan20131020
EXPNO	13
PROCNO	1
Date_	20131020
Time	12.50
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	256
DW	48.400 usec
DE	6.50 usec
TE	270.5 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300036 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



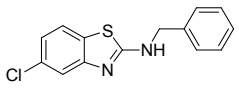


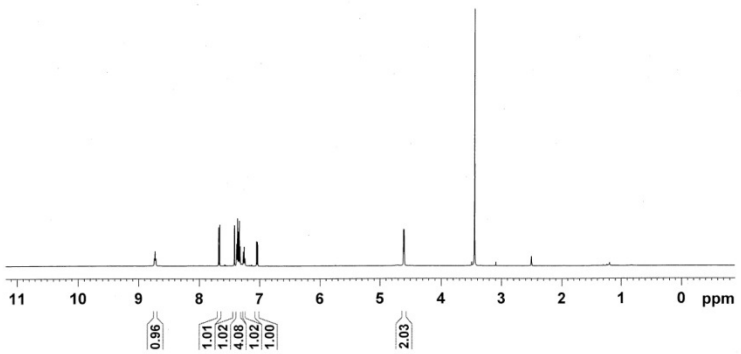


BRUKER

420

NAME	zengweilan20131020
EXPNO	14
PROCNO	1
Date_	20131020
Time	12.57
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	170
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	270.6 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577850 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

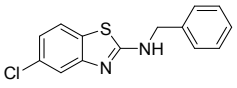


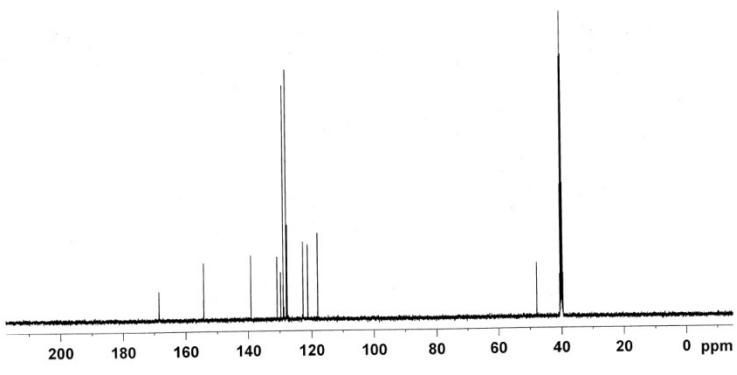


BRUKER

416

NAME	zengweilan20131020
EXPNO	9
PROCNO	1
Date_	20131020
Time	12.20
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	65536
SOLVENT	DMSO
NS	16
DS	2
SWH	10330.578 Hz
FIDRES	0.157632 Hz
AQ	3.1719923 sec
RG	50.8
DW	48.400 usec
DE	6.50 usec
TE	269.8 K
D1	1.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	14.00 usec
PL1	1.00 dB
PL1W	12.47038937 W
SFO1	500.1330885 MHz
SI	32768
SF	500.1300035 MHz
WDW	no
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

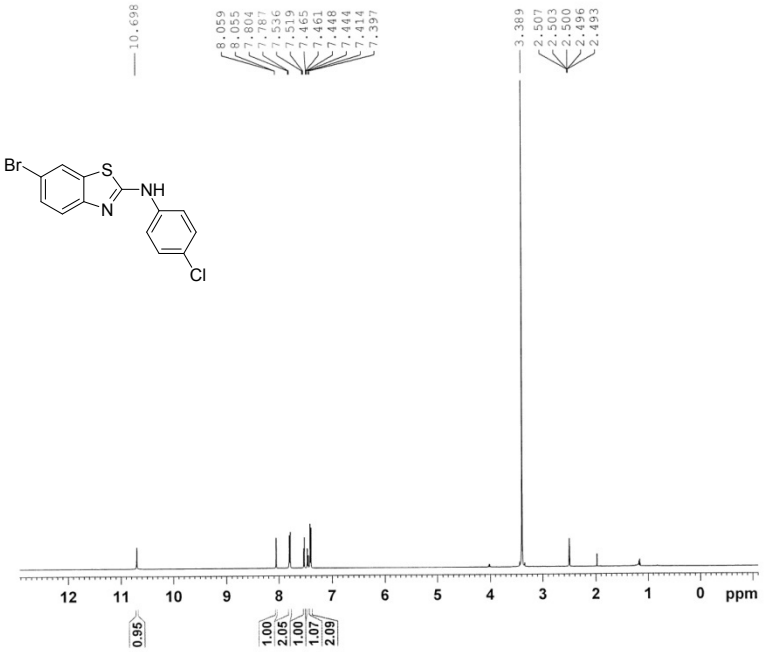




BRUKER

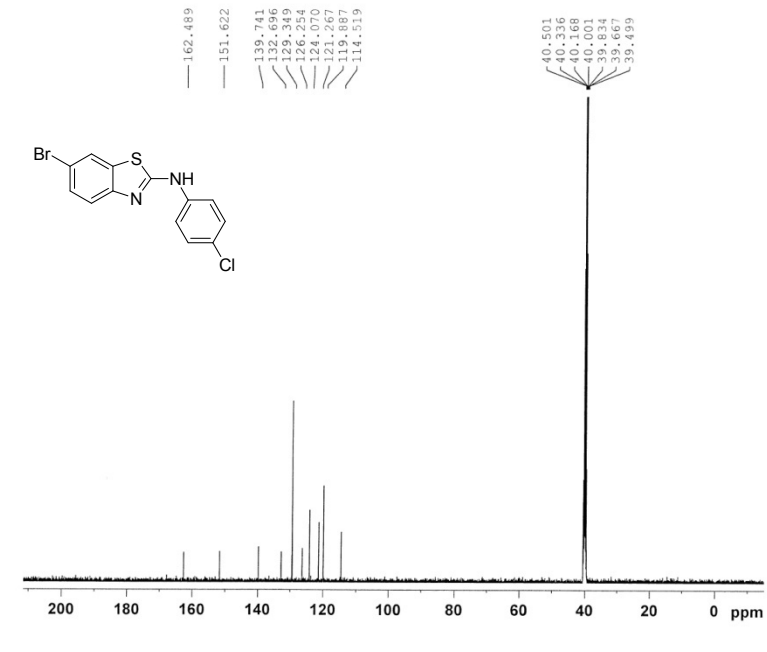
416

NAME	zengweilan20131020
EXPNO	10
PROCNO	1
Date_	20131020
Time	12.26
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	DMSO
NS	150
DS	4
SWH	29761.904 Hz
FIDRES	0.454131 Hz
AQ	1.1010548 sec
RG	2050
DW	16.800 usec
DE	6.50 usec
TE	270.4 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.00 usec
PL1	1.00 dB
PL1W	79.41143799 W
SFO1	125.7703643 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	1.00 dB
PL12	16.14 dB
PL13	16.14 dB
PL2W	12.47038937 W
PL12W	0.38183883 W
PL13W	0.38183883 W
SFO2	500.1320005 MHz
SI	32768
SF	125.7577831 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



361

```
NAME          zengweilan20130910
EXPNO                          3
PROCNO                         1
Date_                   20130910
Time                       19.50
INSTRUM                    spect
PROBHD     5 mm PABBO BB-
PULPROG                     zg30
TD                         65536
SOLVENT                     DMSO
NS                            16
DS                             2
SWH                   10330.578 Hz
FIDRES                0.157632 Hz
AQ                    3.1719923 sec
RG                           161
DW                        48.400 usec
DE                         6.50 usec
TE                        271.0 K
D1                  1.00000000 sec
TD0                            1

======== CHANNEL f1 ========
NUC1                         1H
P1                        14.00 usec
PL1                        1.00 dB
PL1W                12.47038937 W
SFO1                500.1330885 MHz
SI                         32768
SF                  500.1300035 MHz
WDW                           no
SSB                            0
LB                         0.00 Hz
GB                             0
PC                         1.00
```



361

```
NAME          zengweilan20130910
EXPNO                          4
PROCNO                         1
Date_                   20130910
Time                       19.54
INSTRUM                    spect
PROBHD     5 mm PABBO BB-
PULPROG                   zgpg30
TD                         65536
SOLVENT                     DMSO
NS                           200
DS                             4
SWH                   29761.904 Hz
FIDRES                0.454131 Hz
AQ                    1.1010548 sec
RG                          2050
DW                        16.800 usec
DE                         6.50 usec
TE                        272.1 K
D1                  2.00000000 sec
D11                 0.03000000 sec
TD0                            1

======== CHANNEL f1 ========
NUC1                        13C
P1                         9.00 usec
PL1                        1.00 dB
PL1W                79.41143799 W
SFO1                125.7703643 MHz

======== CHANNEL f2 ========
CPDPRG2                 waltz16
NUC2                         1H
PCPD2                     80.00 usec
PL2                        1.00 dB
PL12                      16.14 dB
PL13                      16.14 dB
PL2W                12.47038937 W
PL12W                0.38183883 W
PL13W                0.38183883 W
SFO2                500.1320005 MHz
SI                         32768
SF                  125.7577869 MHz
WDW                           EM
SSB                            0
LB                         1.00 Hz
GB                             0
PC                         1.40
```