***Supporting information for***

# Mixed Carboxylic-Sulfonic Anhydride in Reactions with Imines: A Straightforward Route to Water-Soluble β-Lactams via a Staudinger-Type Reaction

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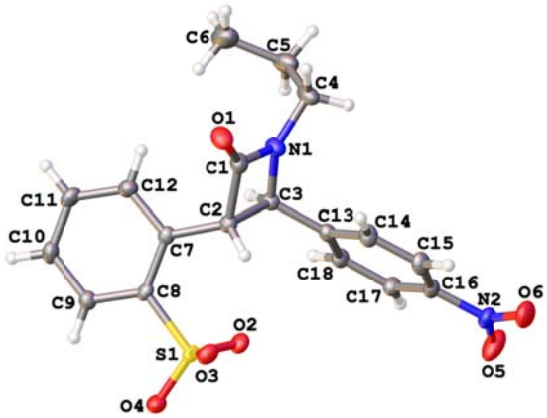
**Crystallographic data for compound *trans*-20h**

Suitable crystals of *trans*-**20h** were studied using SuperNova, Dual, Cu at zero, Atlas diffractometer (monochromated Cu *Kα* radiation, λ = 1.54184 Å). The structure has been solved with the ShelXT [1] structure solution program using Intrinsic Phasing and refined with the ShelXL [1] refinement package incorporated in the OLEX2 program package [2] using Least Squares minimization. Empirical absorption correction was applied in CrysAlisPro [3] program complex using spherical harmonics, implemented in SCALE3 ABSPACK scaling algorithm. CCDC 1548177 contains the supplementary crystallographic data for this paper. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre via http://www.ccdc.cam.ac.uk.

**Table S1**. Crystal data and structure refinement for *trans*-**20h**



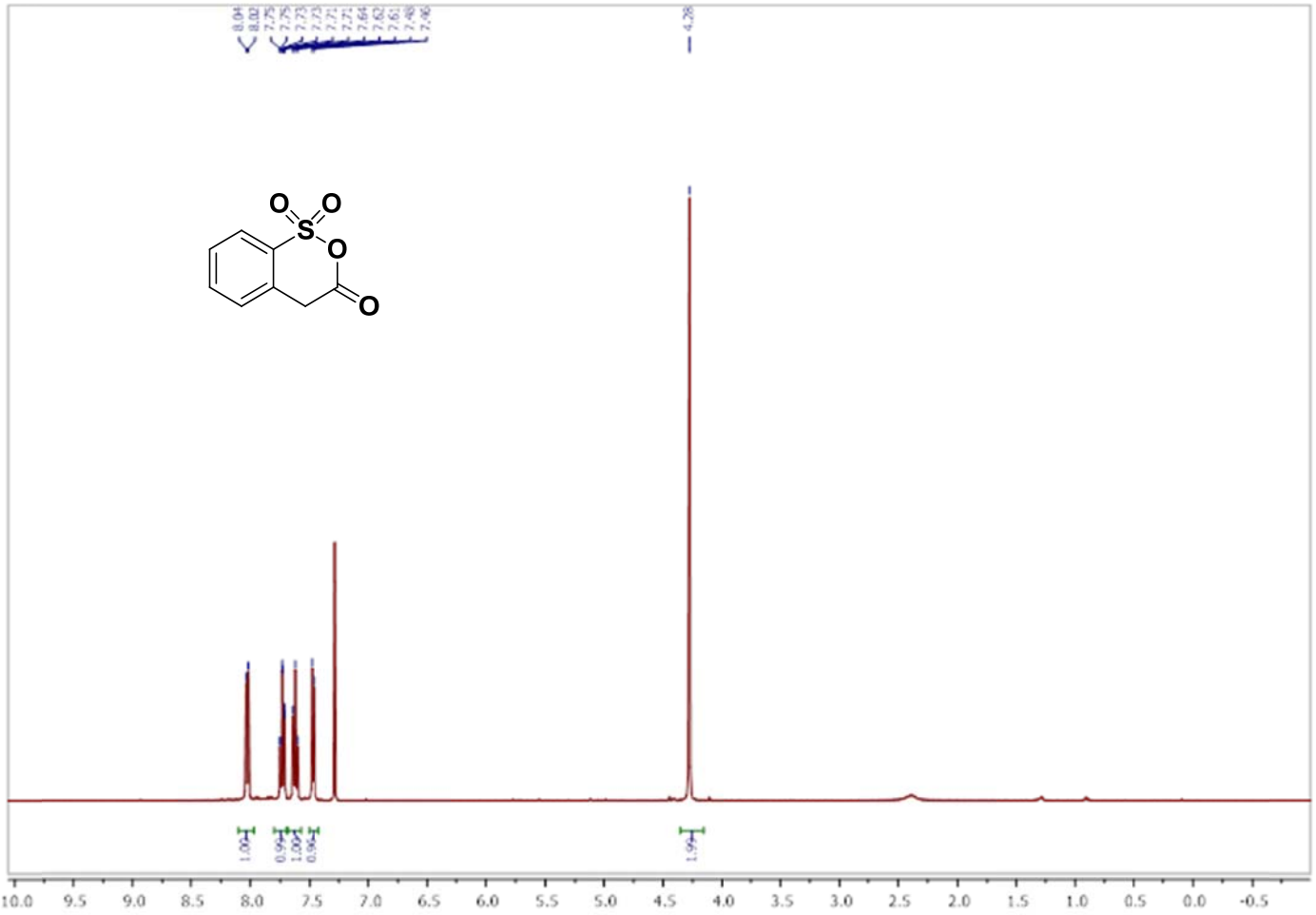

| Identification code | *trans*-**20h** |
|---|---|
| Empirical formula | $C_{24}H_{33}N_3O_6S$ |
| Formula weight | 491.59 |
| Temperature/K | 100.00(10) |
| Crystal system | monoclinic |
| Space group | $P2_1/c$ |
| a/Å | 19.0398(14) |
| b/Å | 8.7917(5) |
| c/Å | 15.4377(11) |
| α/° | 90 |
| β/° | 103.834(7) |
| γ/° | 90 |
| Volume/Å$^3$ | 2509.2(3) |
| Z | 4 |
| $\rho_{calc}$g/cm$^3$ | 1.301 |
| μ/mm$^{-1}$ | 1.513 |
| F(000) | 1048.0 |
| Crystal size/mm$^3$ | 0.12 × 0.06 × 0.04 |
| Radiation | Cu Kα (λ = 1.5418) |
| 2Θ range for data collection/° | 9.568 to 144.976 |
| Index ranges | –23 ≤ h ≤ 19, –10 ≤ k ≤ 9, –16 ≤ l ≤ 19 |
| Reflections collected | 10954 |
| Independent reflections | 4956 [$R_{int}$ = 0.0418, $R_{sigma}$ = 0.0494] |

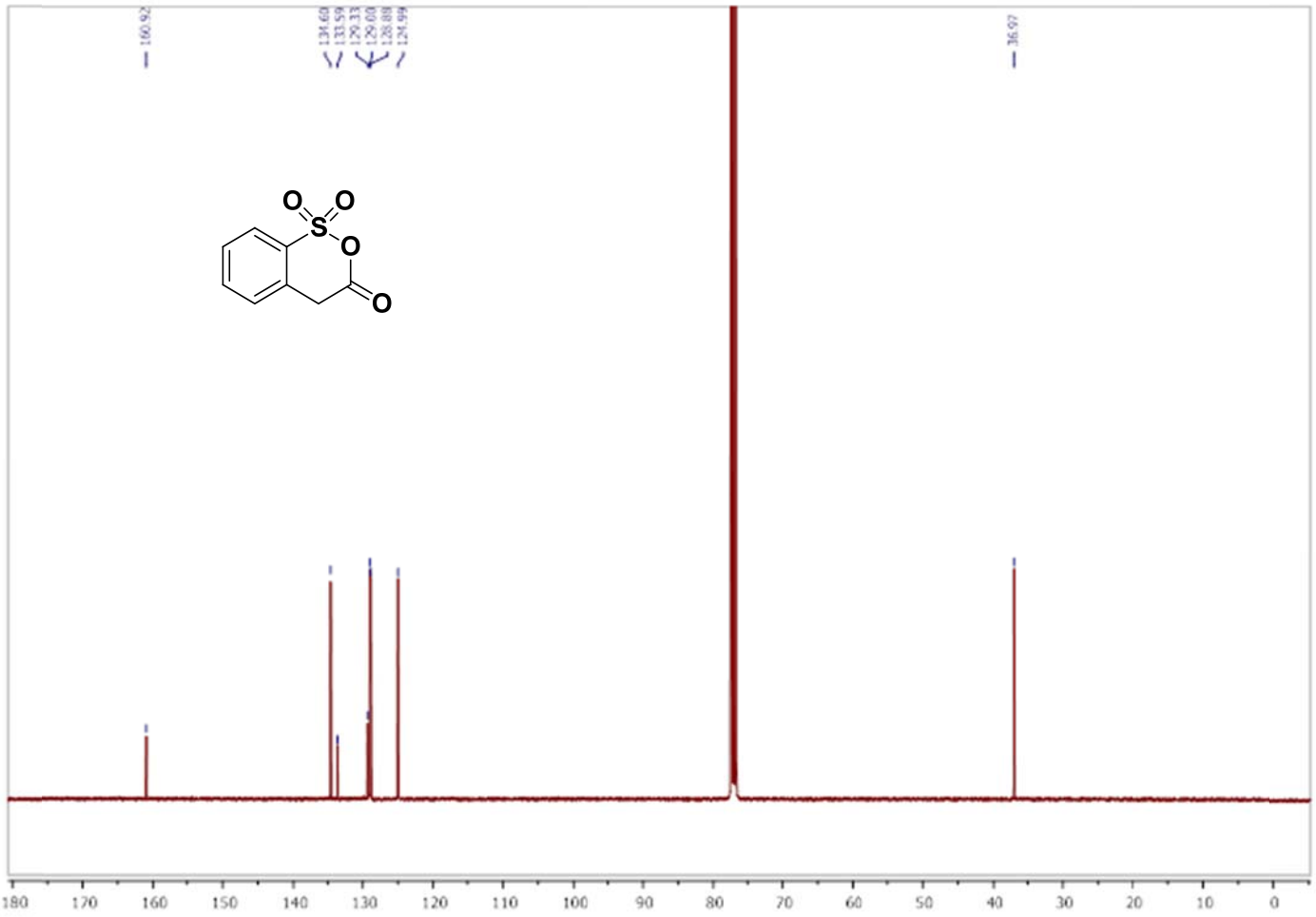
| | |
|---|---|
| Data/restraints/parameters | 4956/3/315 |
| Goodness-of-fit on $F^2$ | 1.020 |
| Final R indexes [$I \geq 2\sigma$ (I)] | $R_1 = 0.0557$, $wR_2 = 0.1369$ |
| Final R indexes [all data] | $R_1 = 0.0673$, $wR_2 = 0.1480$ |
| Largest diff. peak/hole / e•Å$^{-3}$ | 1.04/–0.98 |
| **CCDC** | **1548177** |

## References

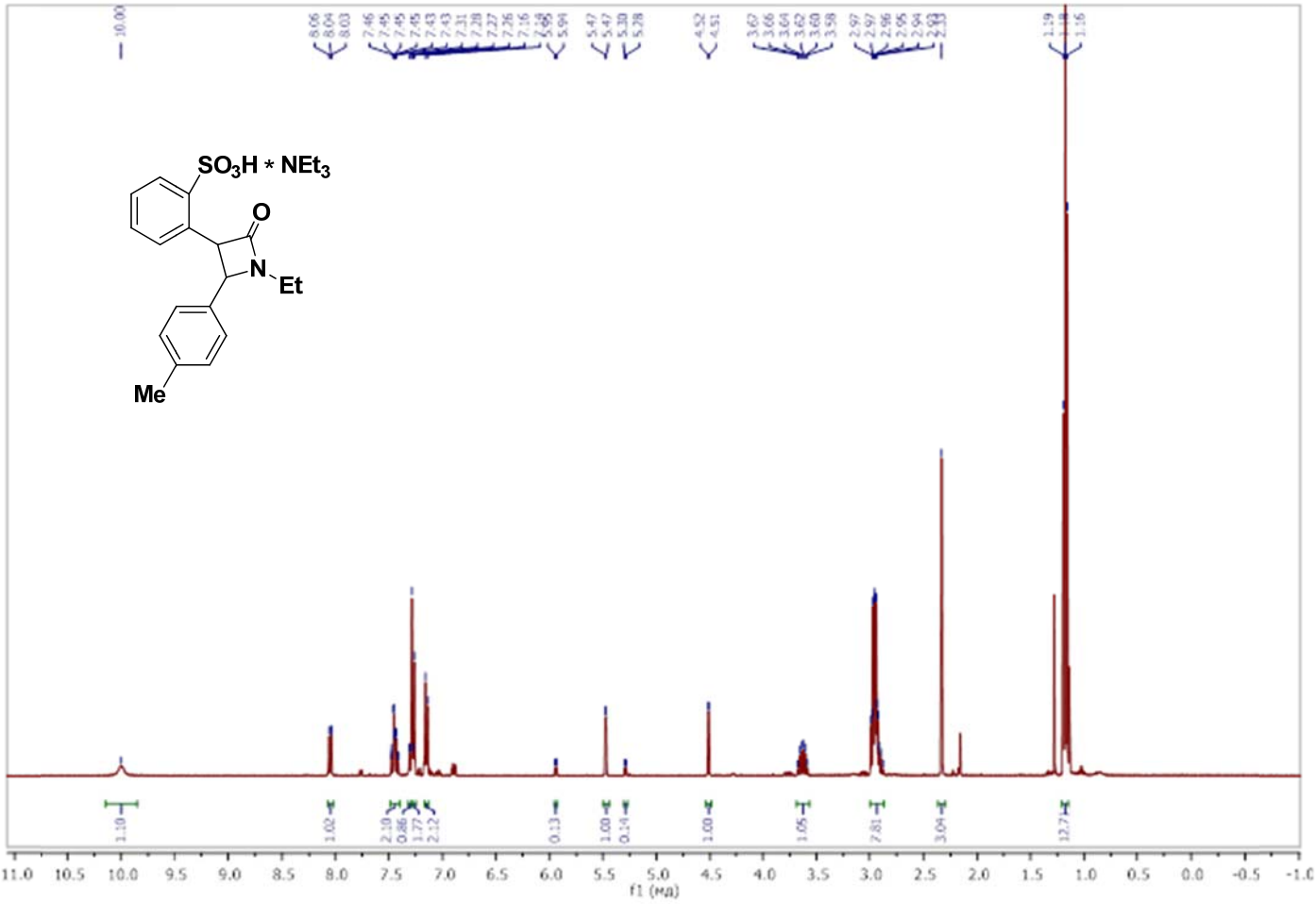

1. Sheldrick, G. M. *Acta Crystallographica Section C* 2015, *71*, 3–8.
2. O. V. Dolomanov, L. J. Bourhis, R. J. Gildea, J. A. K. Howard and H. Puschmann, *J. Appl. Cryst.*, 2009, *42*, 339–341.
3. CrysAlisPro, Agilent Technologies Ltd., Version 1.171.36.32 (release 02-08-2013 CrysAlis171.NET).

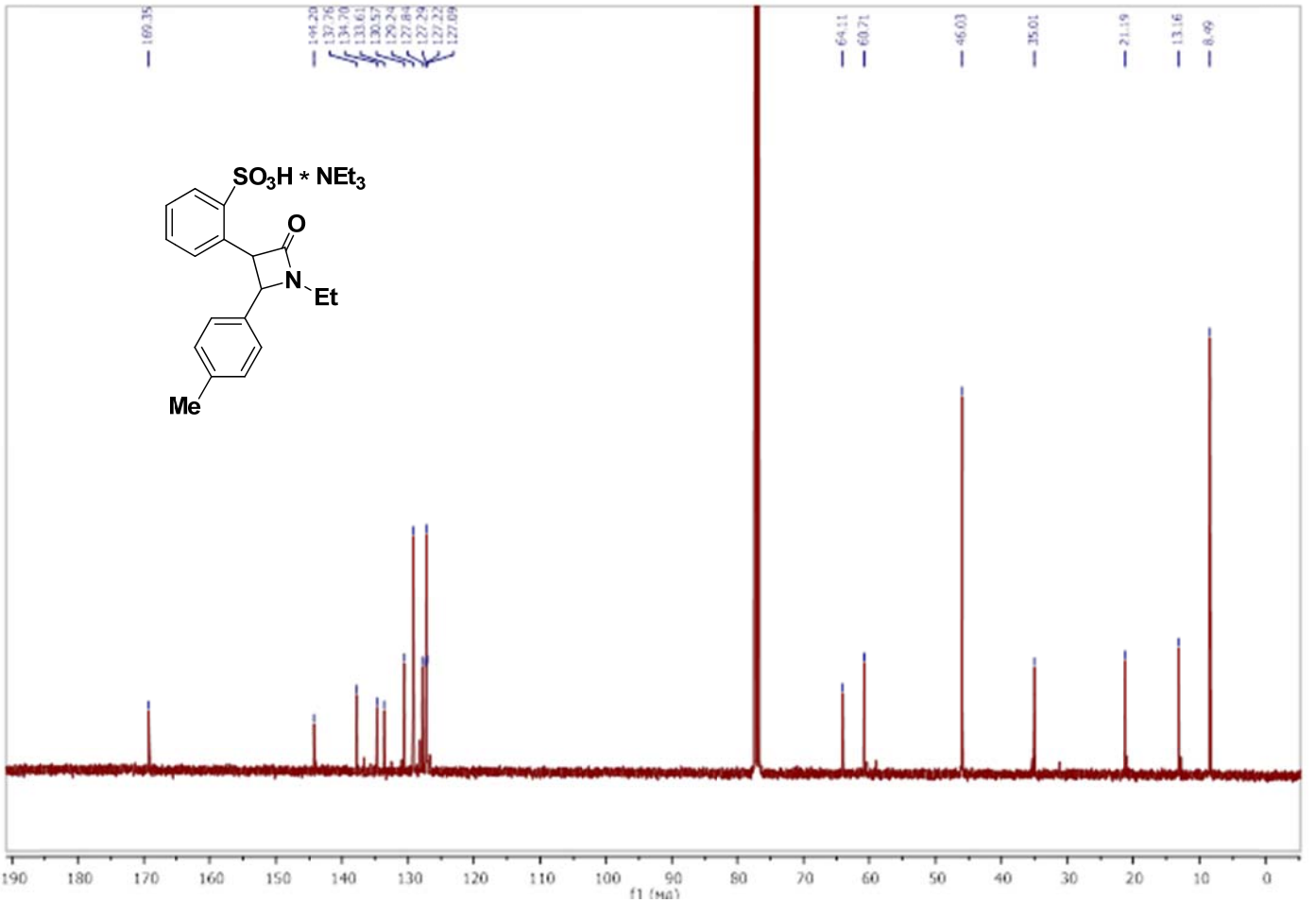
$^{1}H$ and $^{13}C$ NMR of compound **14**



$^{1}$H and $^{13}$C NMR of compound *trans/cis*-**20a**



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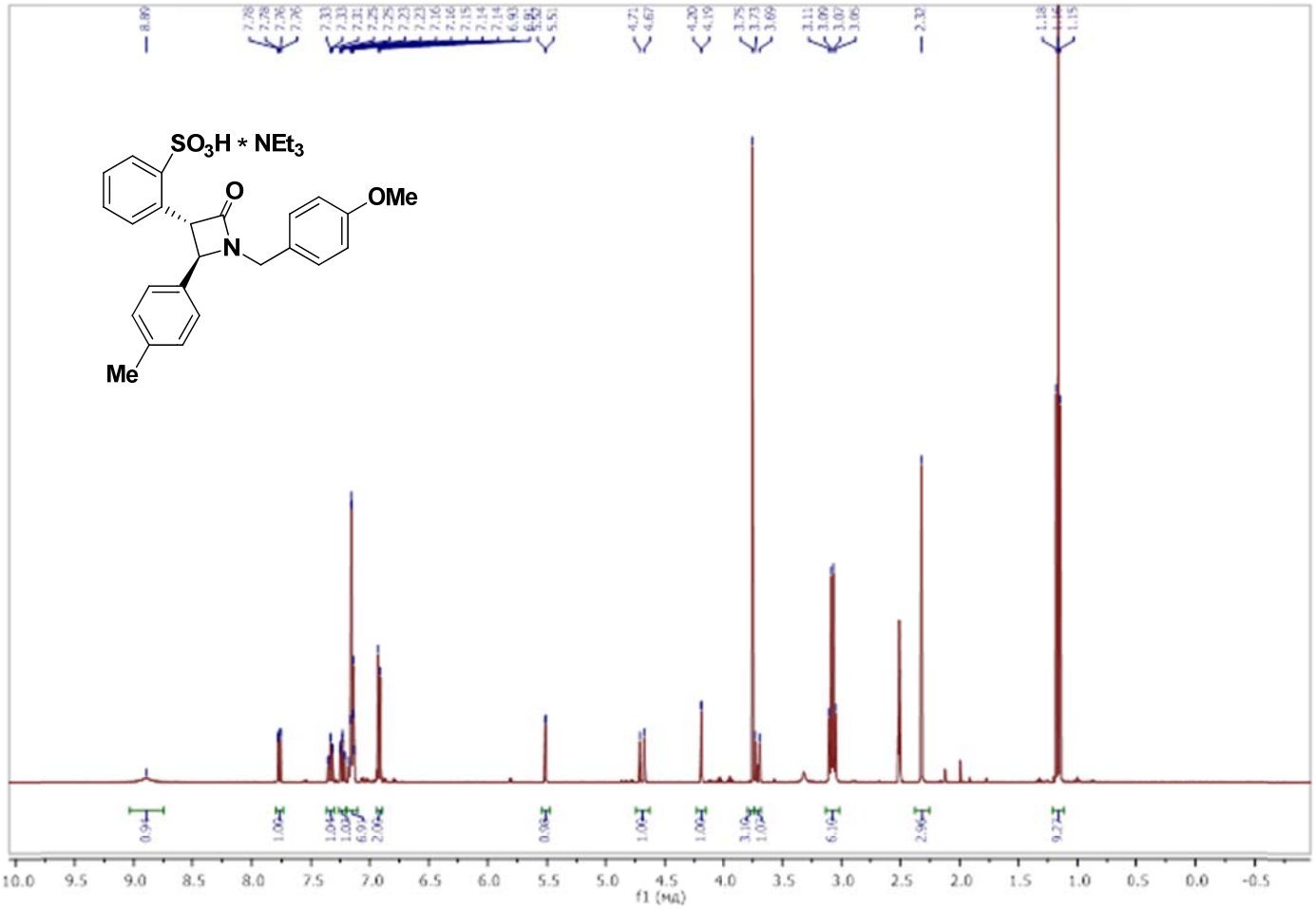
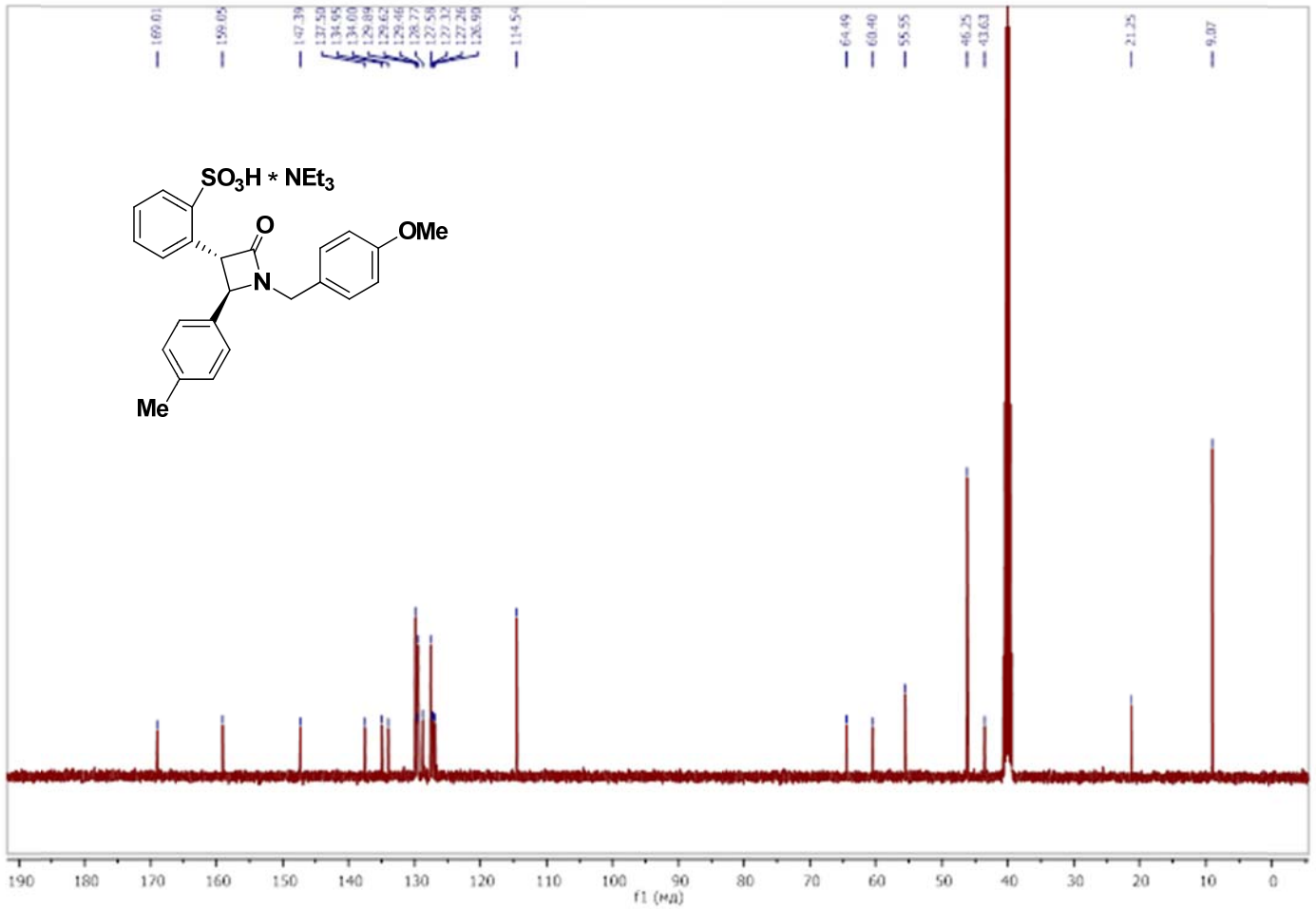
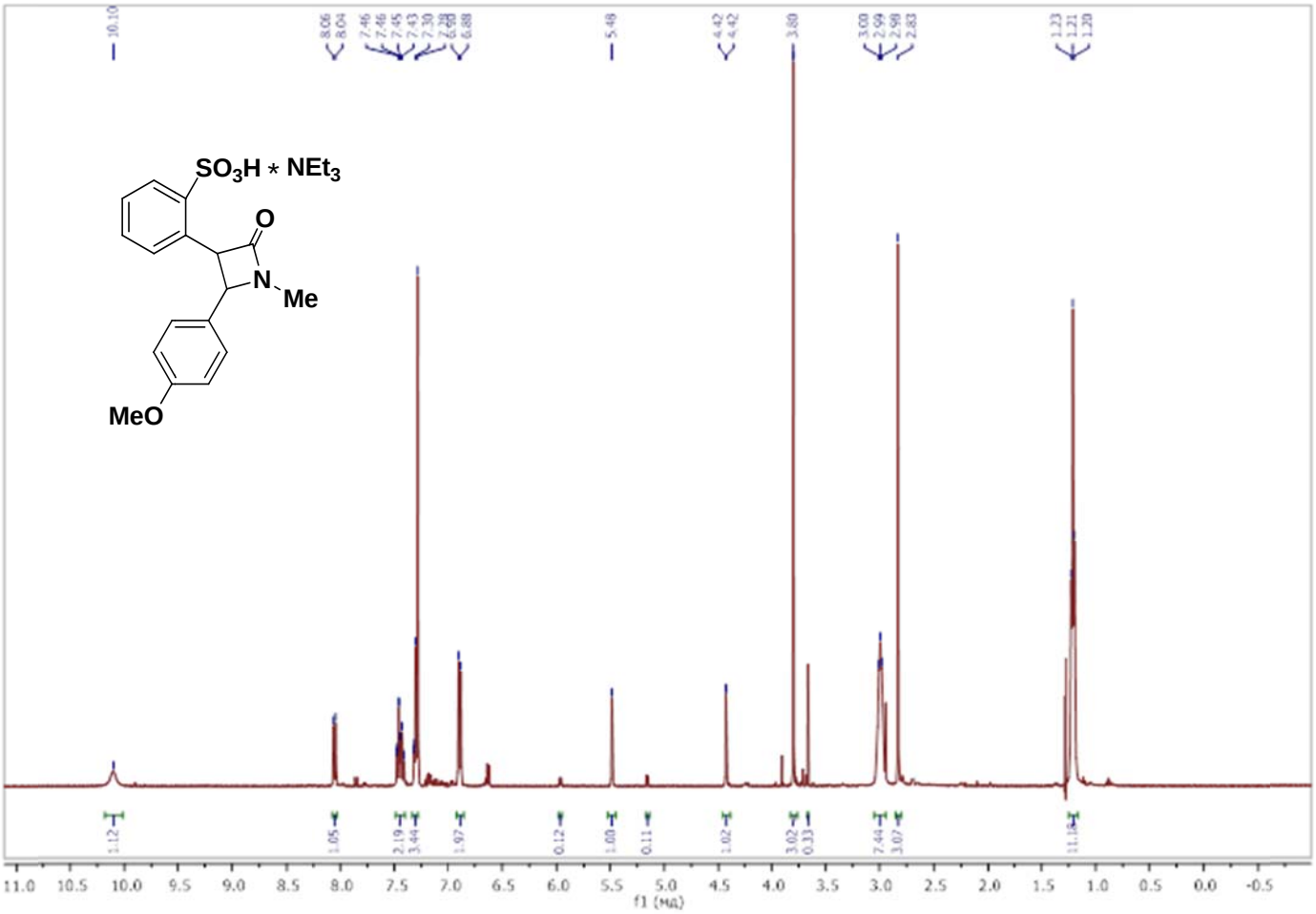
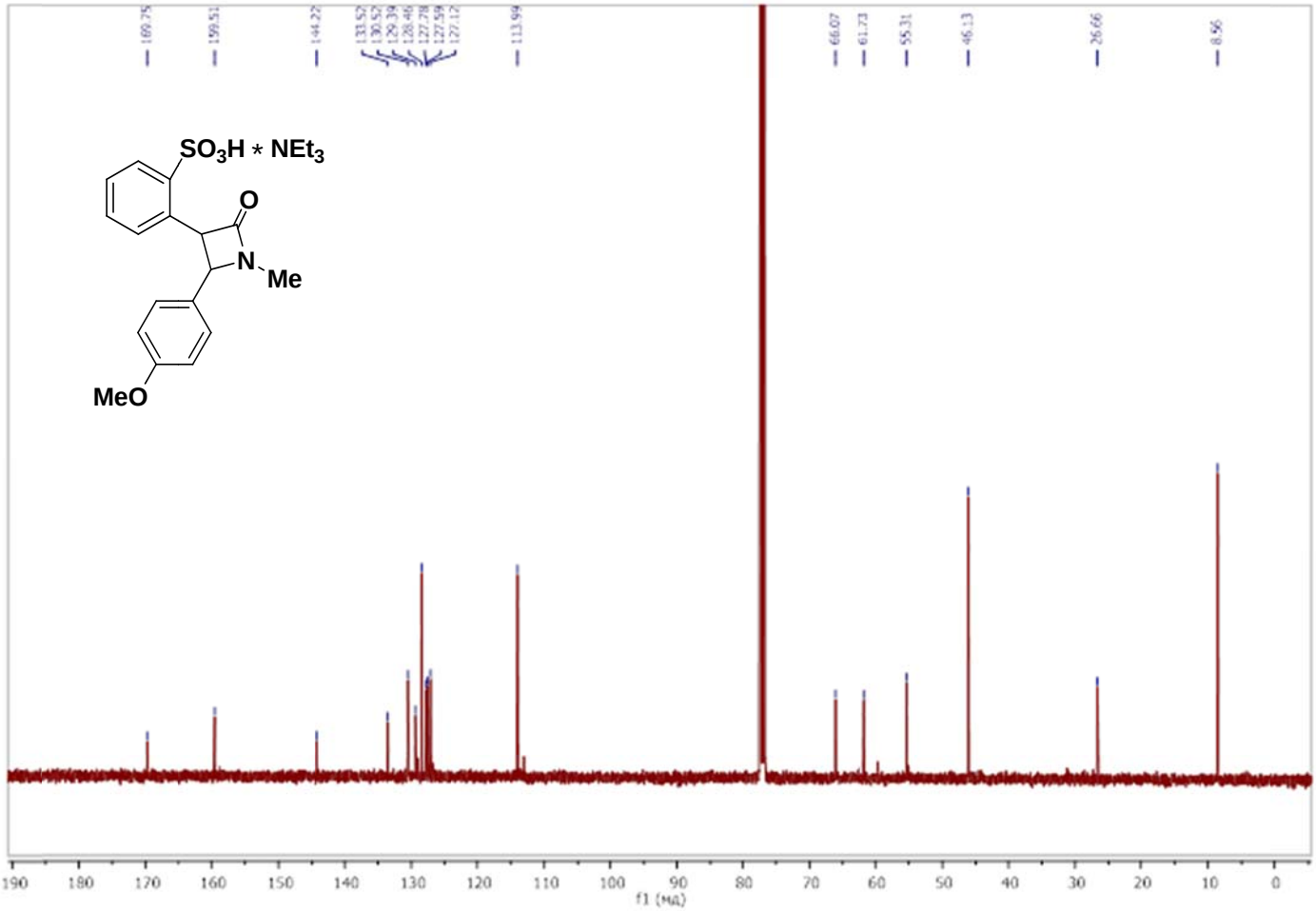


$^{1}$H and $^{13}$C NMR of compound *trans/cis*-**20c**



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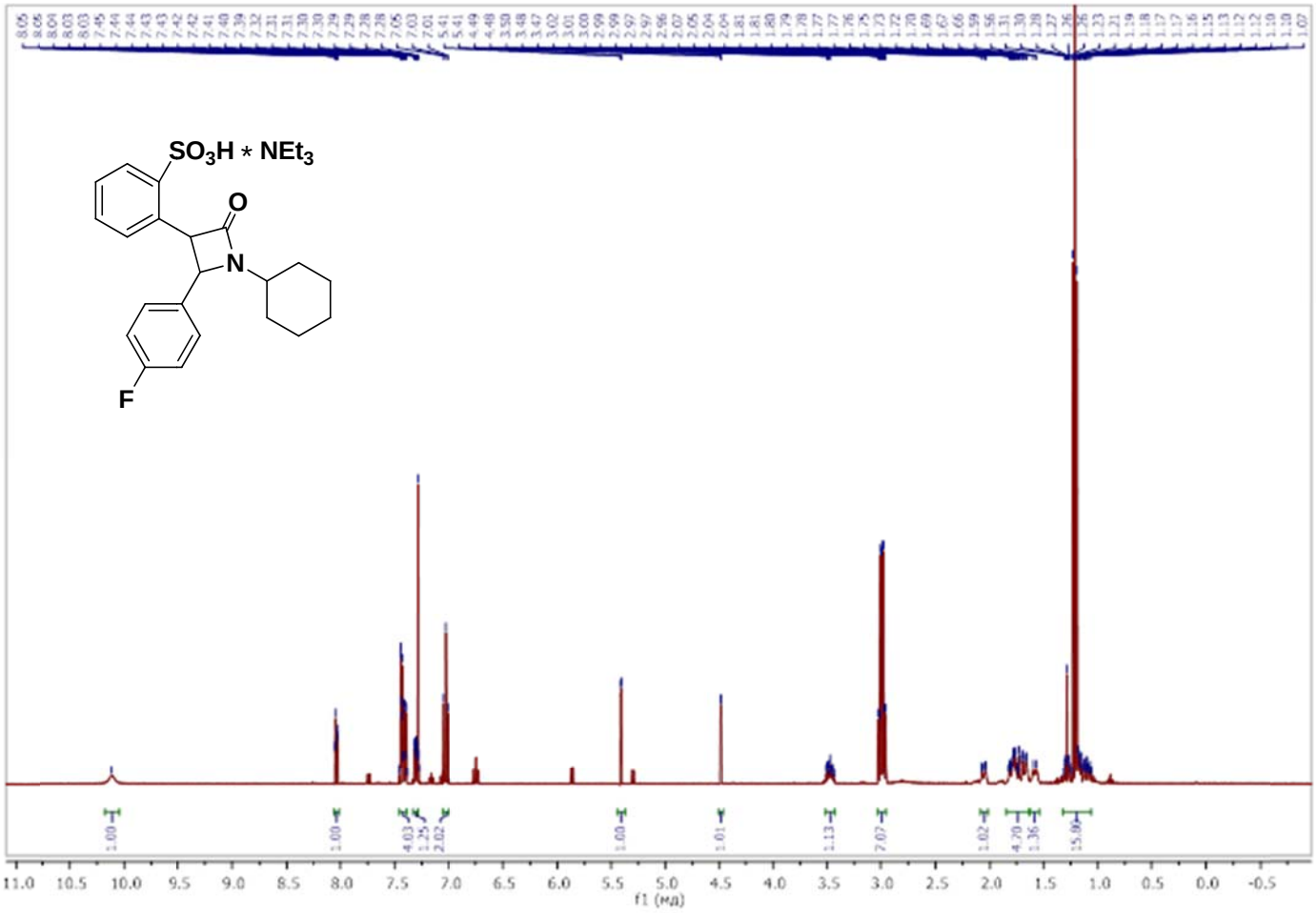


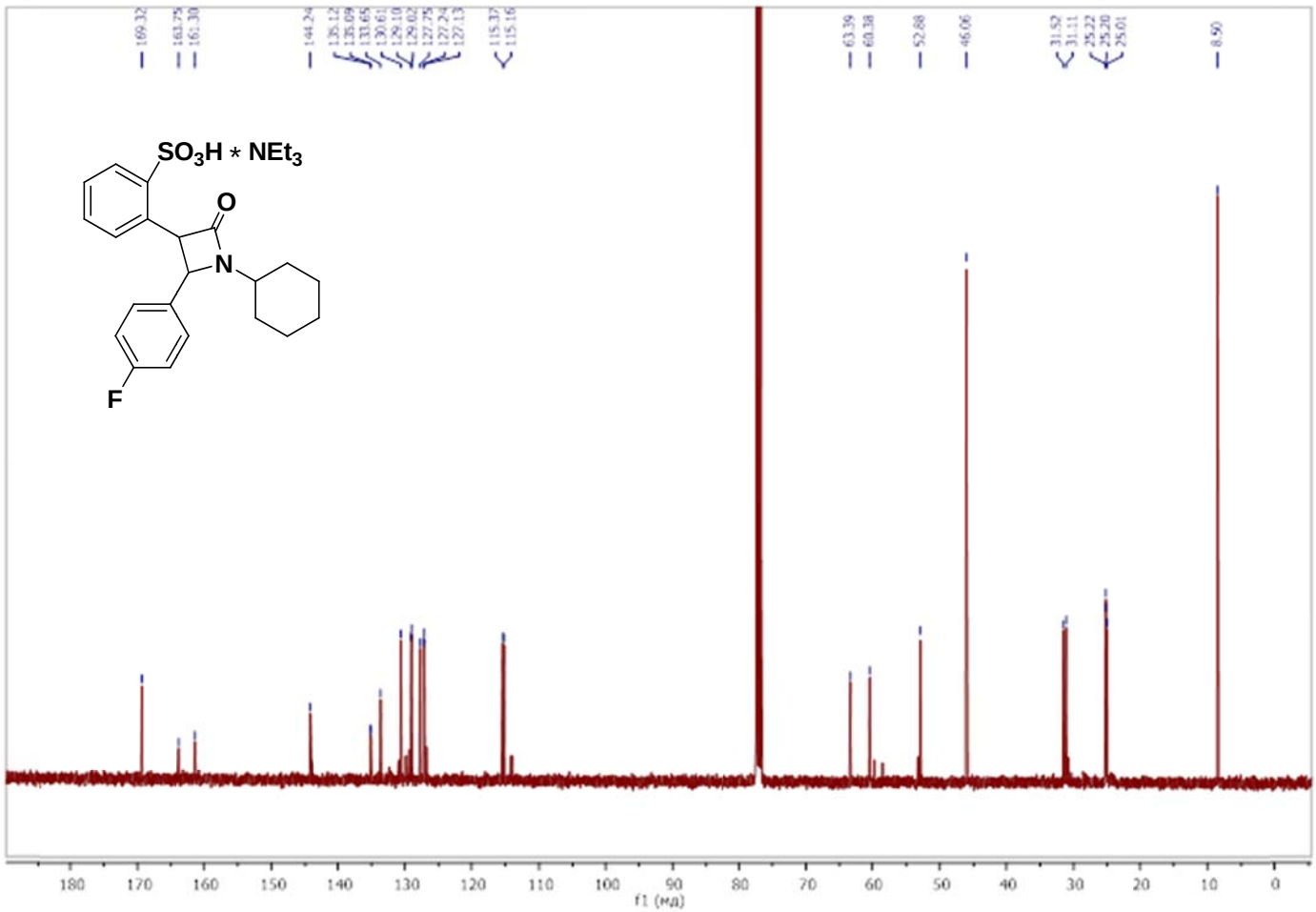

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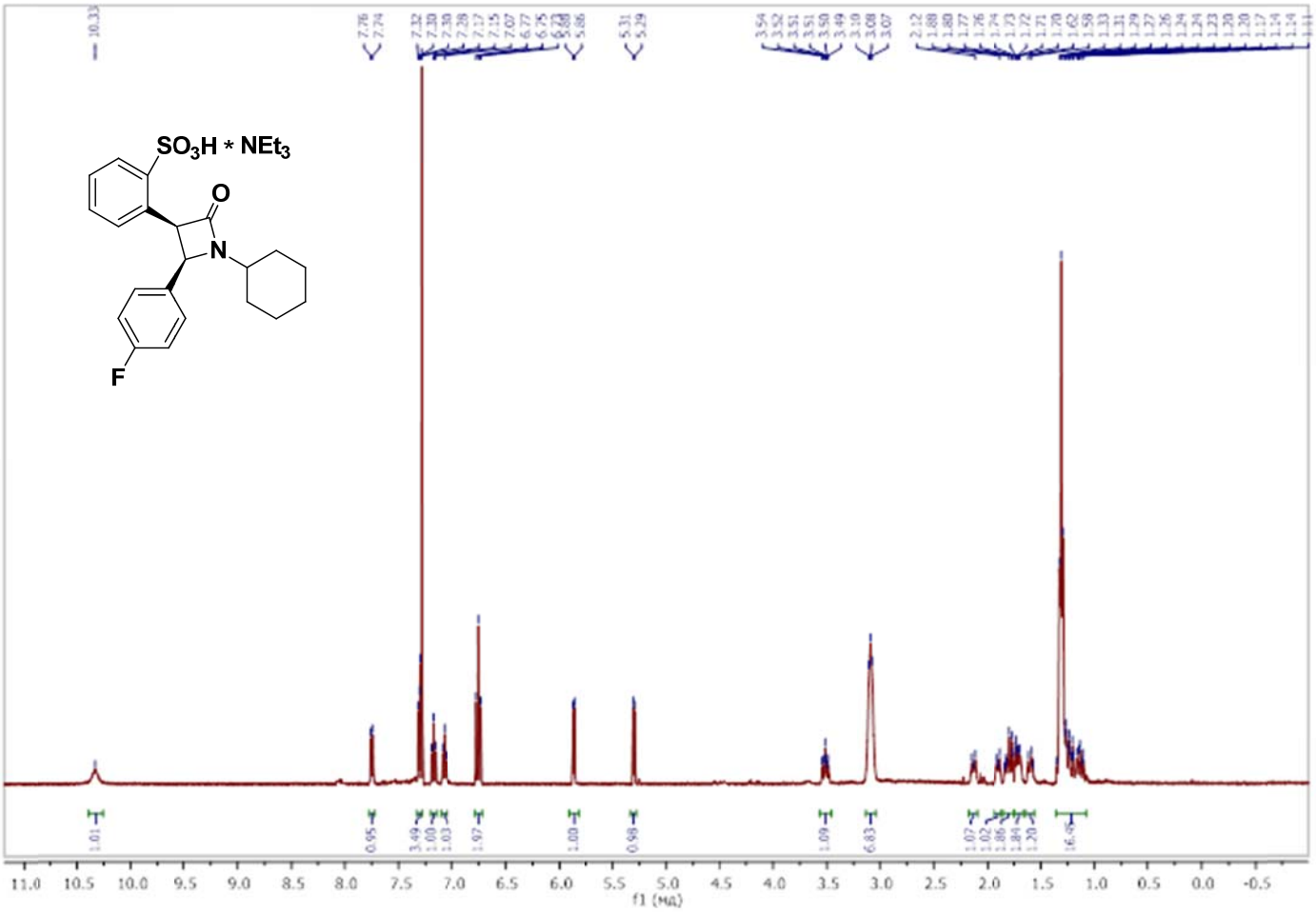
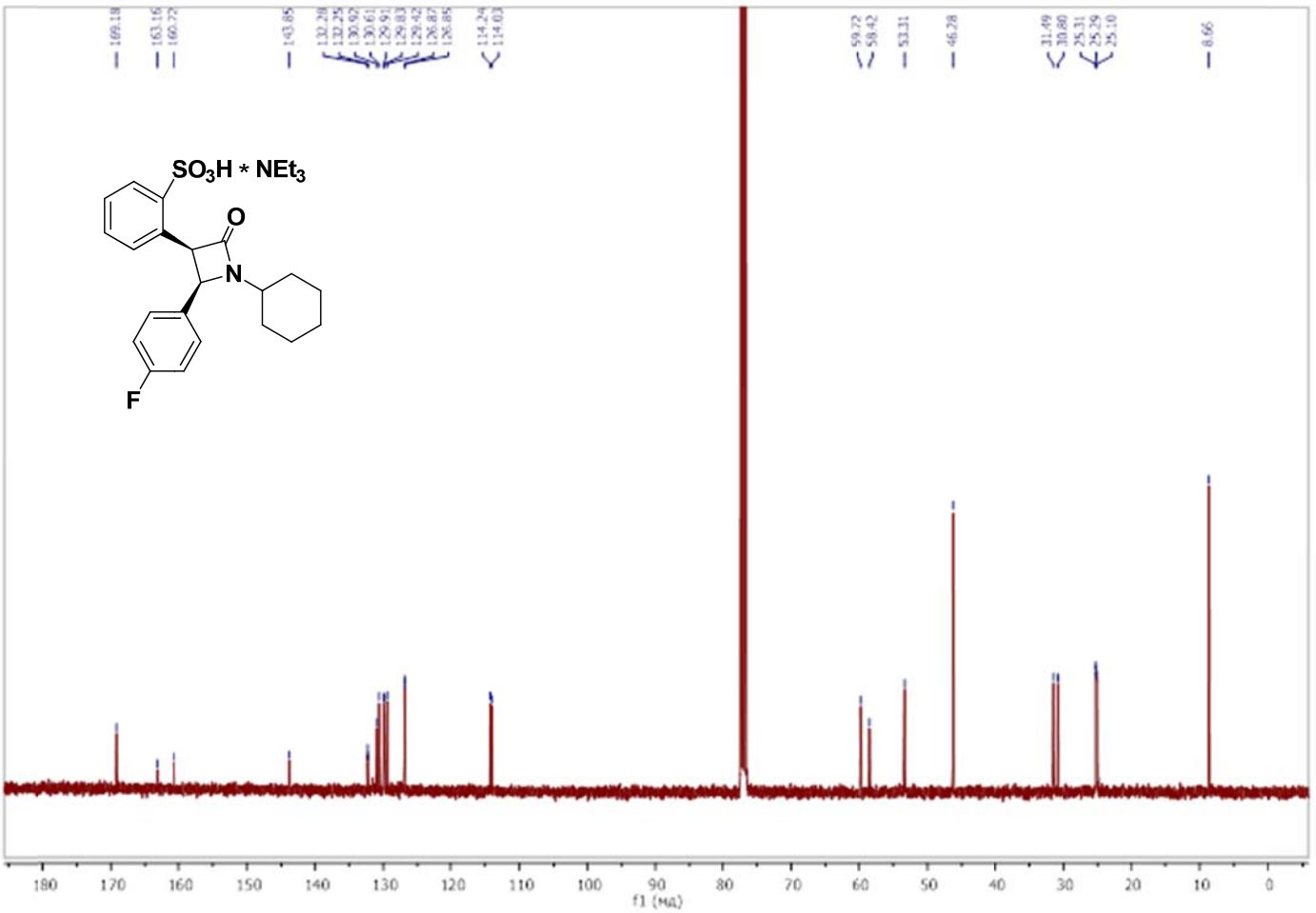
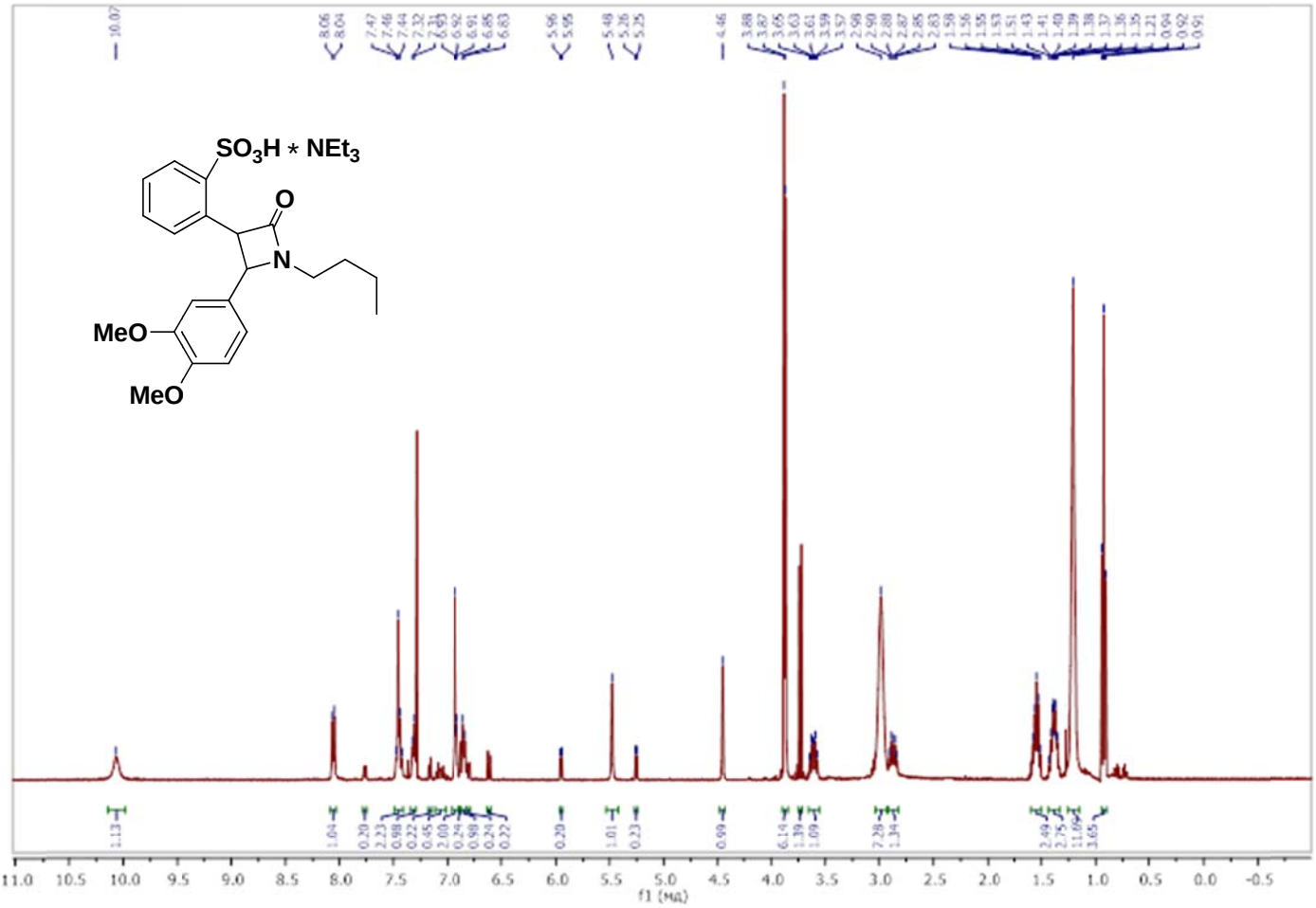
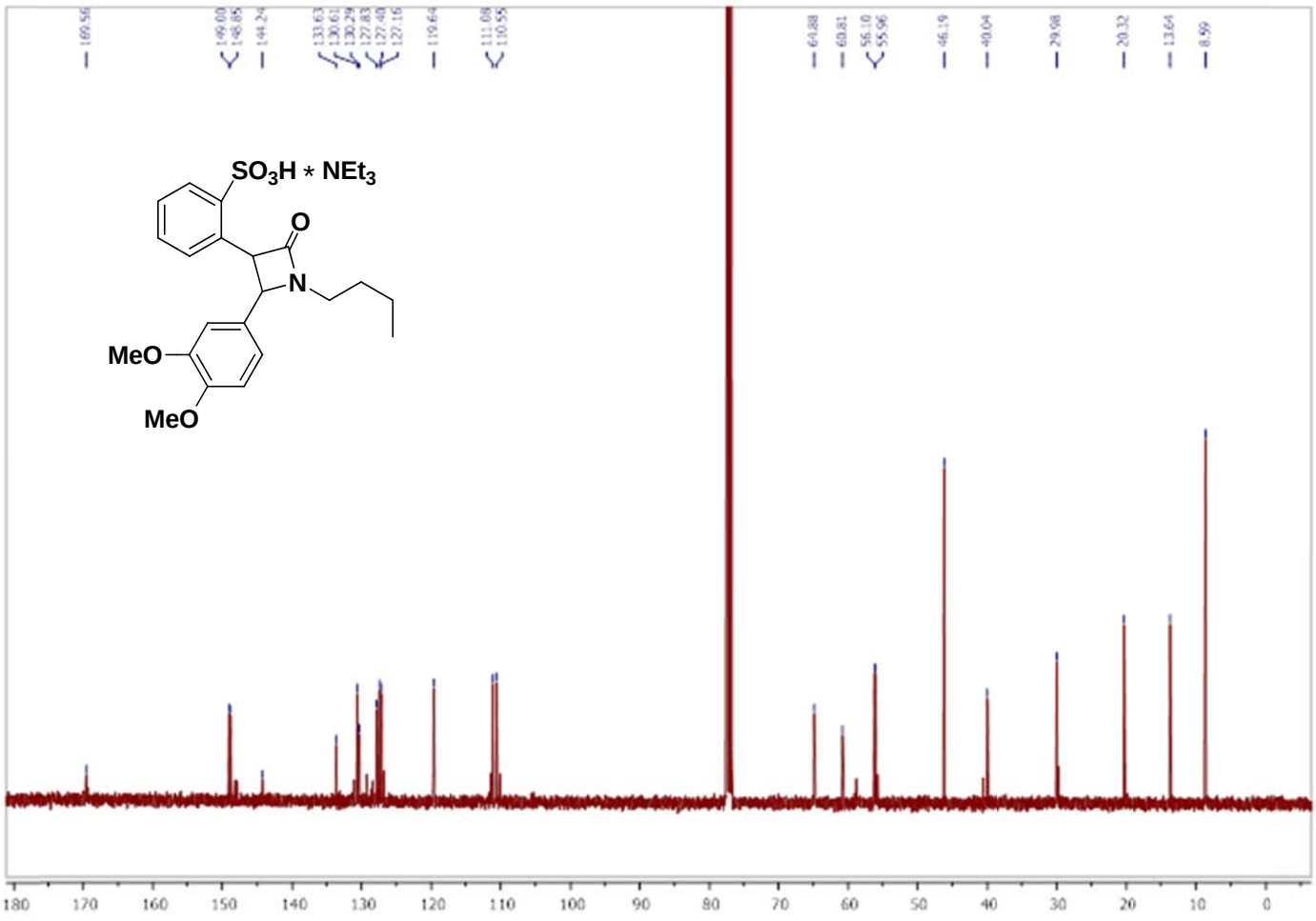


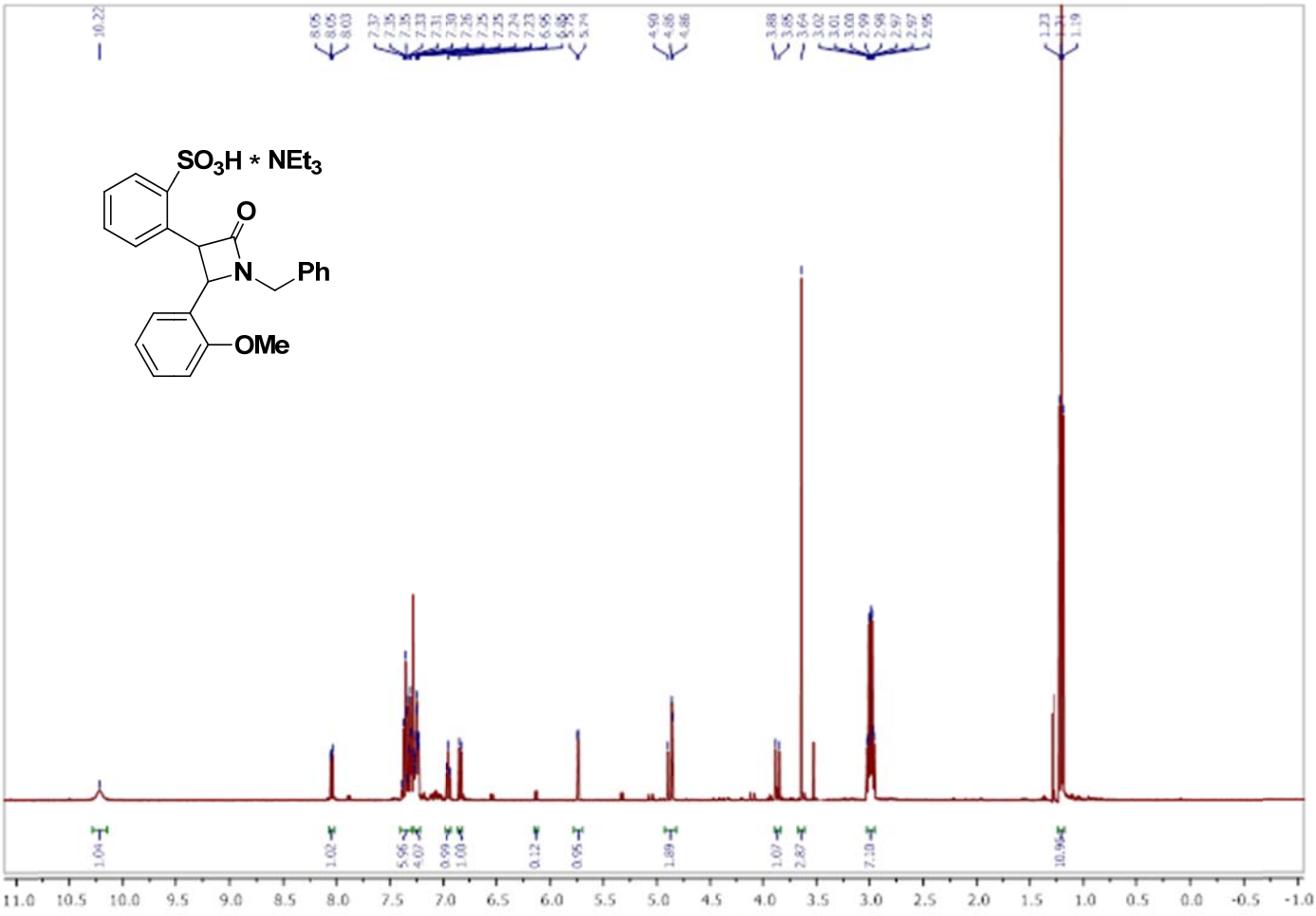



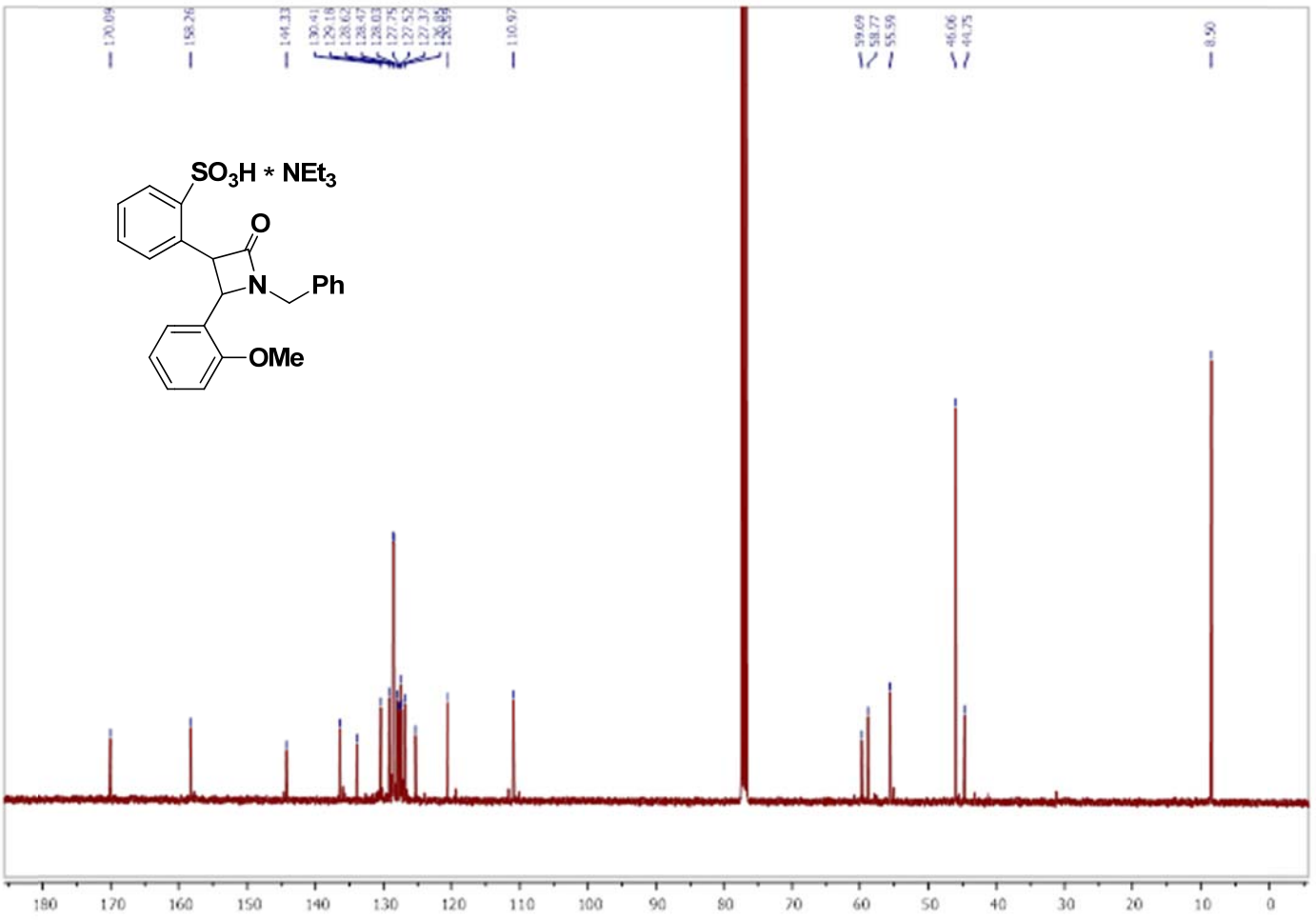
$^{1}$H and $^{13}$C NMR of compound *trans/cis*-**20e**



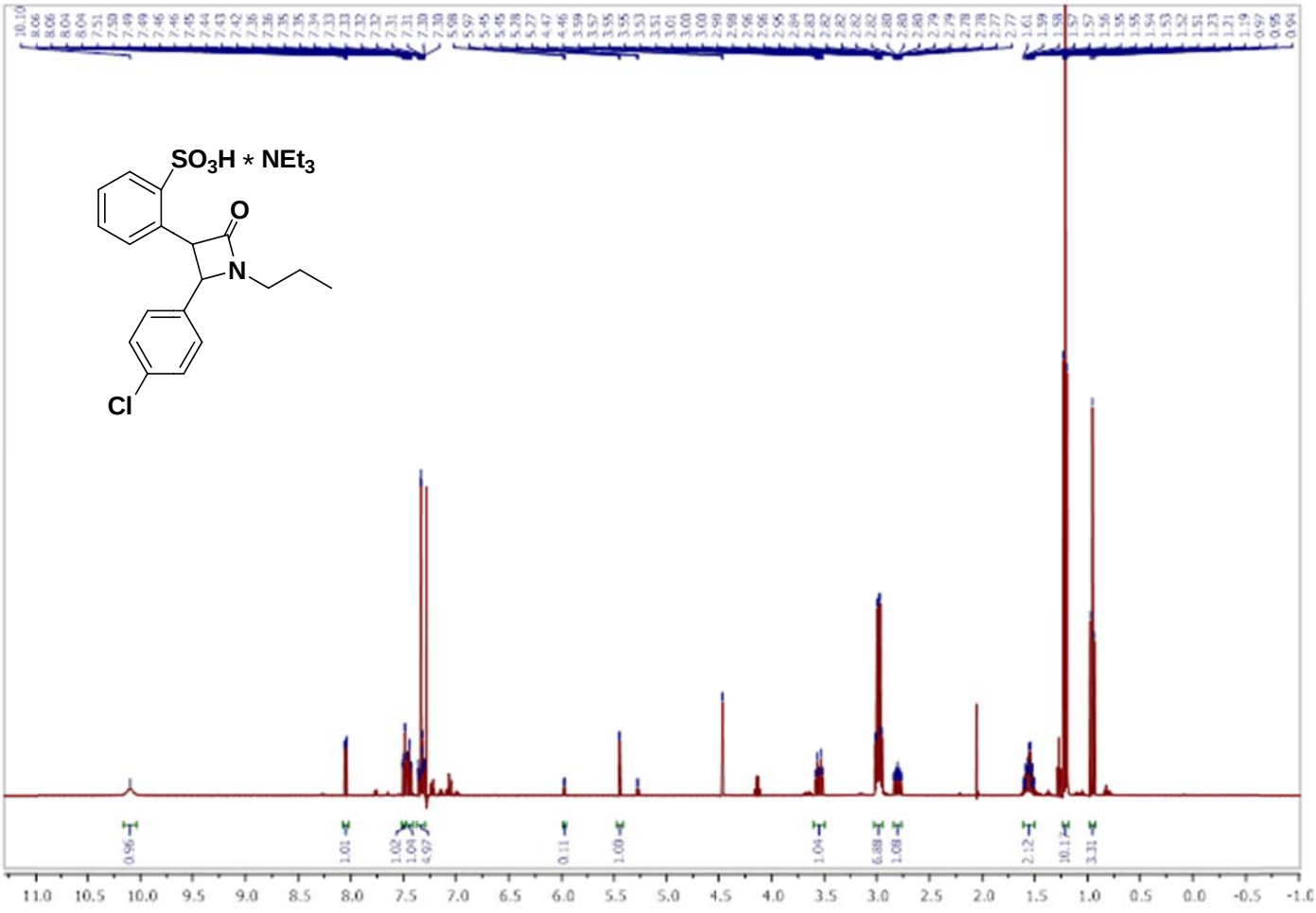



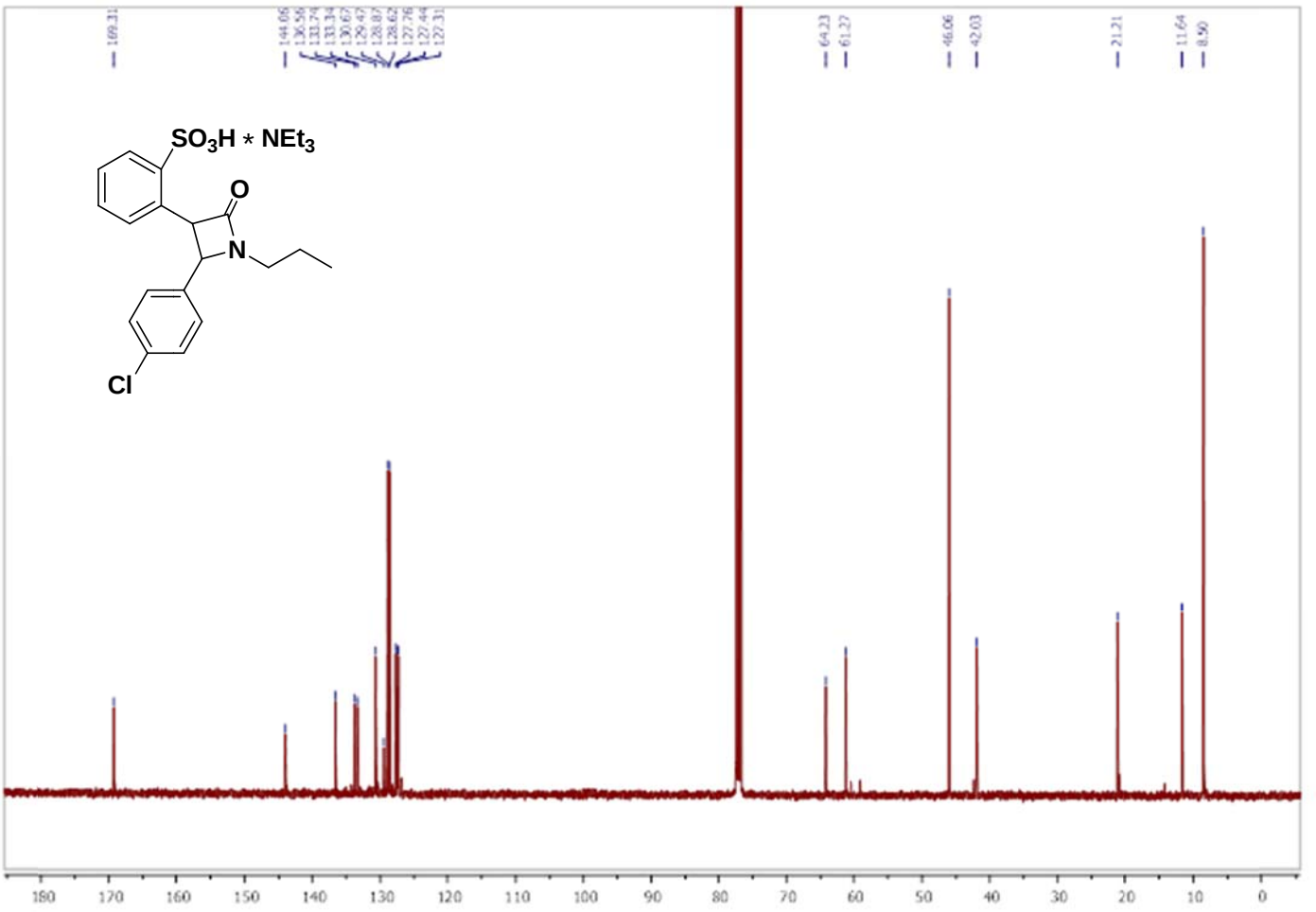
$^{1}$H and $^{13}$C NMR of compound *trans/cis*-**20f**



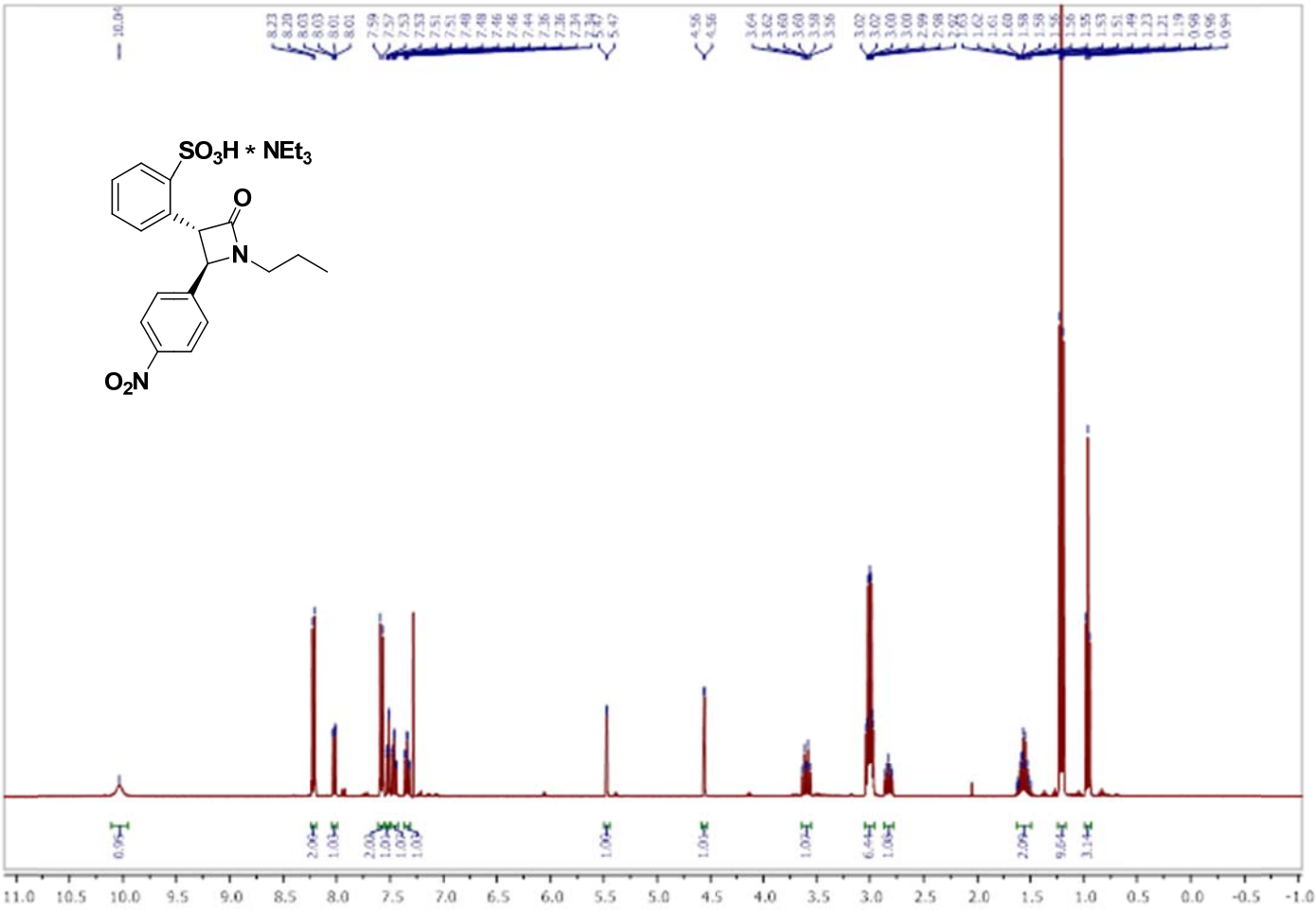



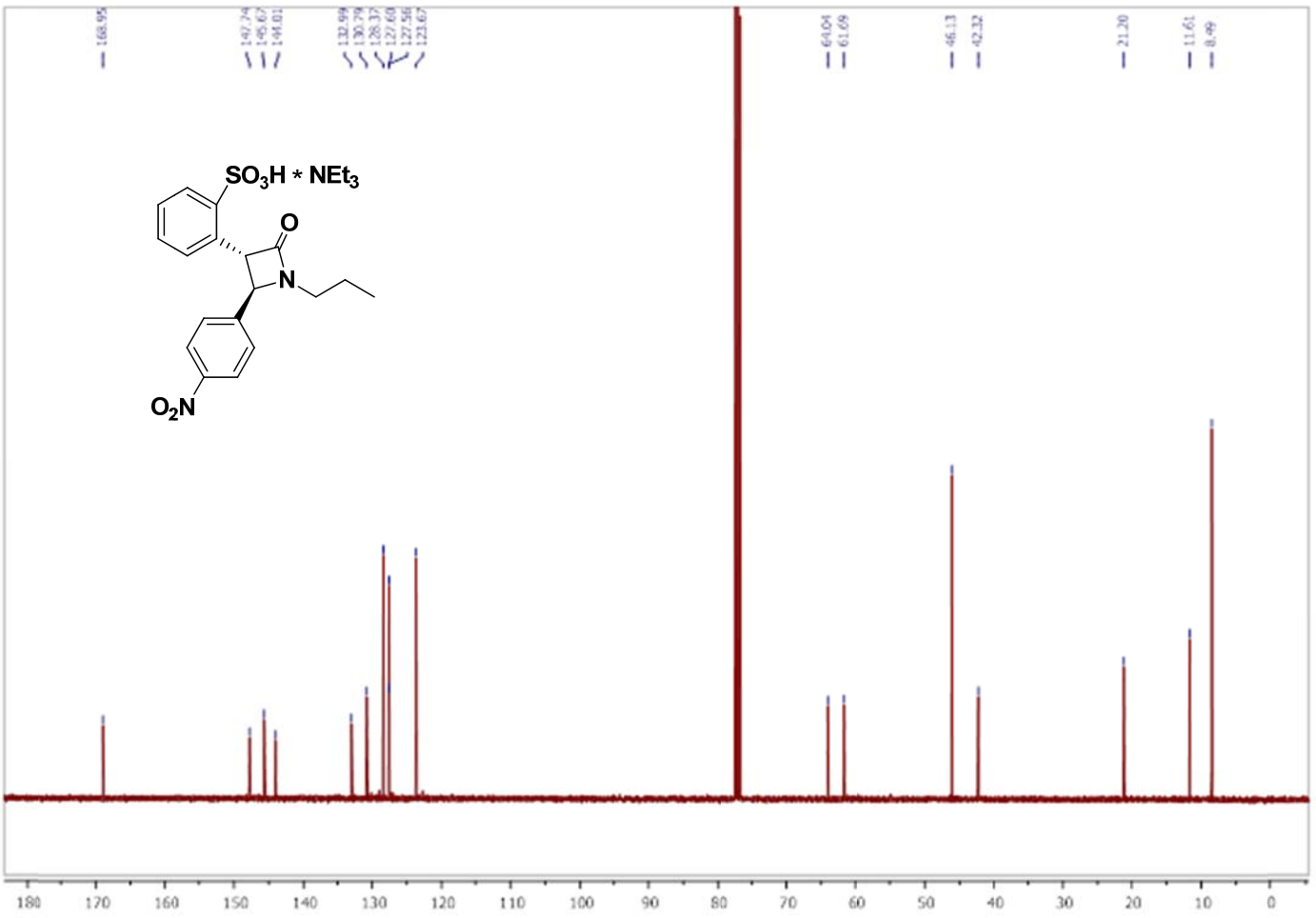
$^{1}$H and $^{13}$C NMR of compound *trans/cis*-**20g**



$^{1}$H and $^{13}$C NMR of compound *trans*-**20h**



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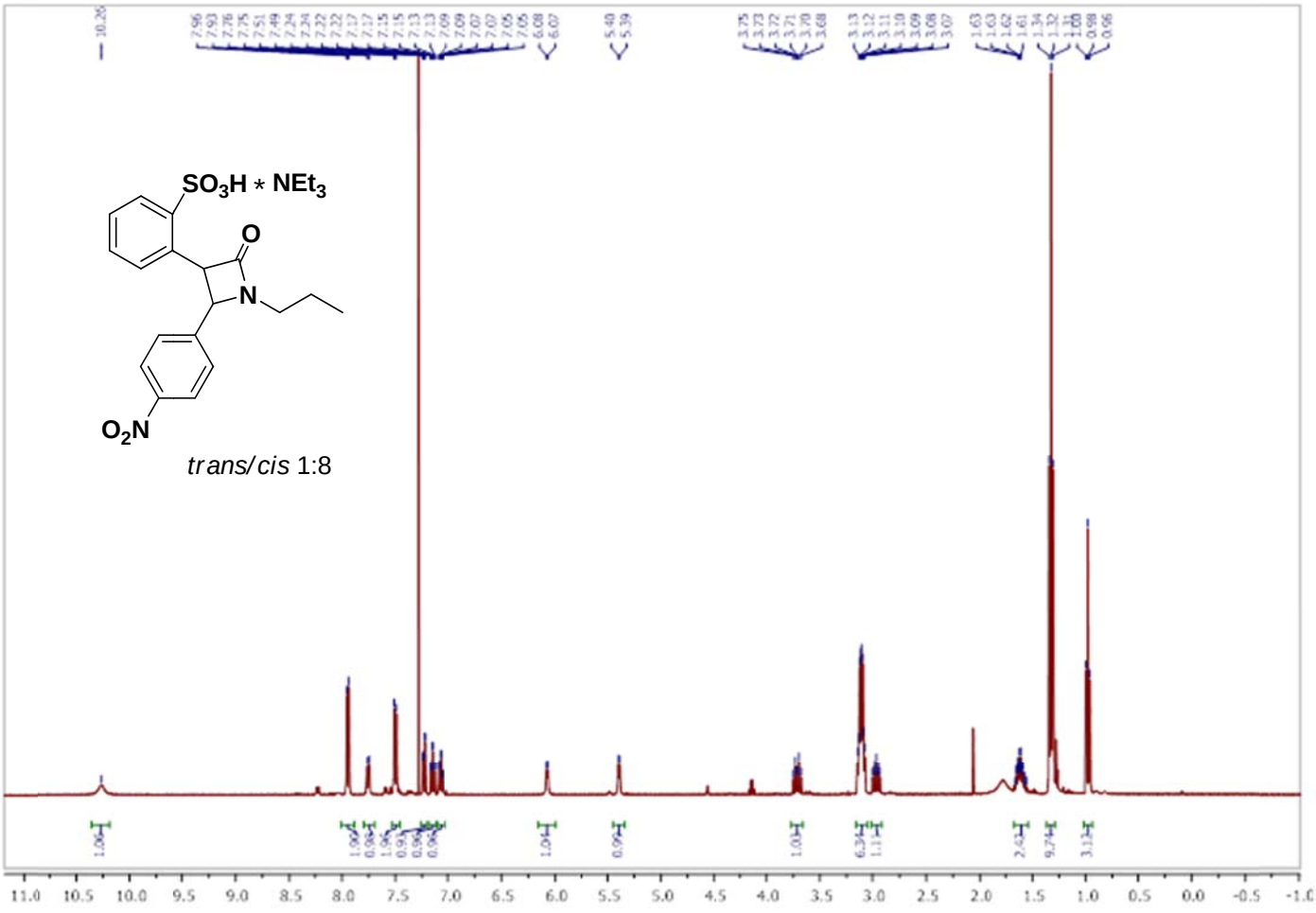


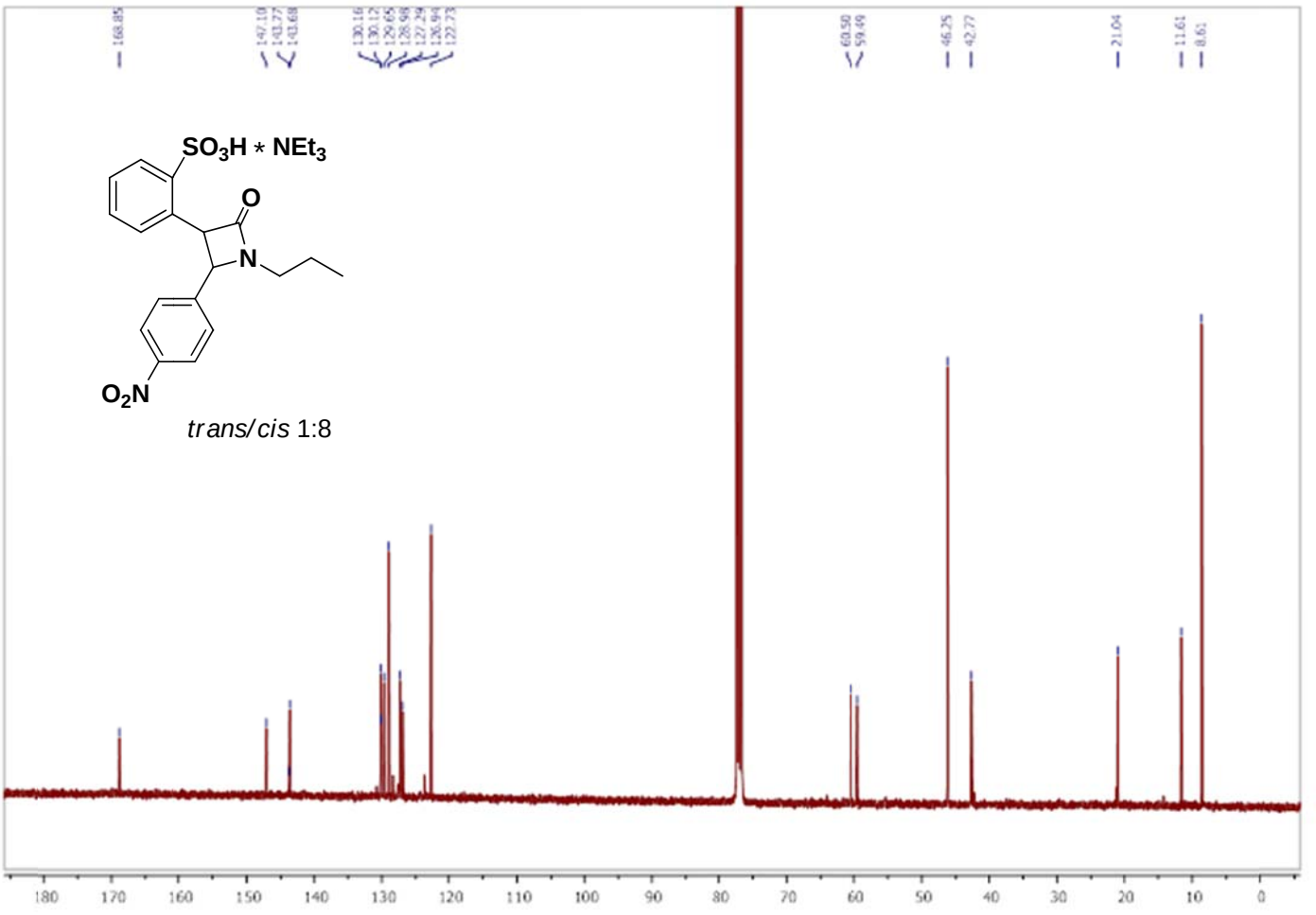

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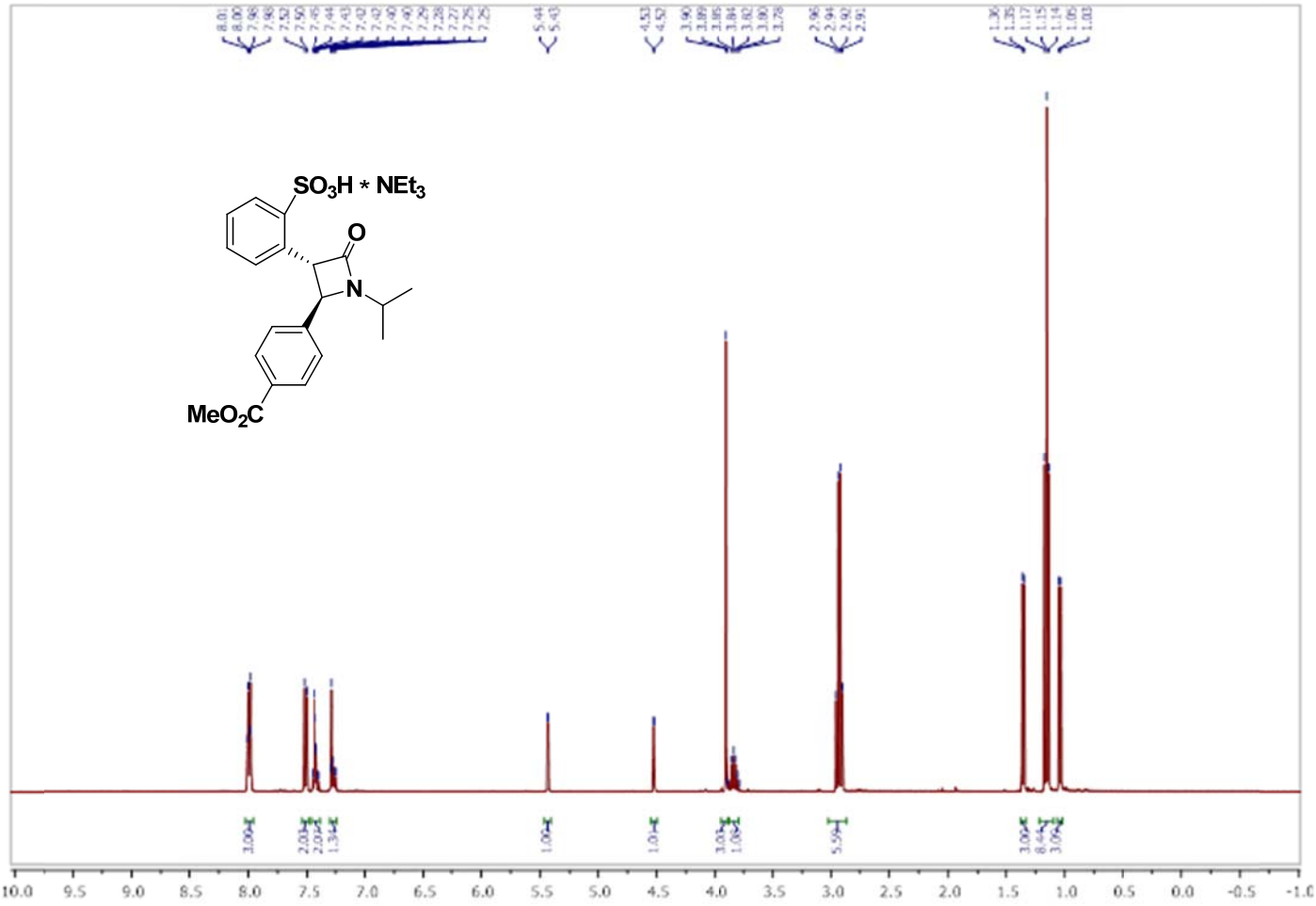
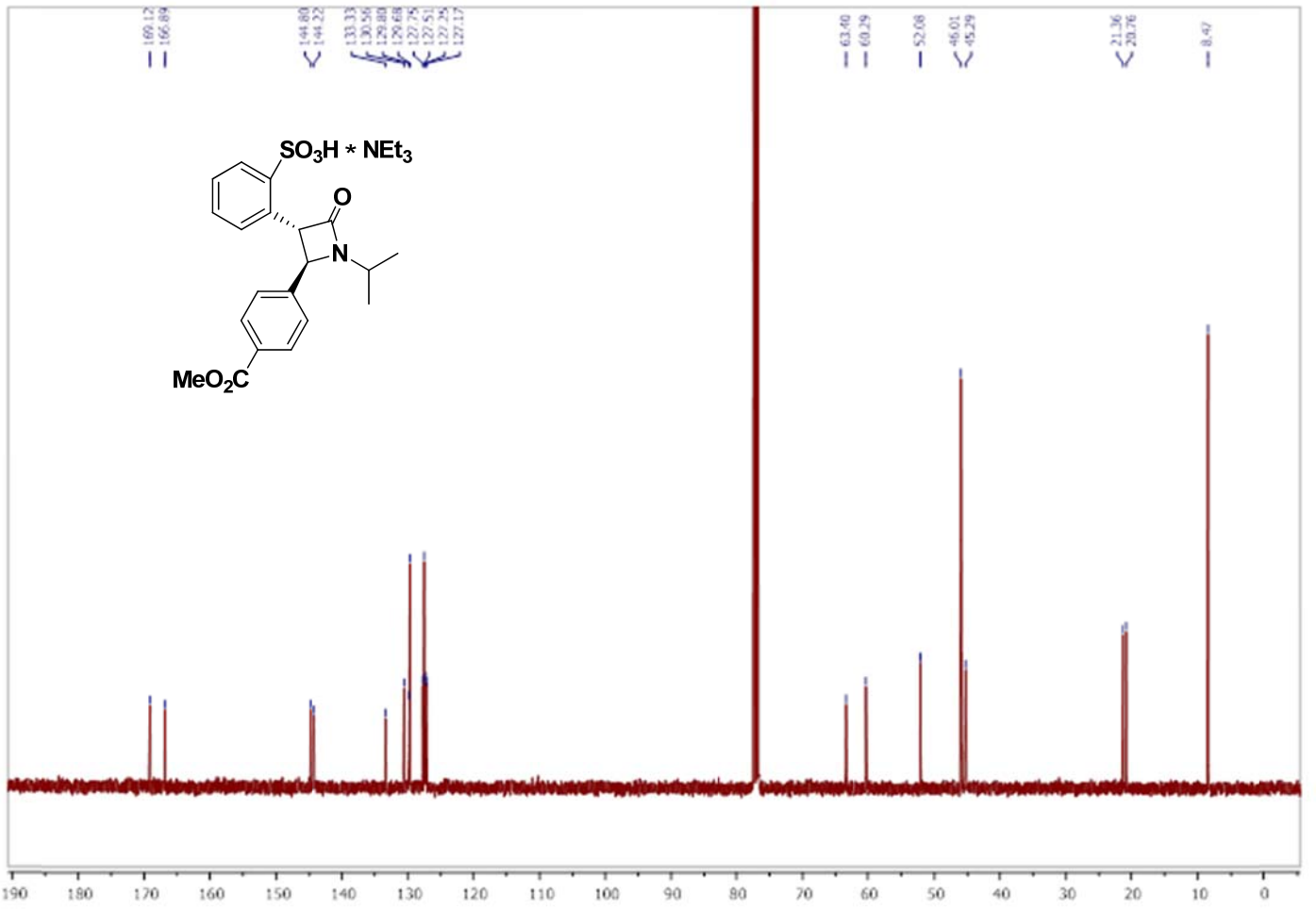
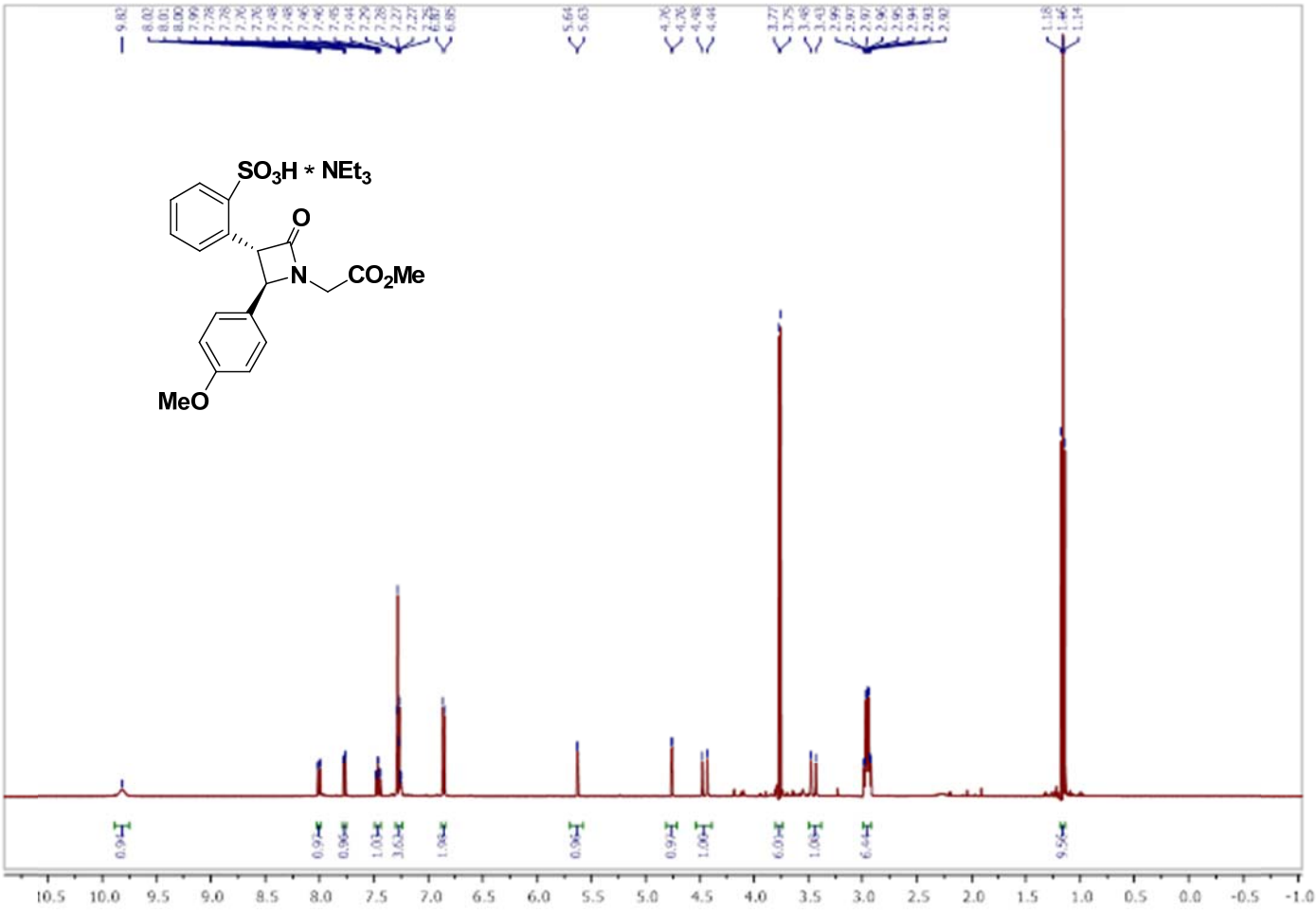
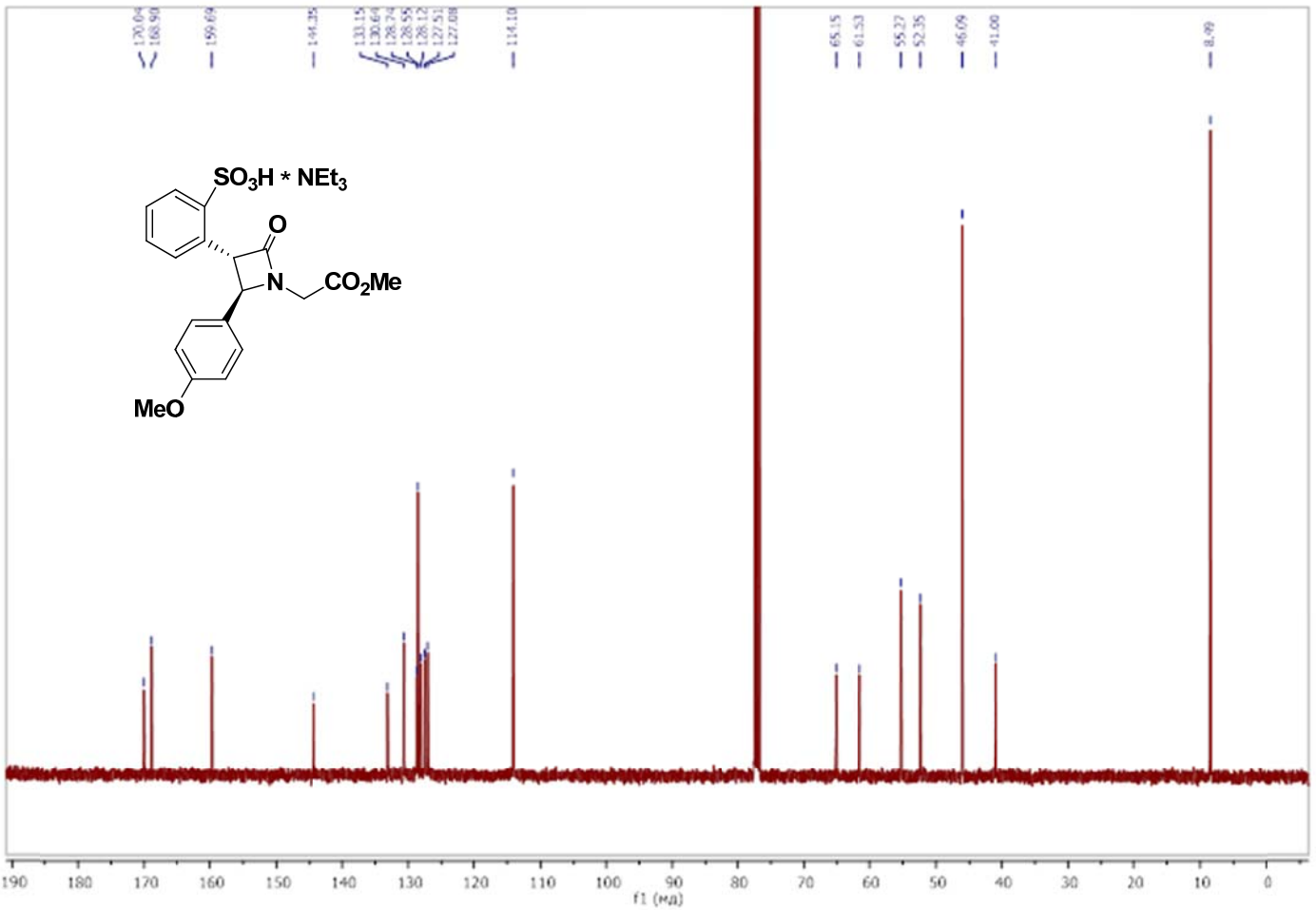


$^{1}$H and $^{13}$C NMR of compound *trans*-**20j**



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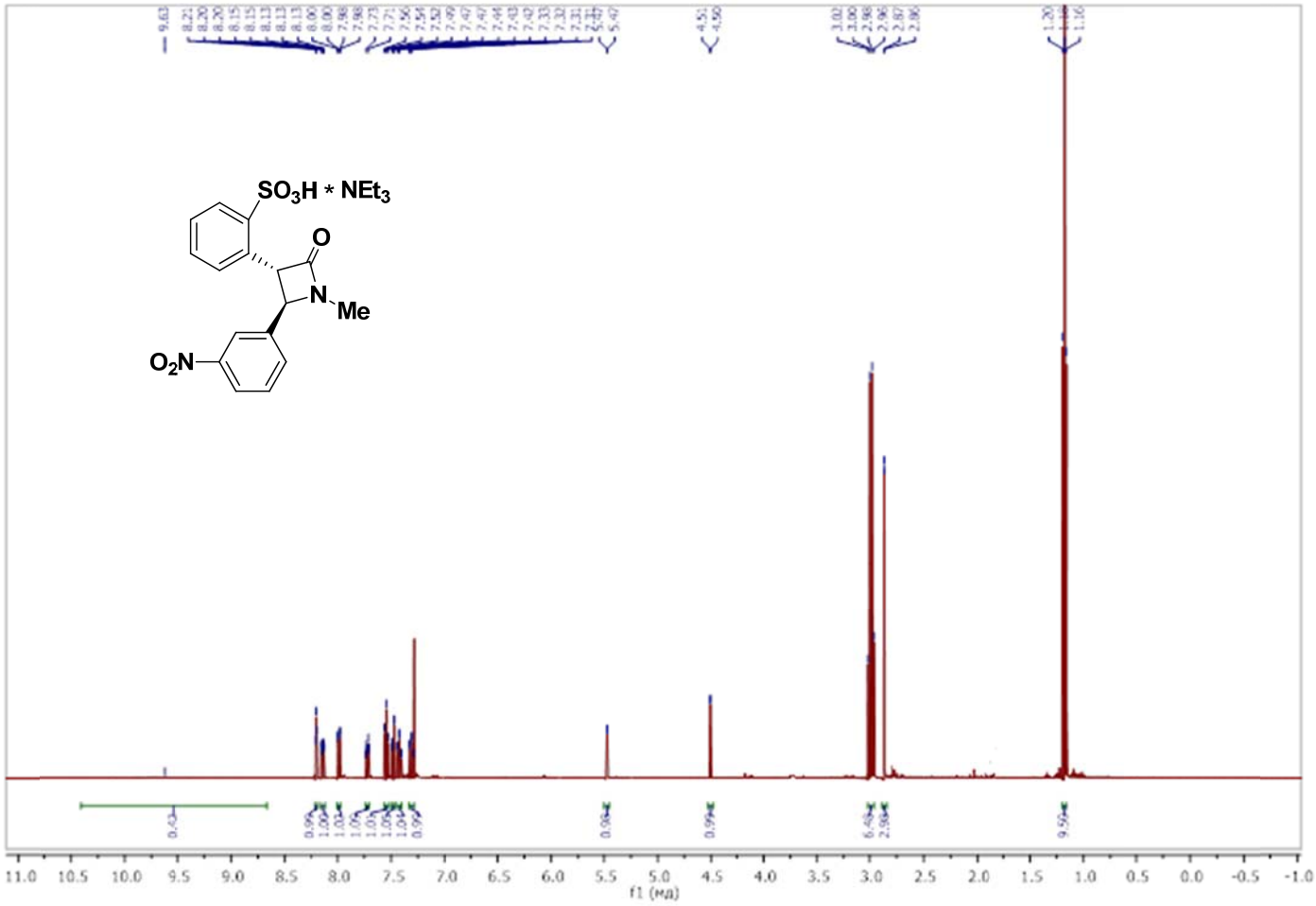


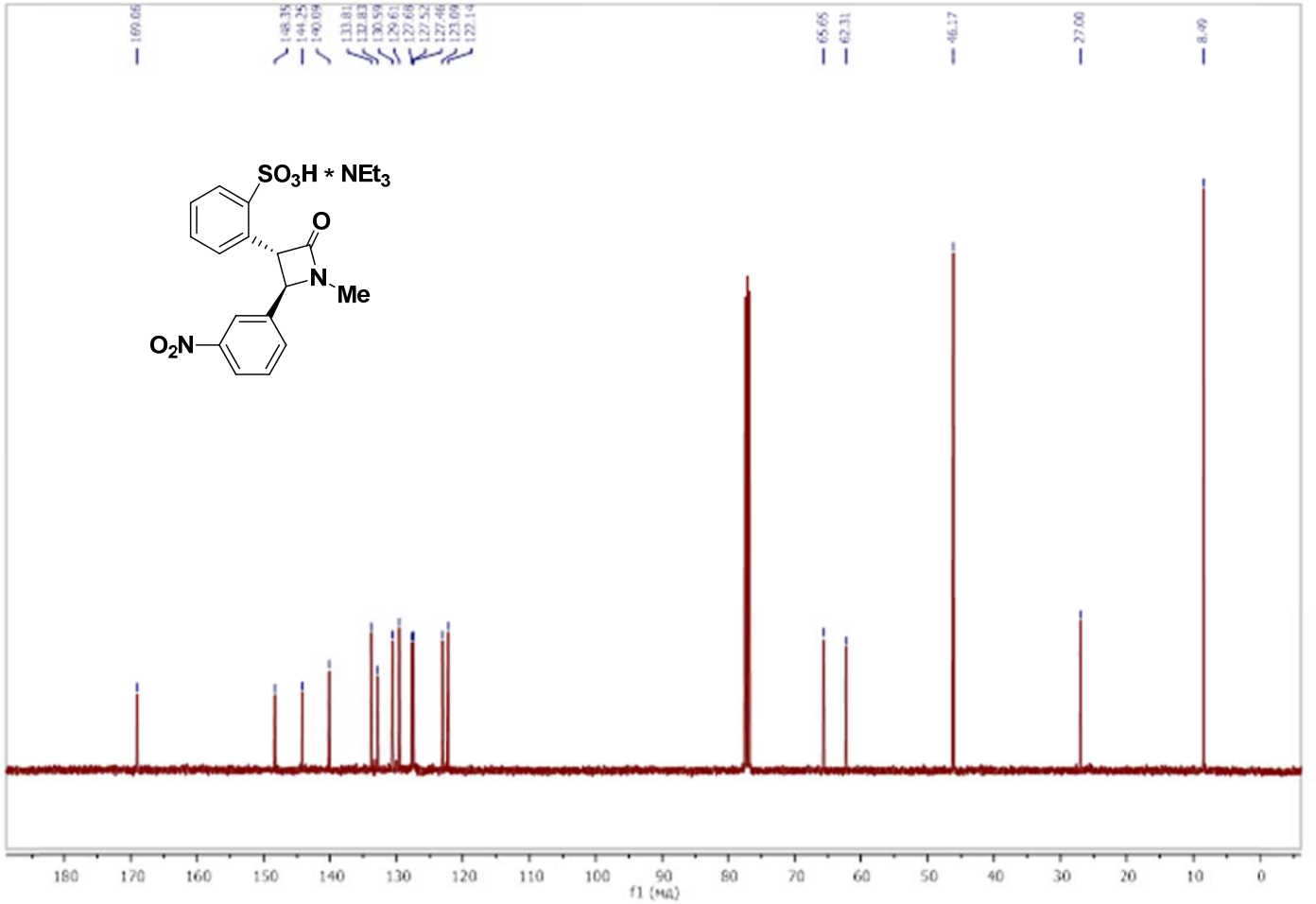

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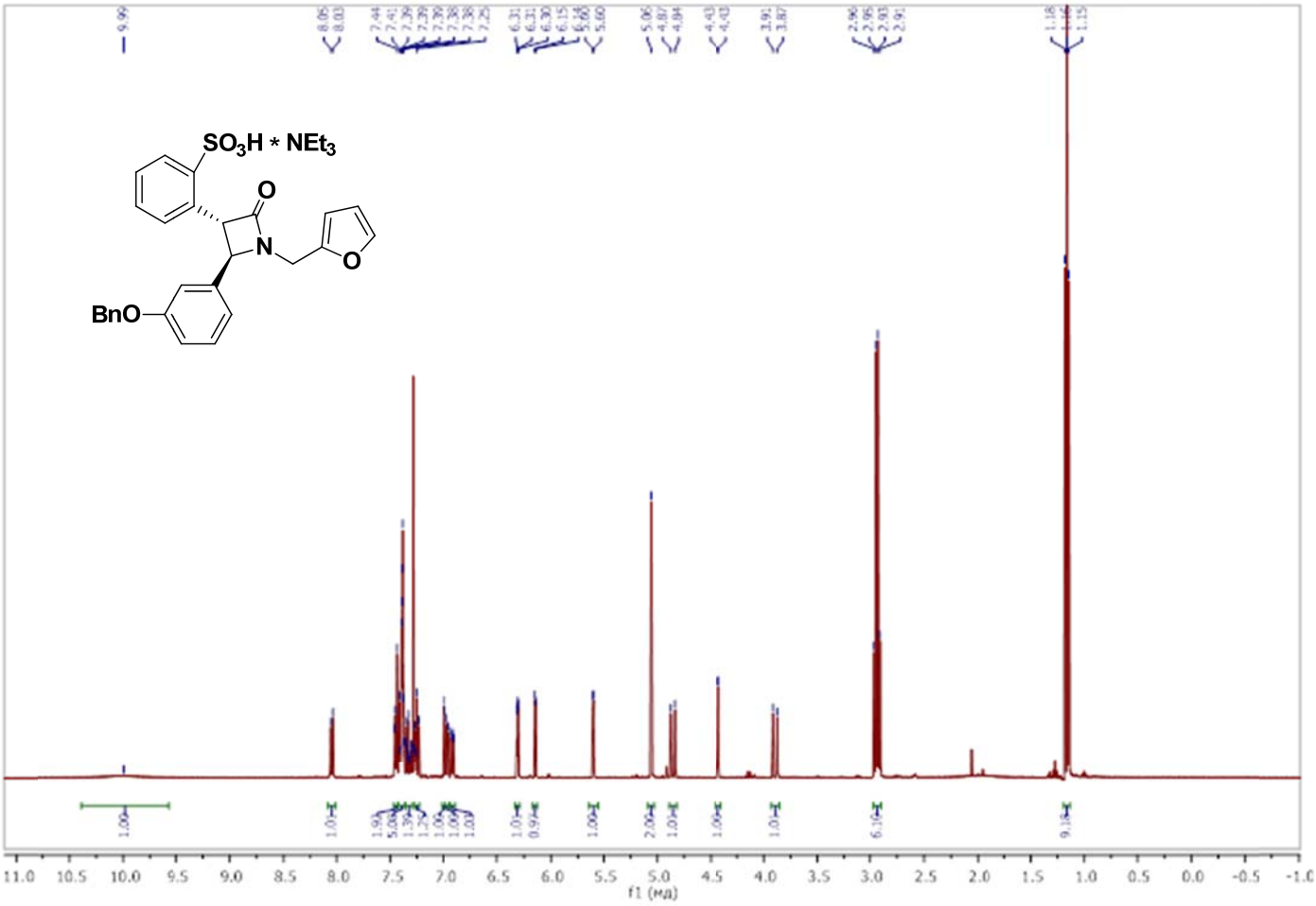


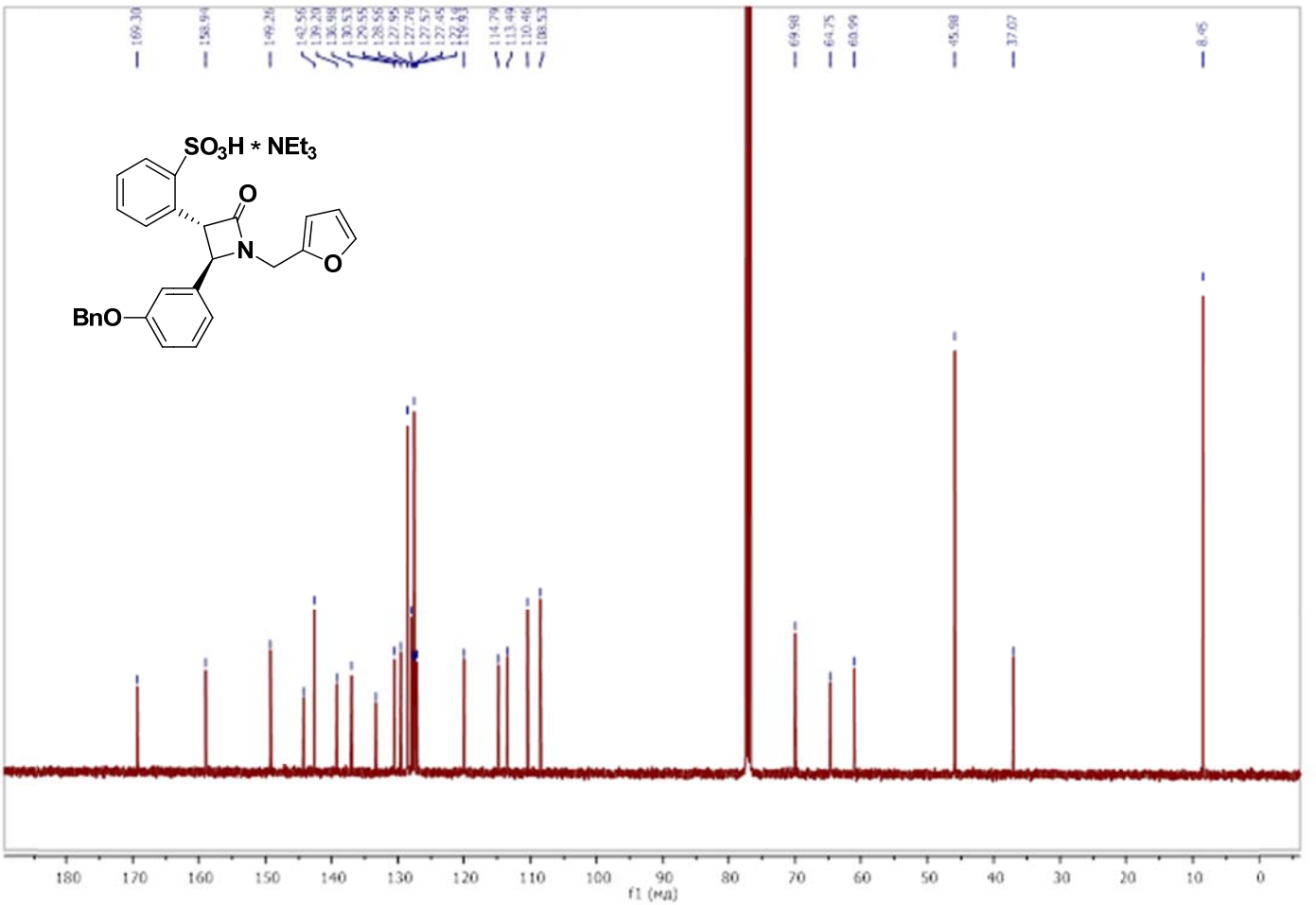

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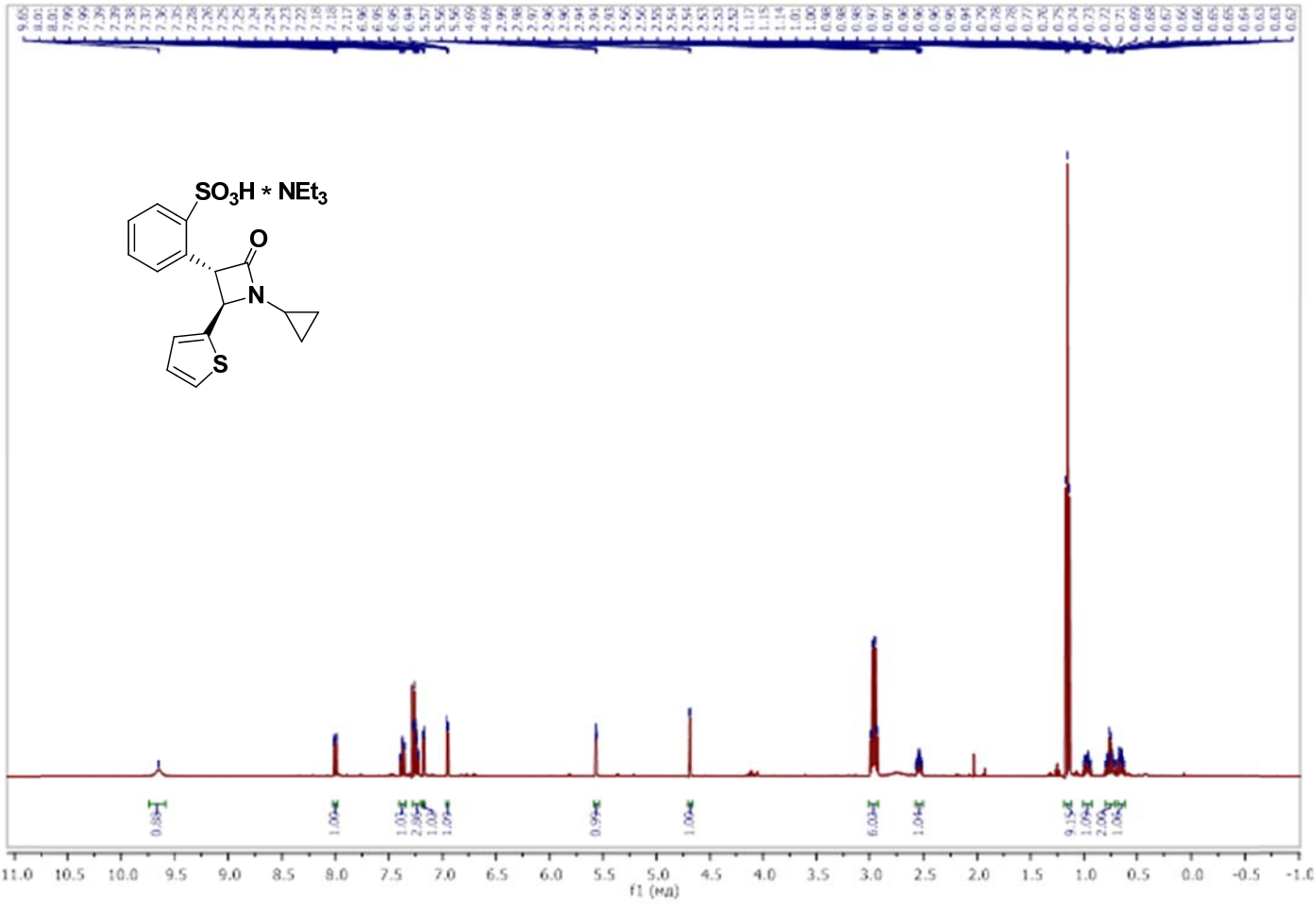


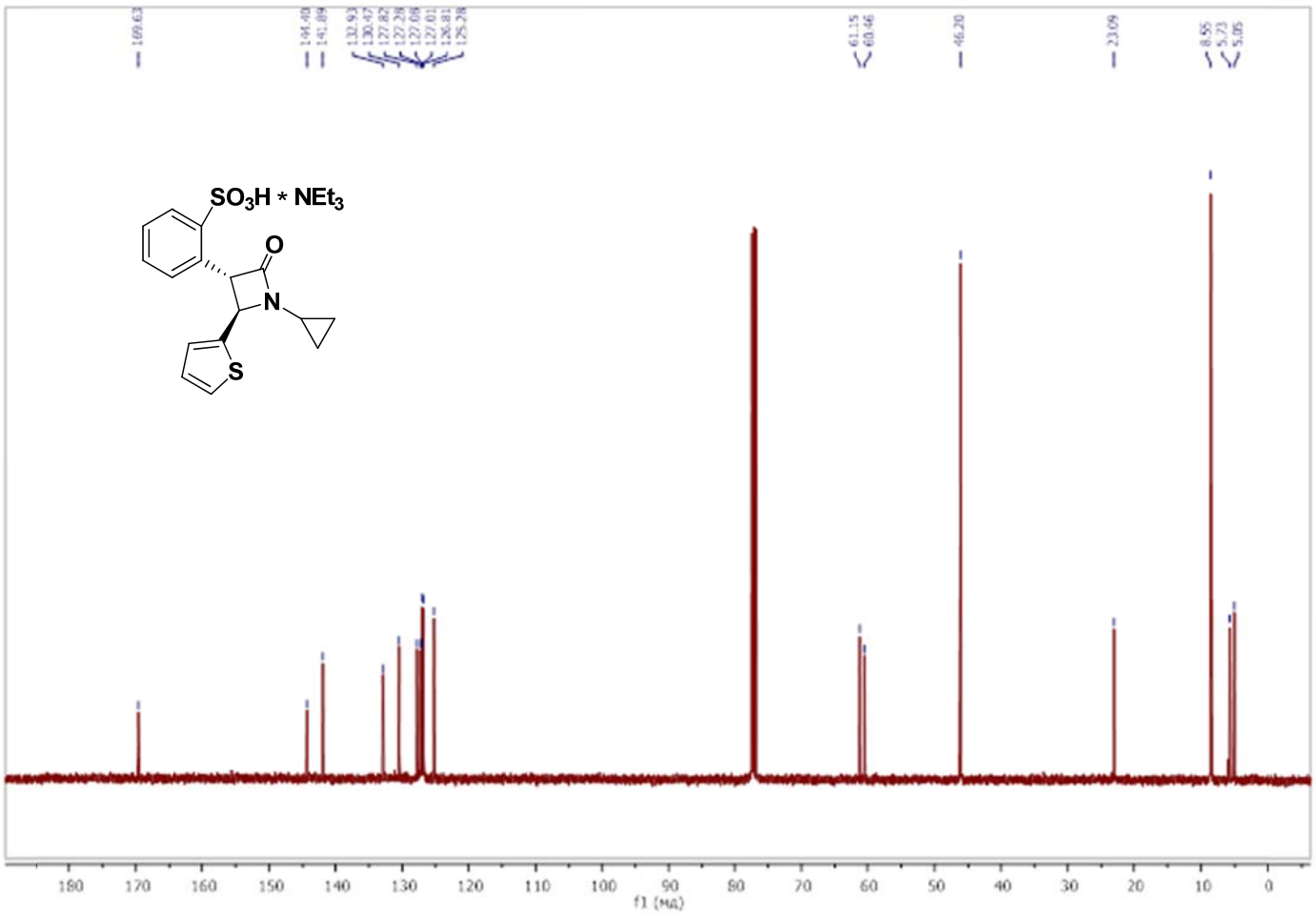

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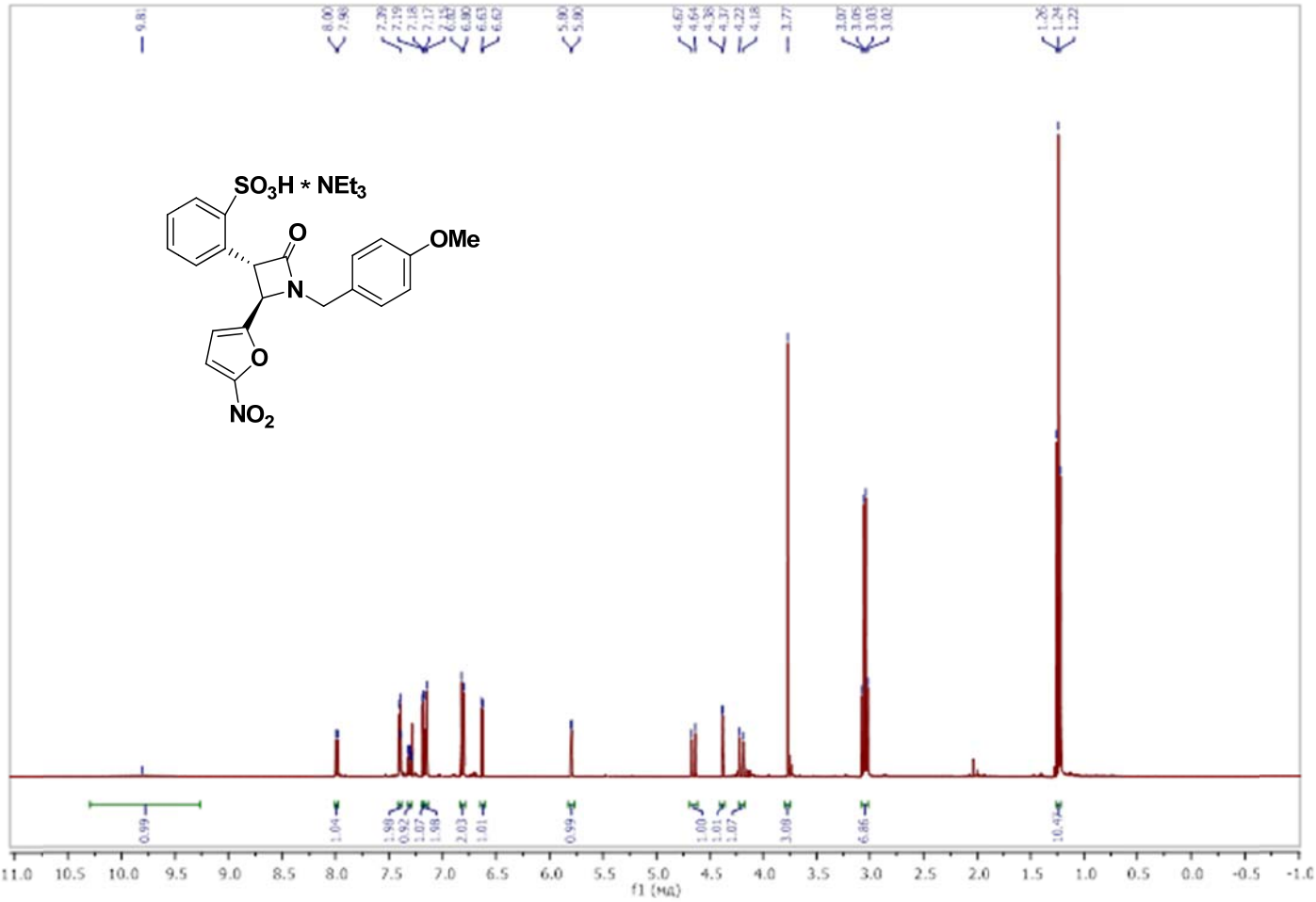


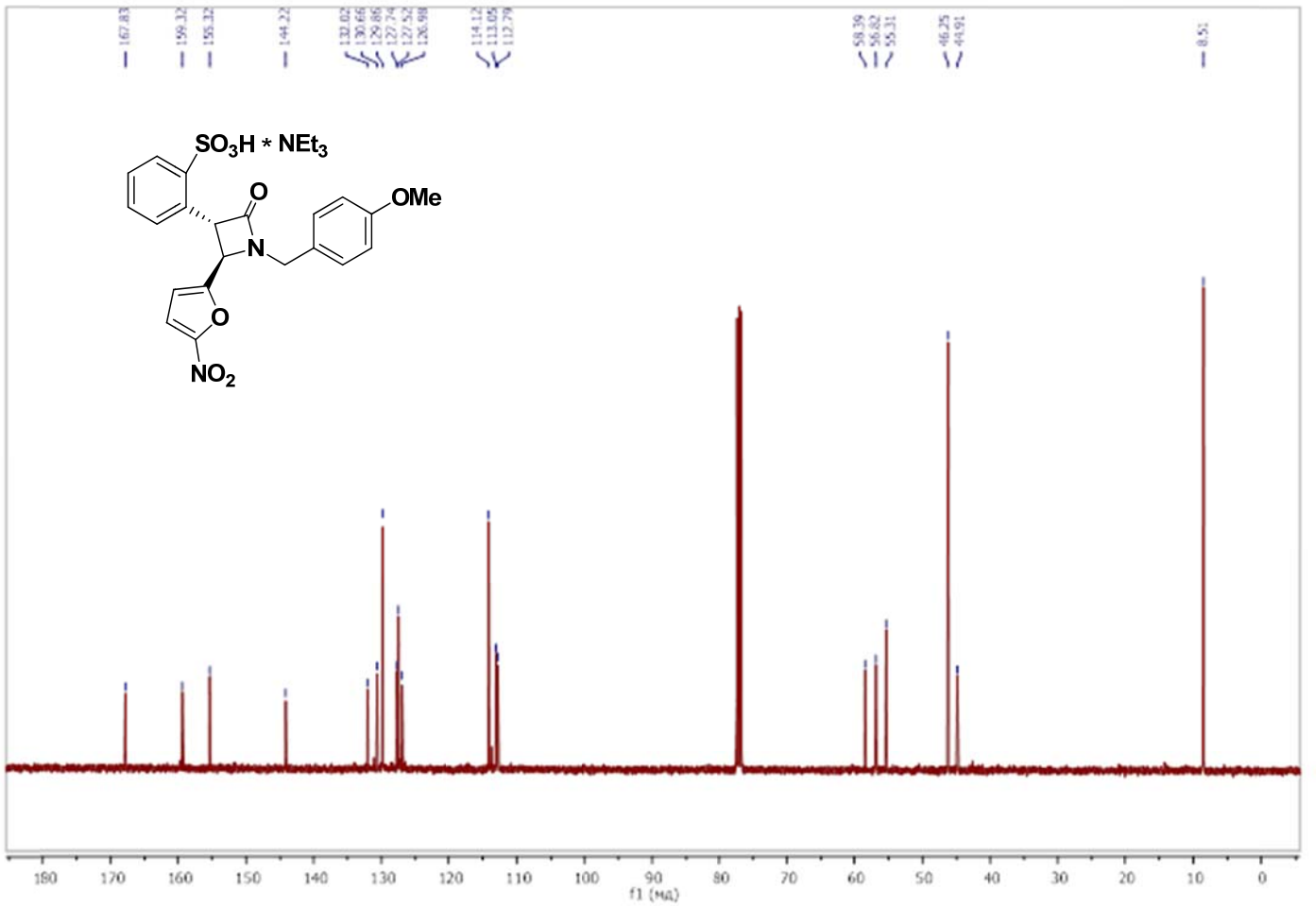

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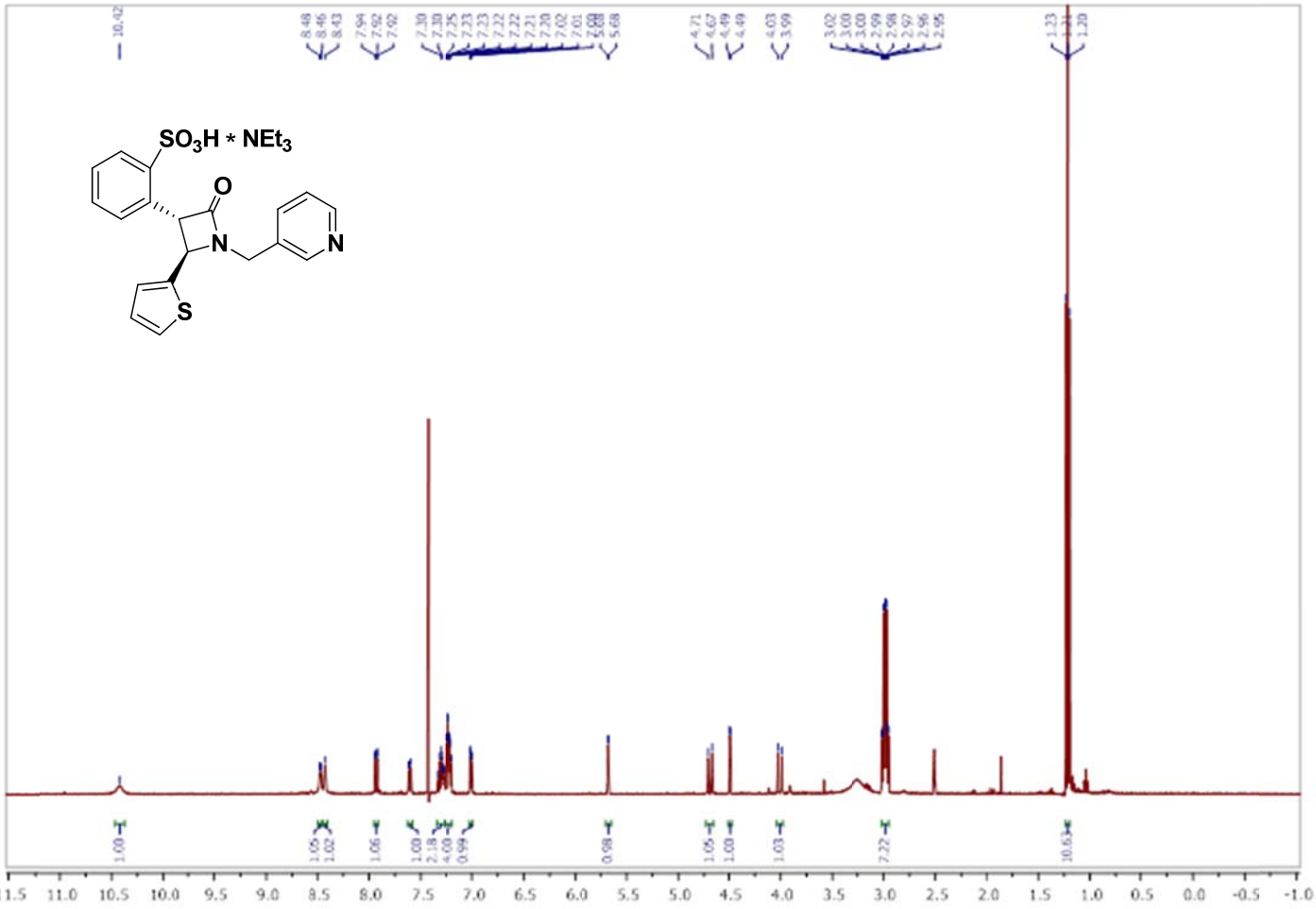


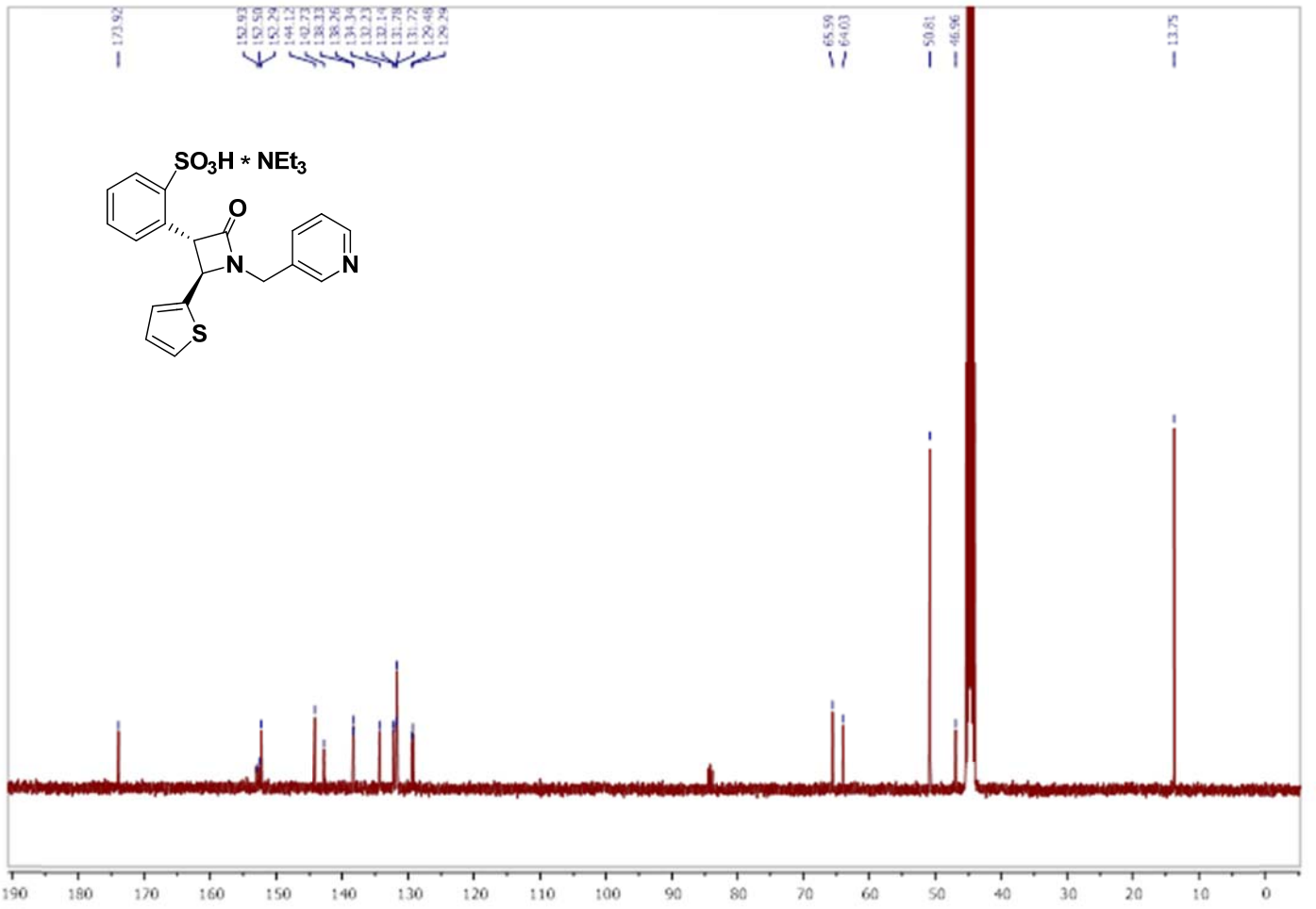

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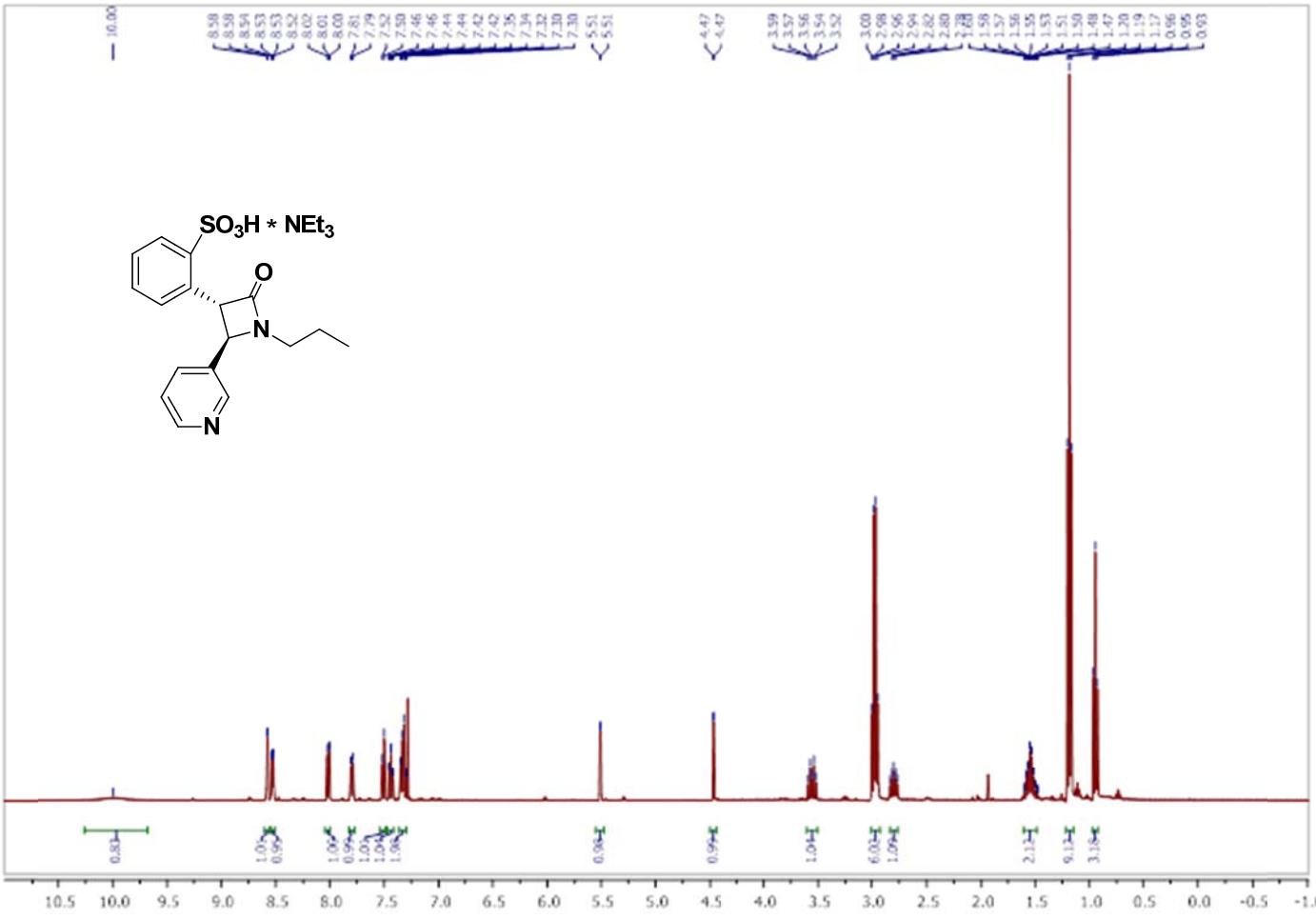


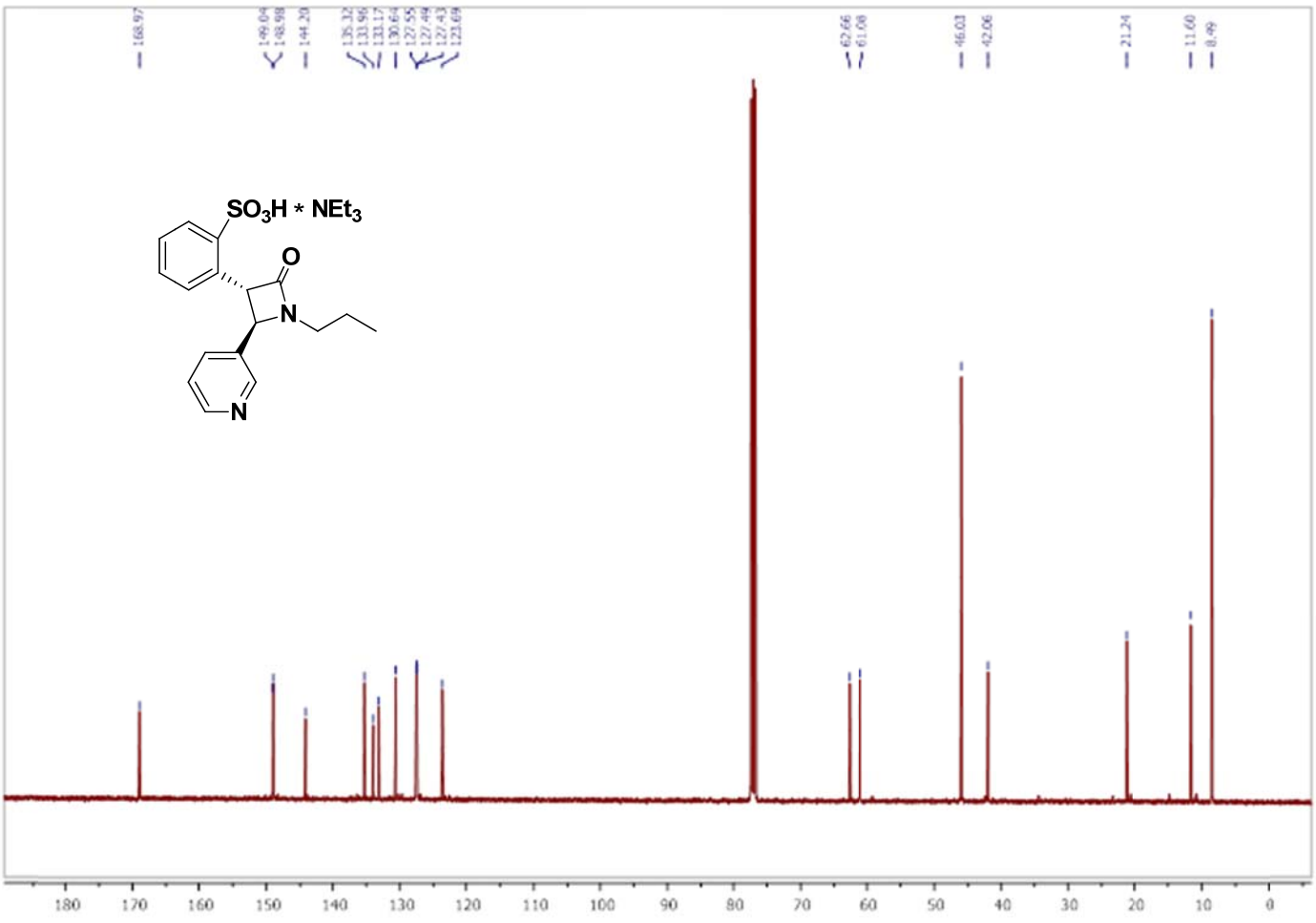

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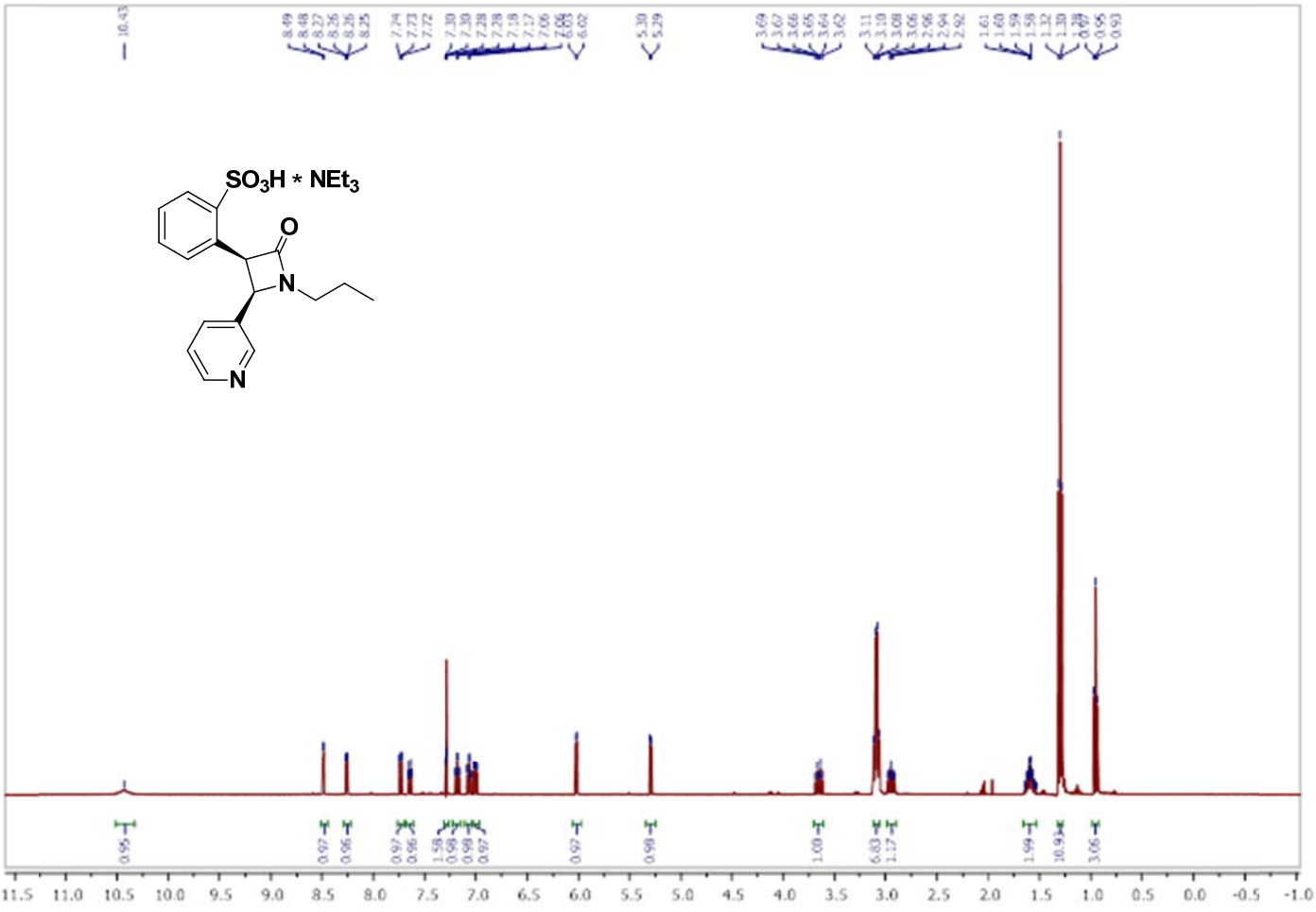
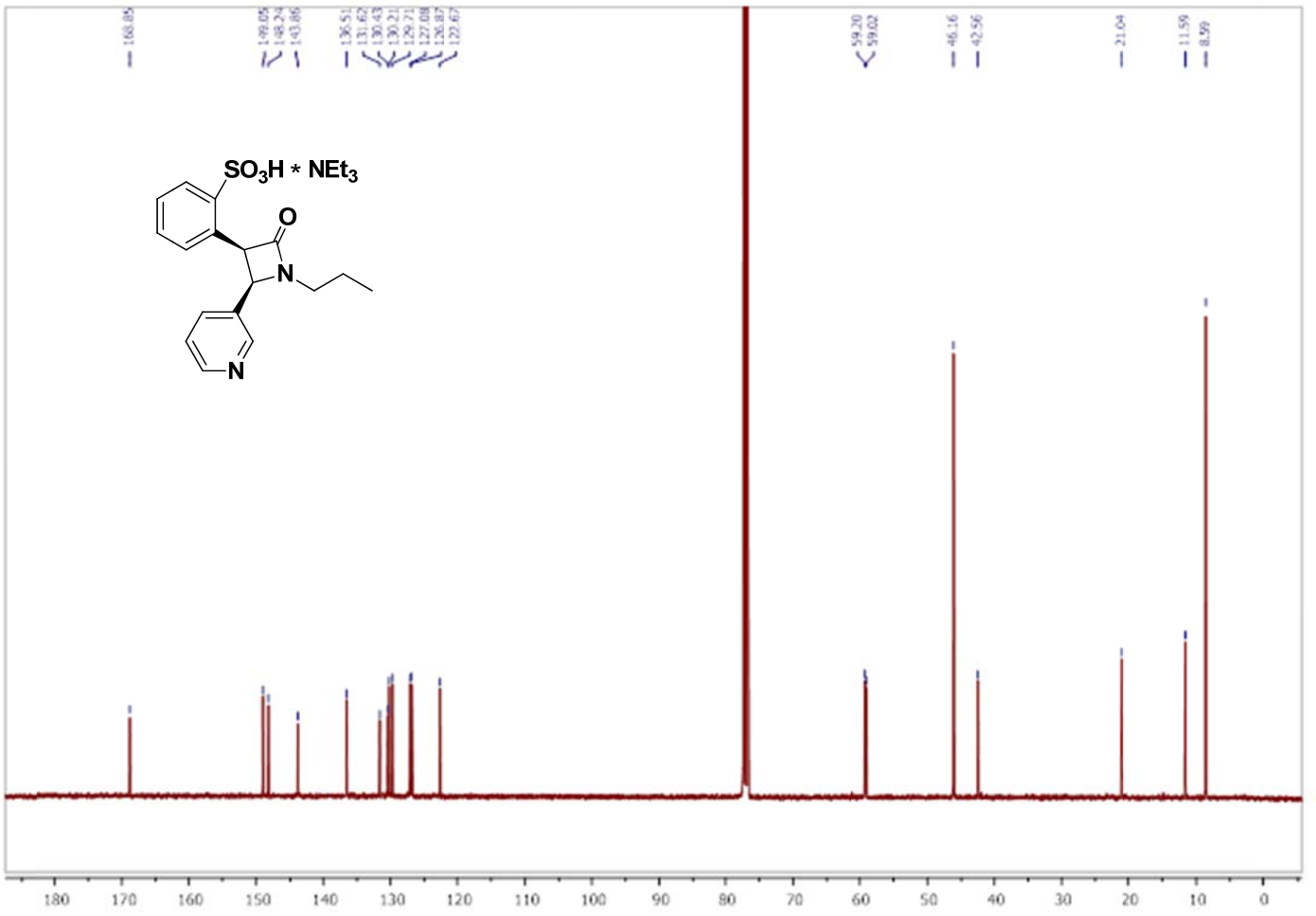
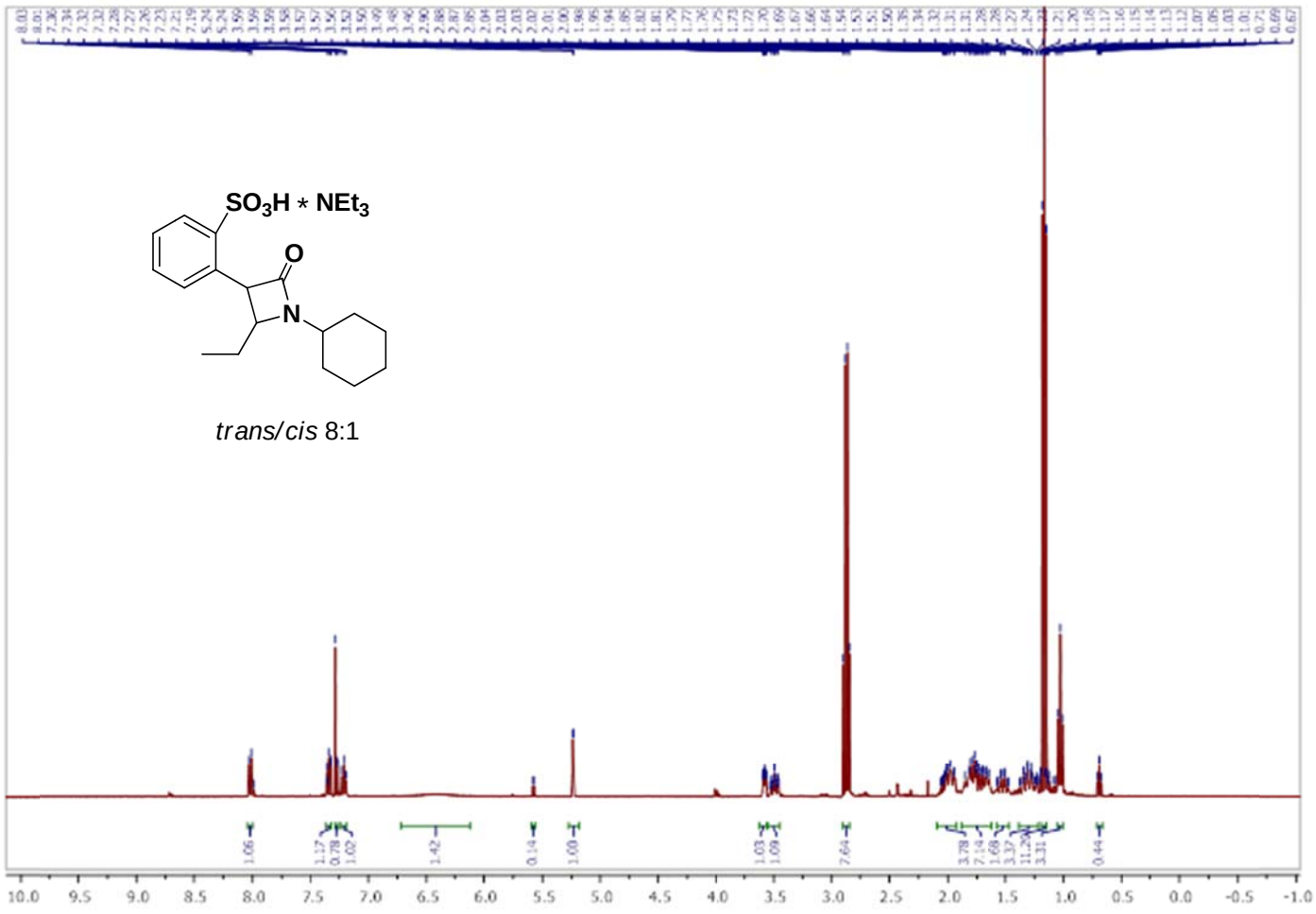
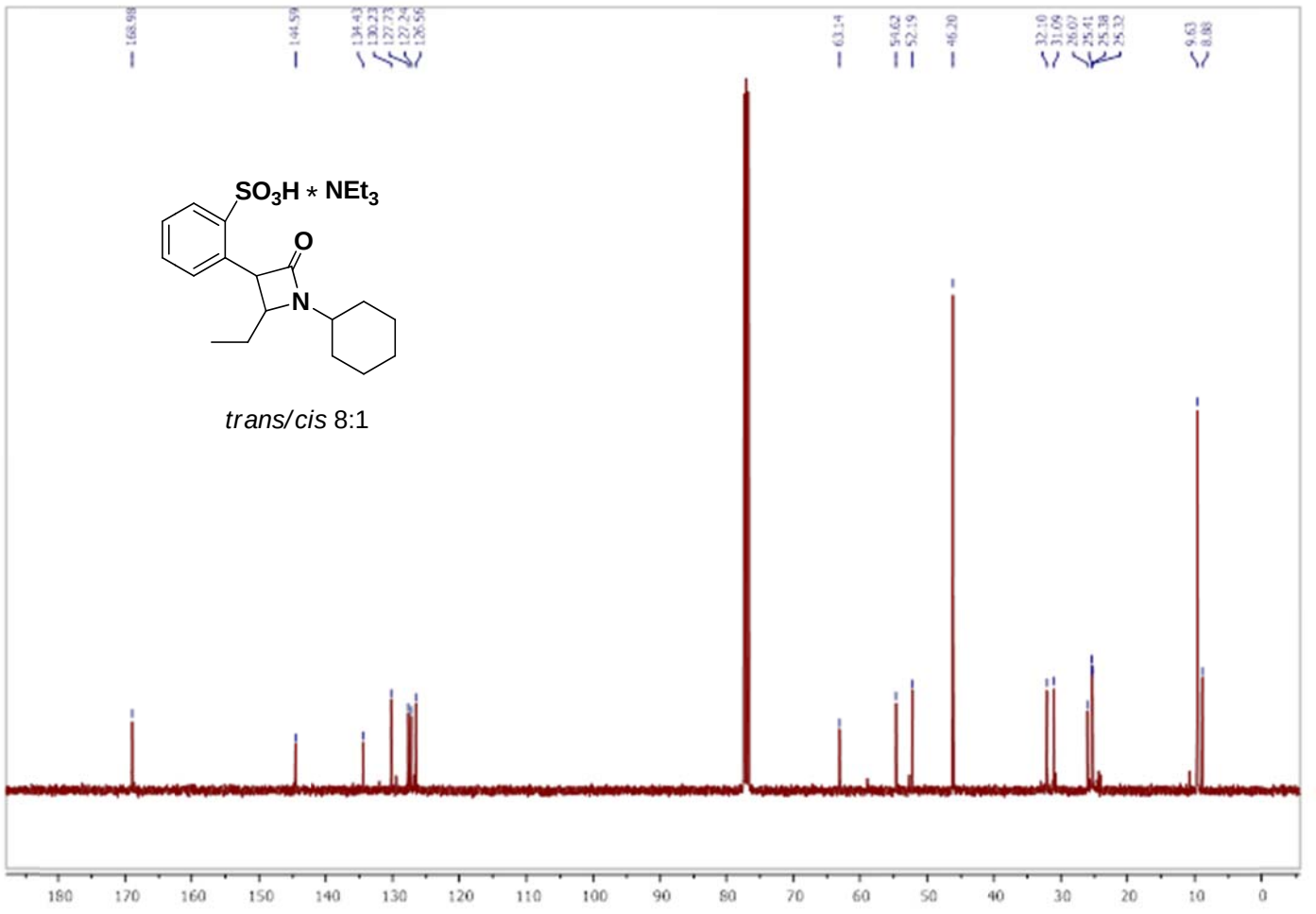


$^{1}$H and $^{13}$C NMR of compound *trans/cis*-**20q**




*trans/cis* 8:1




*trans/cis* 8:1

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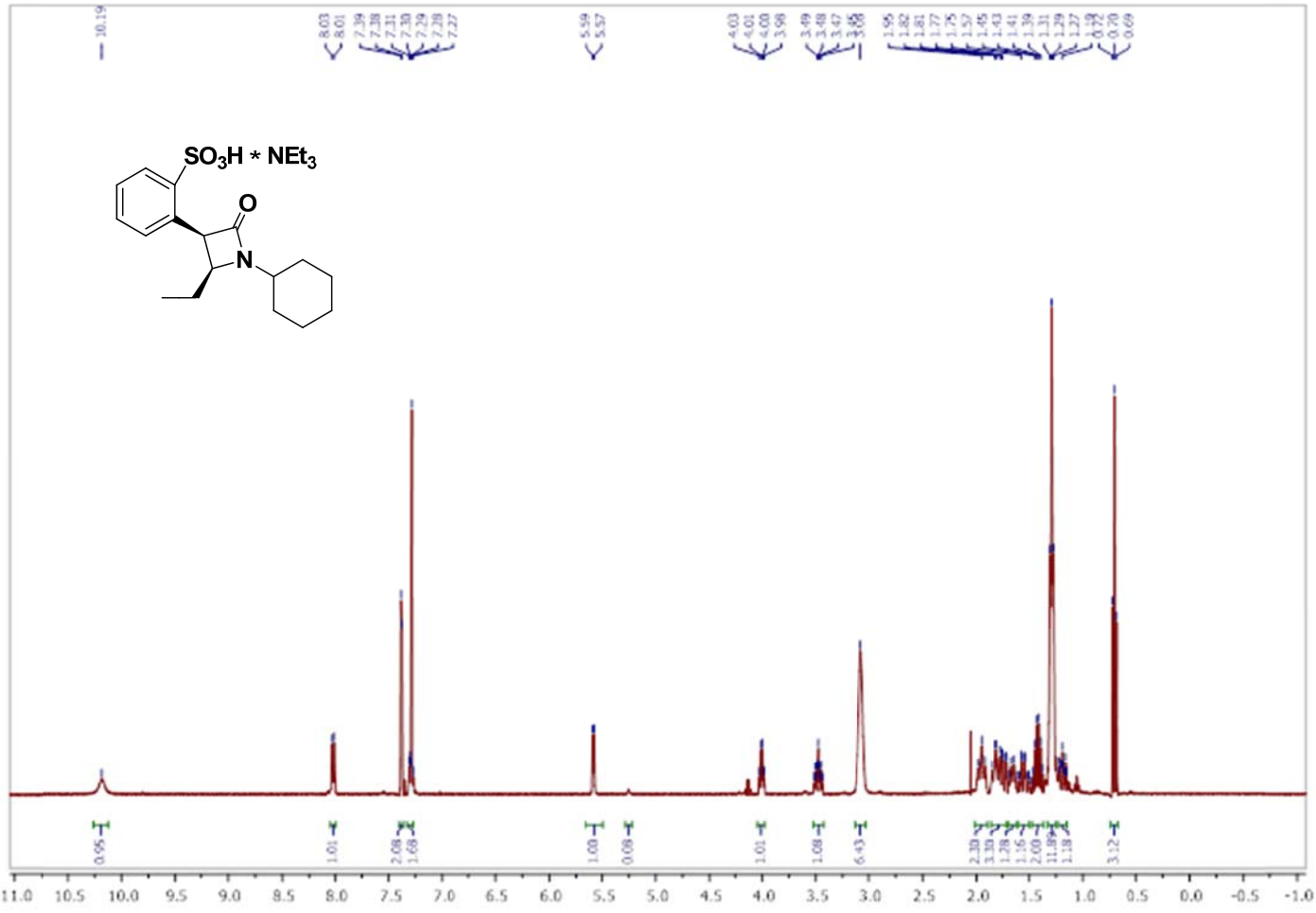
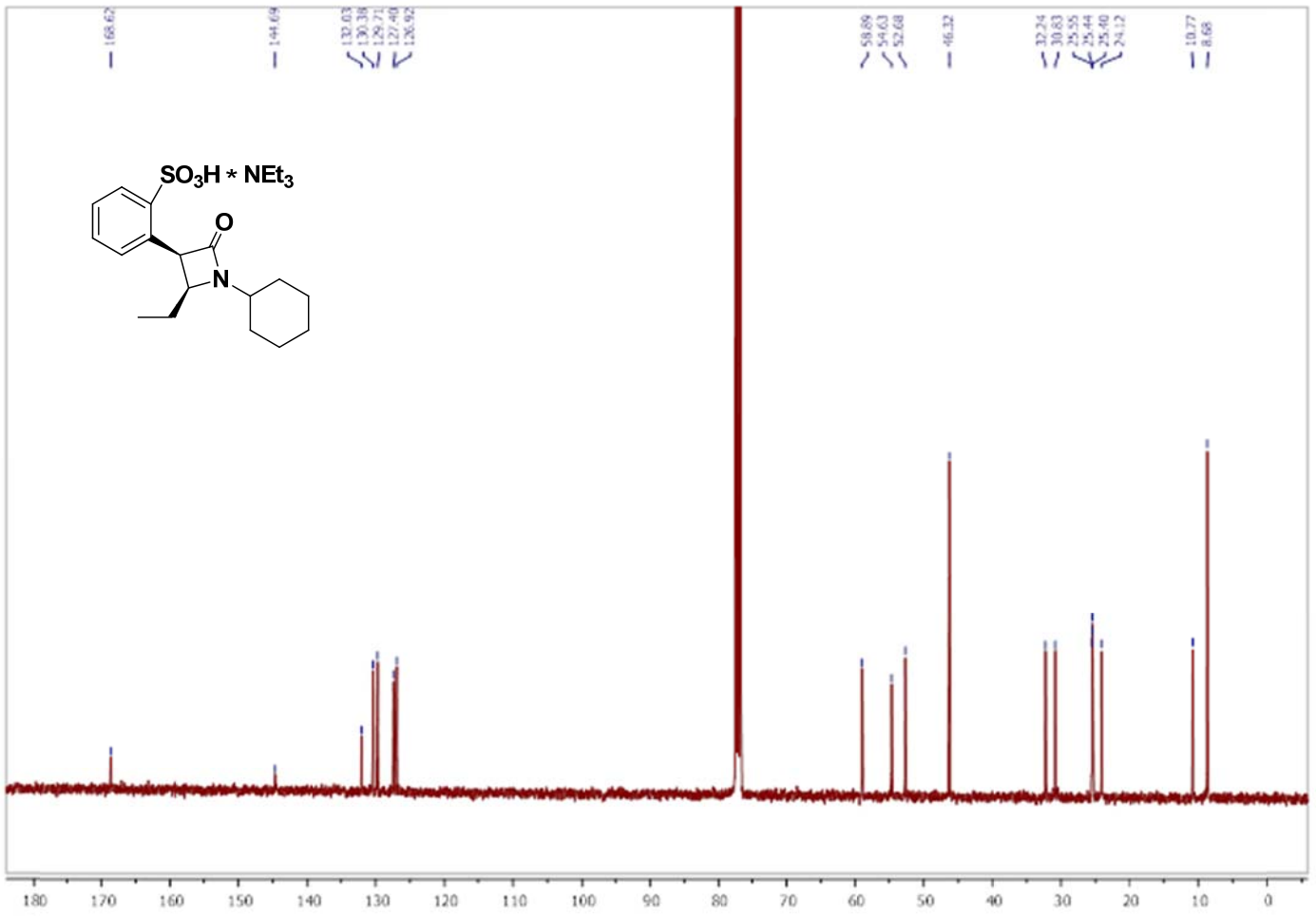
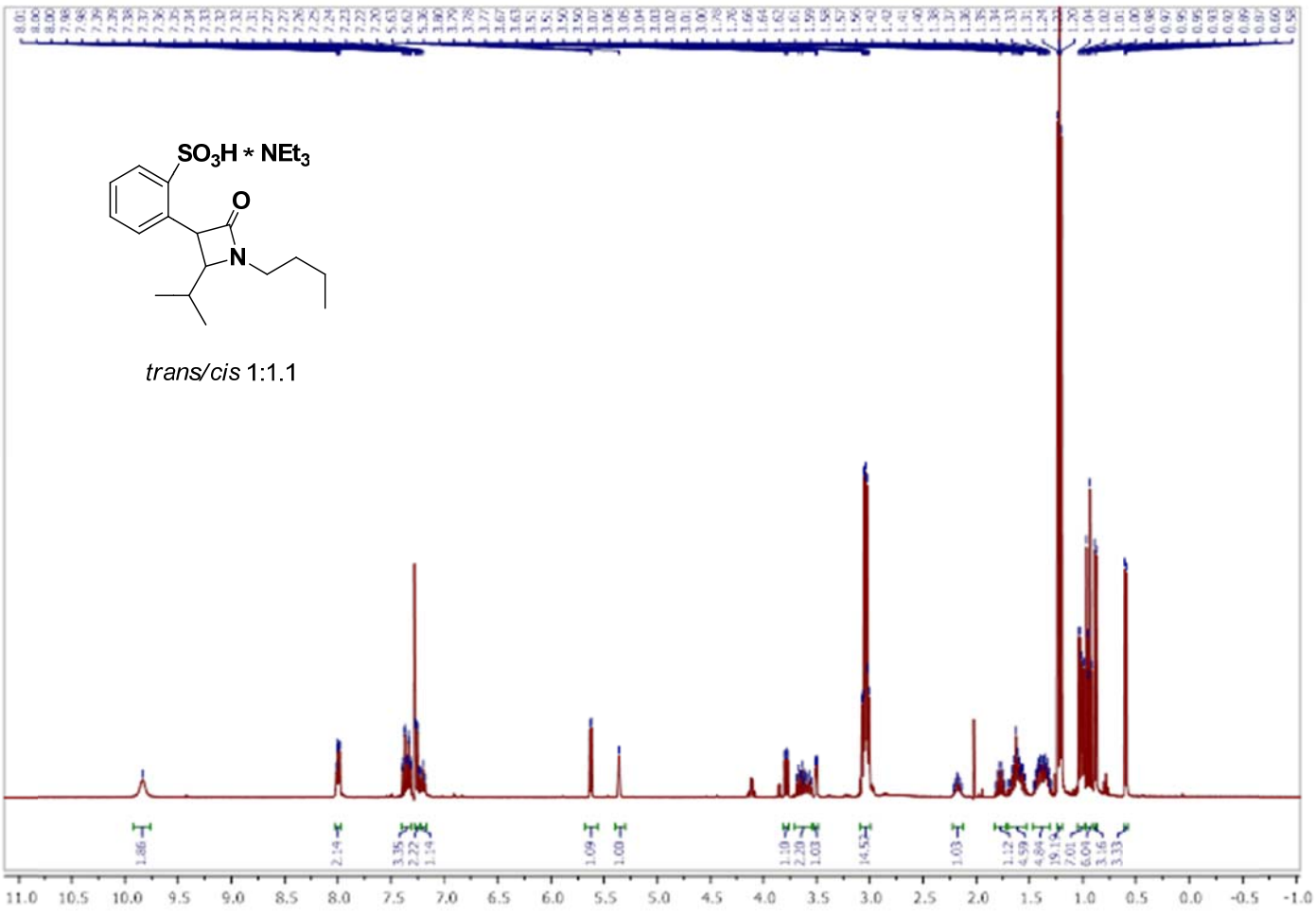
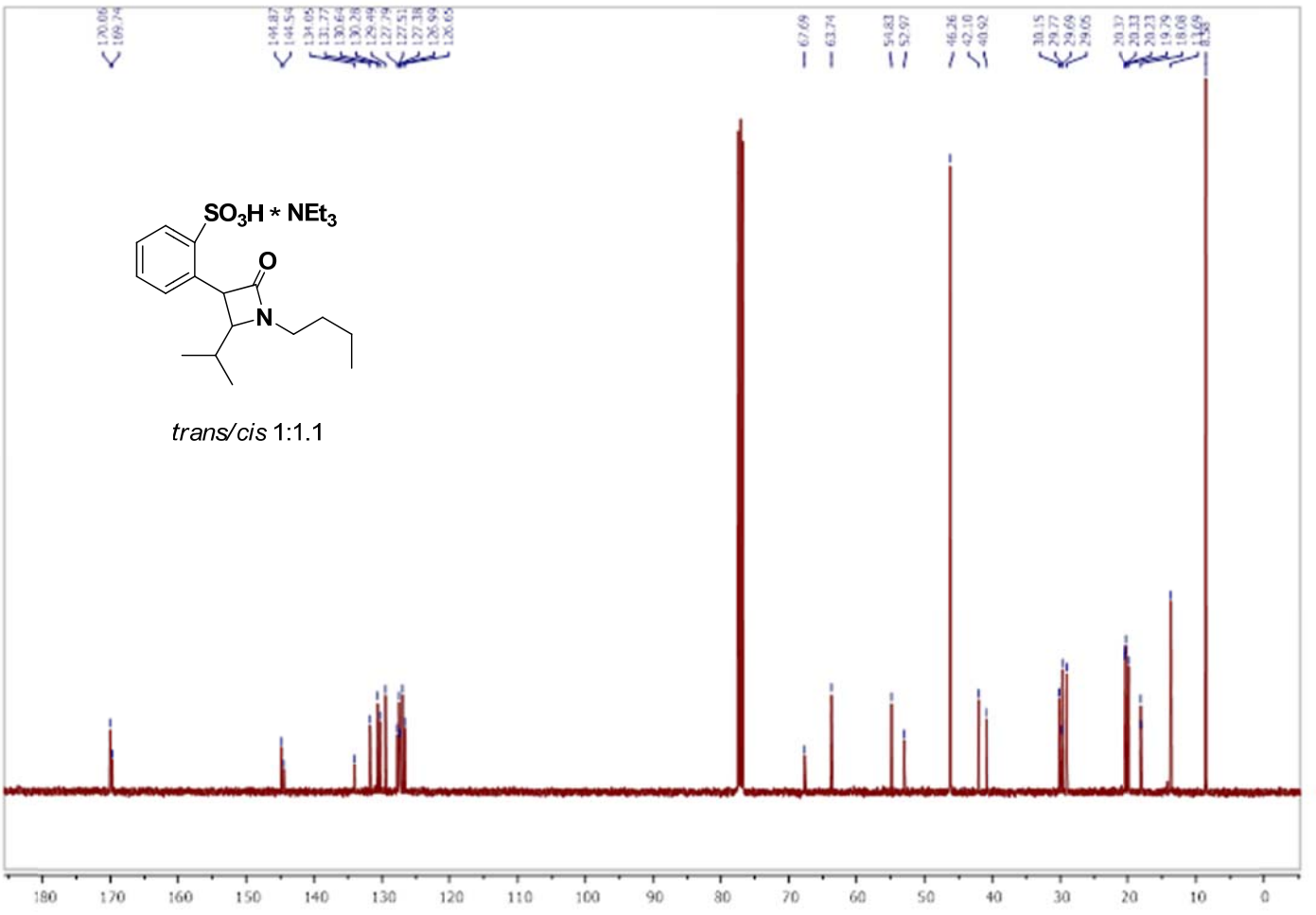


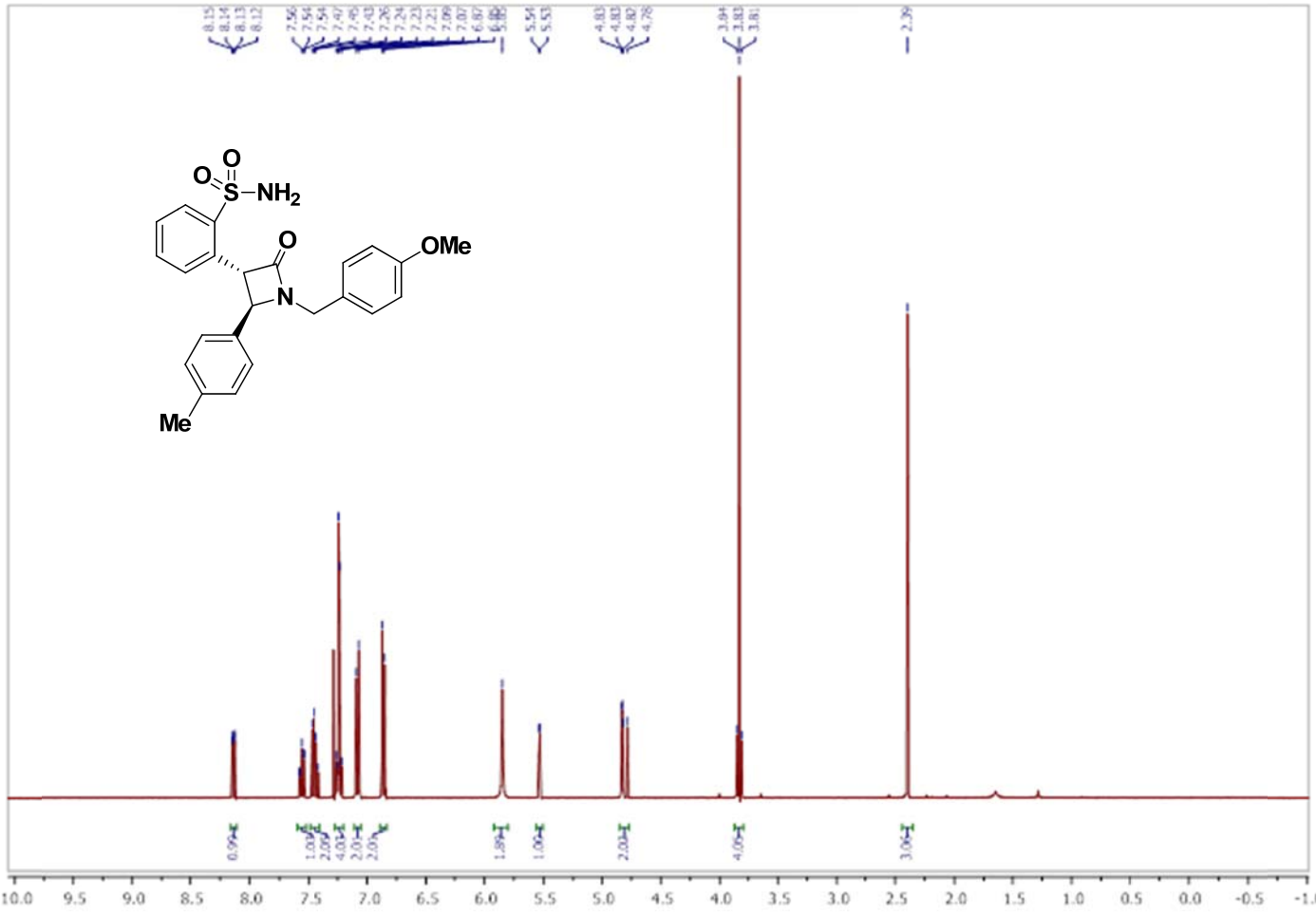



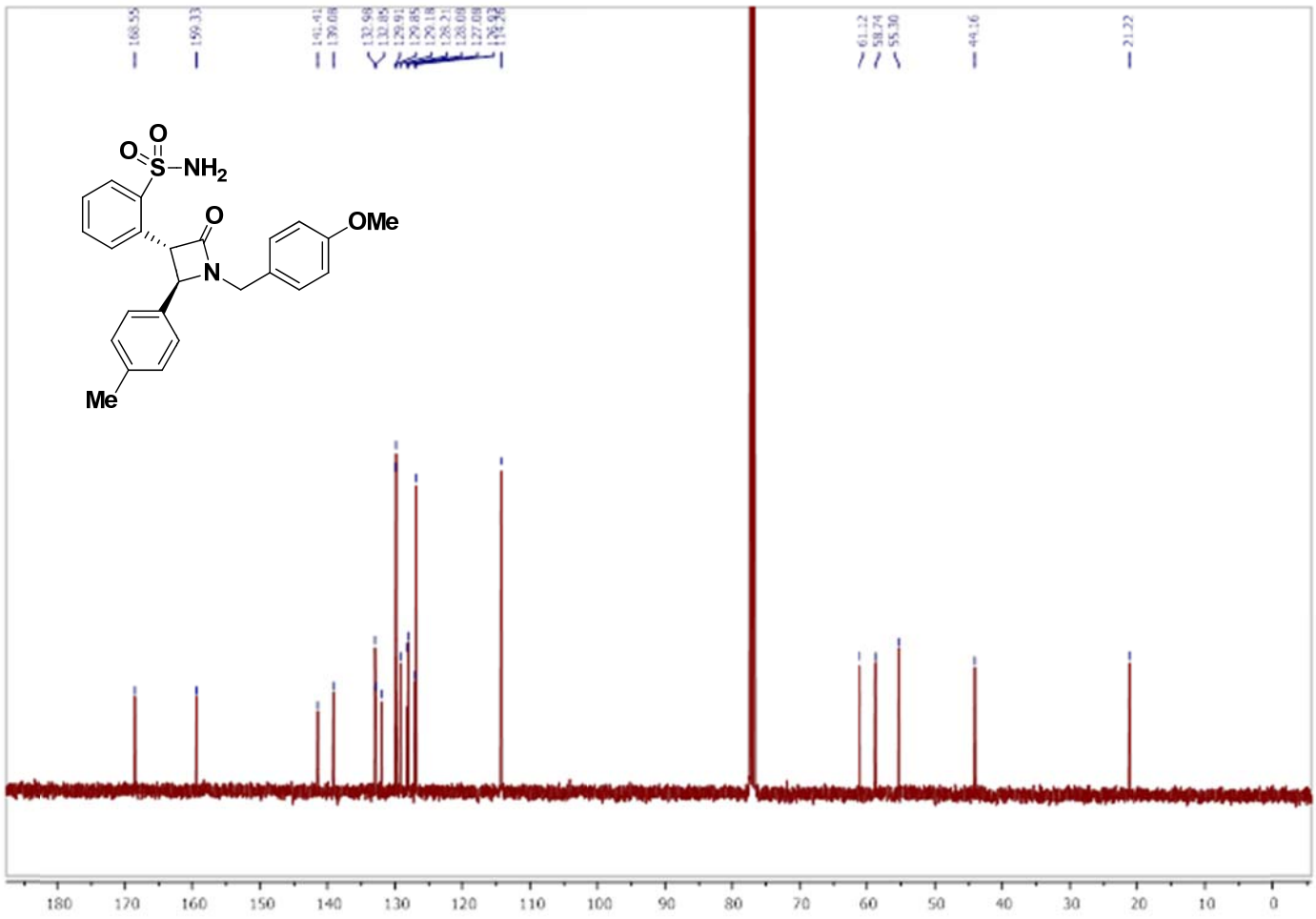
$^{1}$H and $^{13}$C NMR of compound *trans/cis*-**20r**



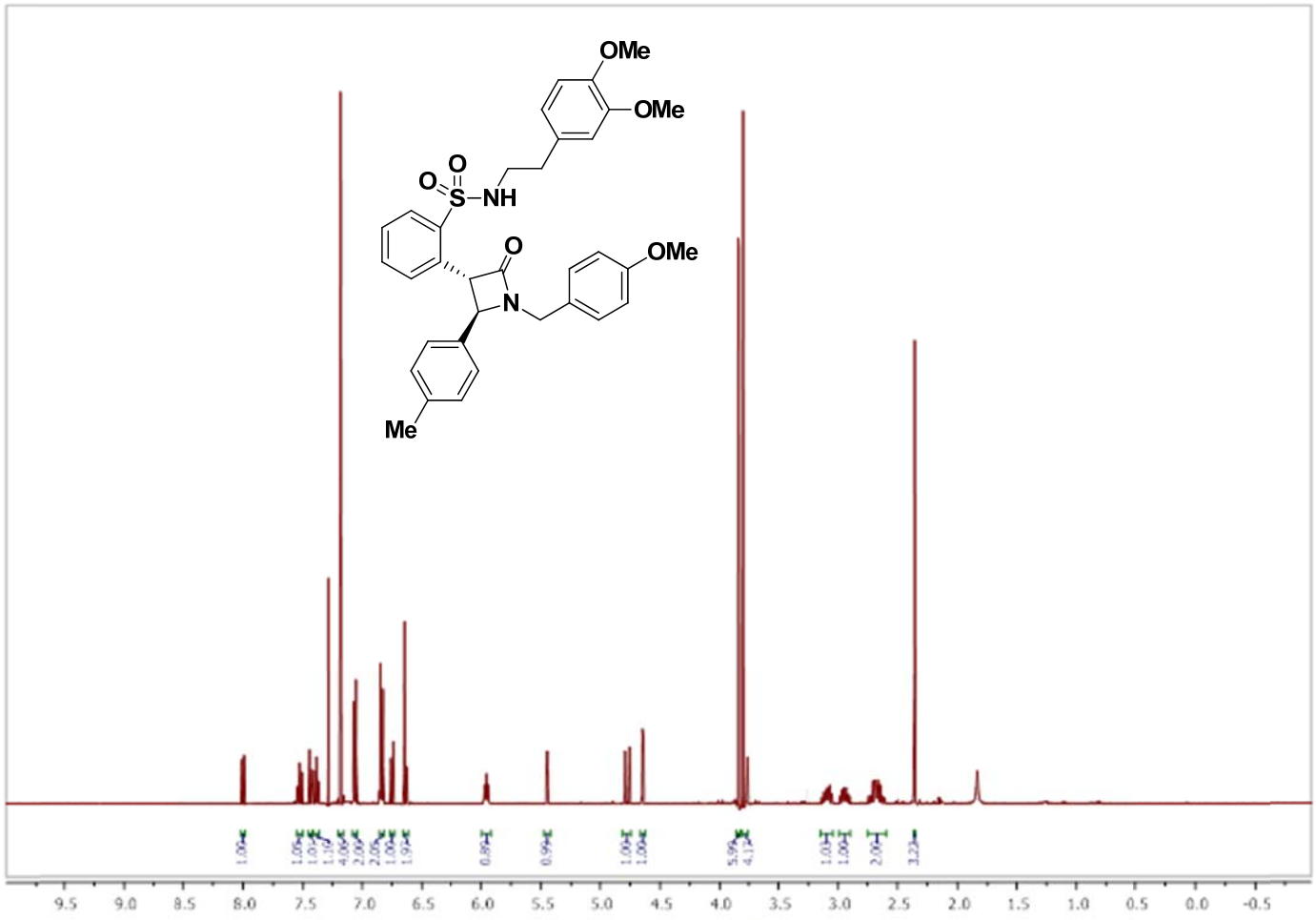



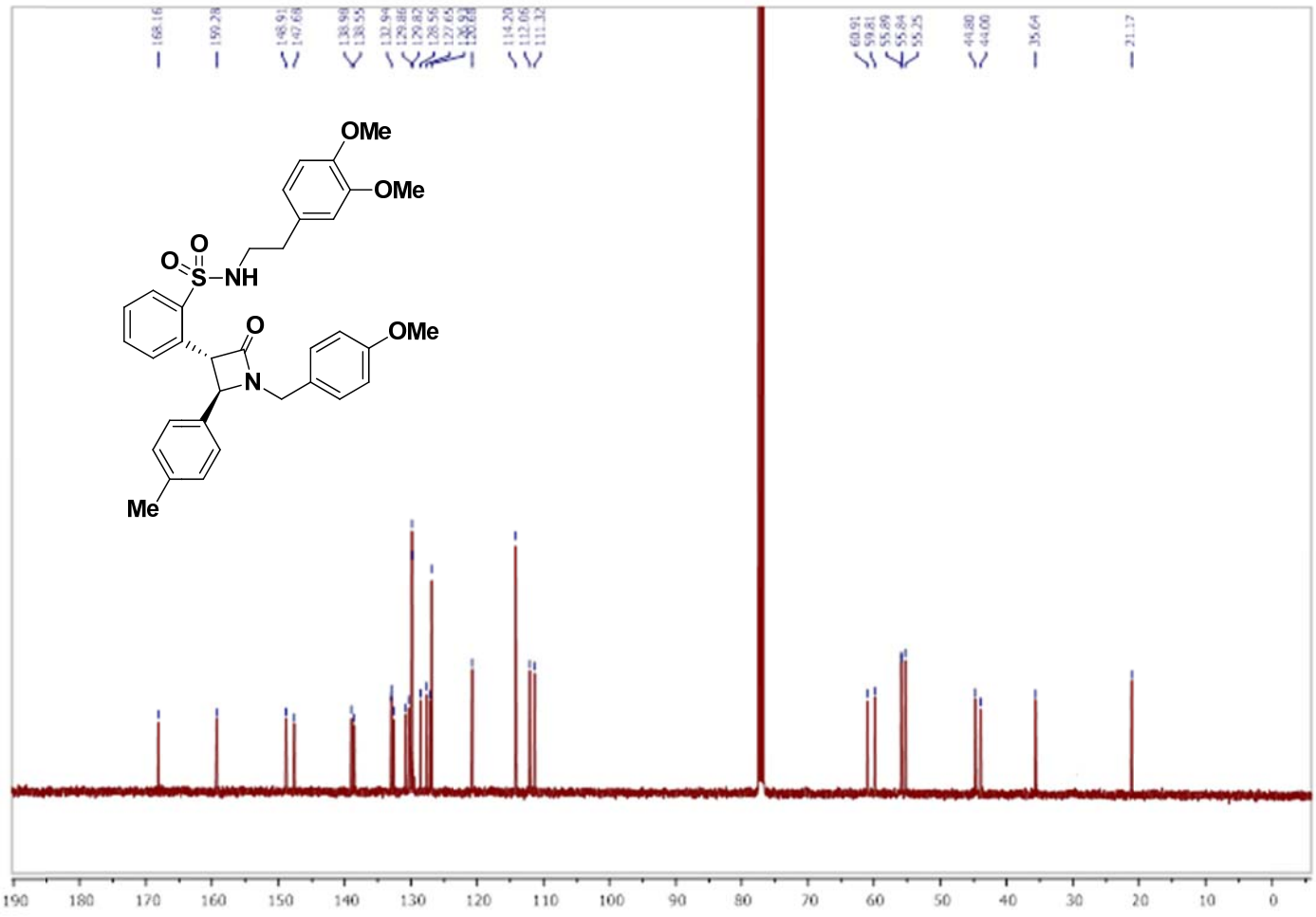
$^{1}H$ and $^{13}C$ NMR of compound **24a**



$^{1}H$ and $^{13}C$ NMR of compound **24b**



$^{1}H$ and $^{13}C$ NMR of compound **24c**