

Supporting Information

New multicomponent reactions in water: A facile synthesis of 1,3-dioxo-2-indanilidene-heterocyclic scaffolds and indenoquinoxalines through reaction of ninhydrin-malononitrile adduct with diverse *N*-binucleophiles

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Experimental Section

General remarks:

All commercially available reagents and other solvents were purchased from Aldrich and Merck chemical Co. and used without further purification. The NMR spectra were recorded with a Bruker DRX-300 AVANCE instrument (300 MHz for ^1H and 75.4 MHz for ^{13}C) with $\text{DMSO-}d_6$ as solvent. Chemical shifts are given in ppm (δ) and coupling constants (J) are reported in Hertz (Hz).

Melting points were measured with an electrothermal 9100 apparatus. Mass spectra were recorded with an Agilent 5975C VL MSD with Triple-Axis detector operating at an ionization potential of 70 eV. IR spectra were measured with Bruker Tensor 27 spectrometer.

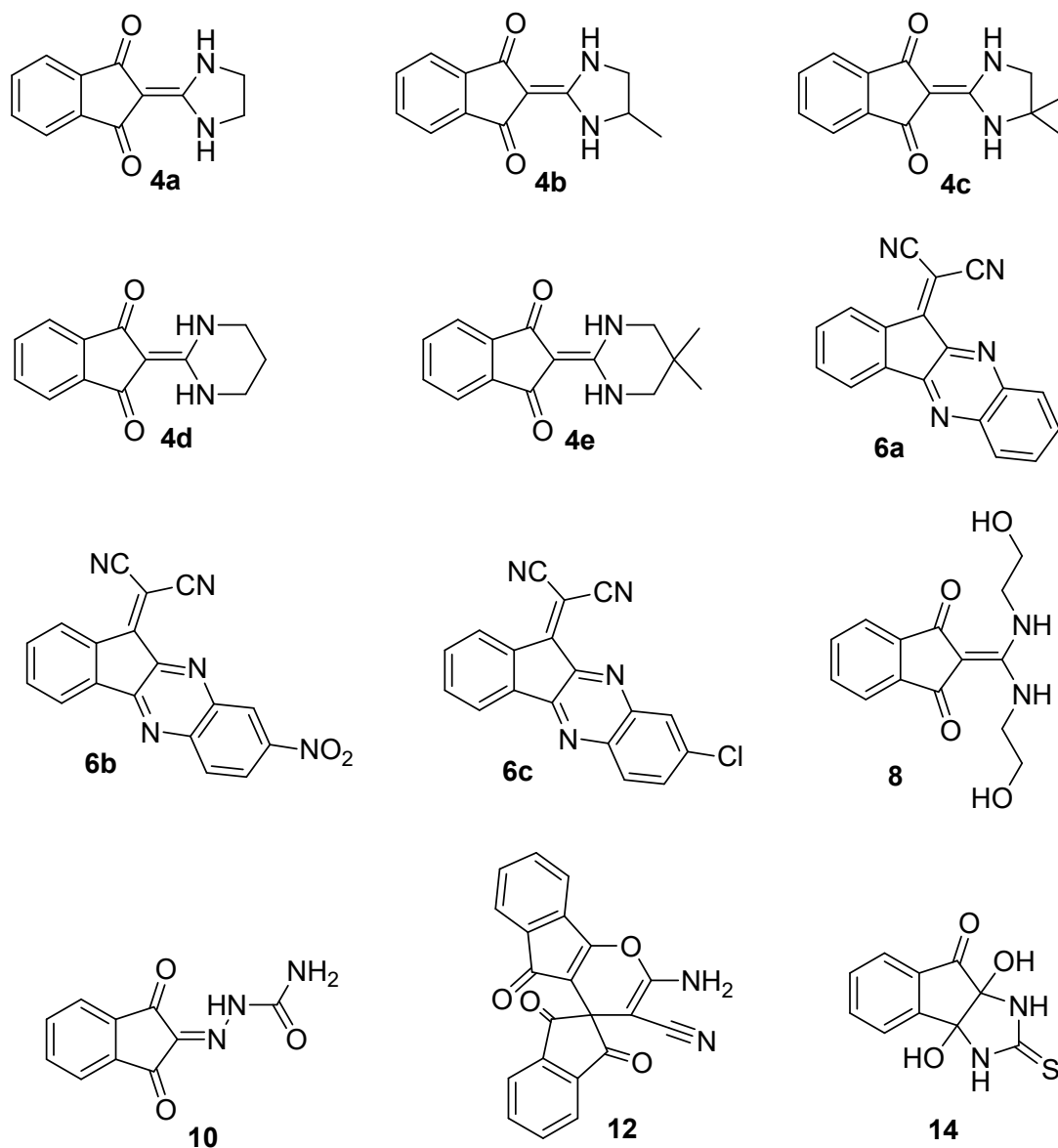
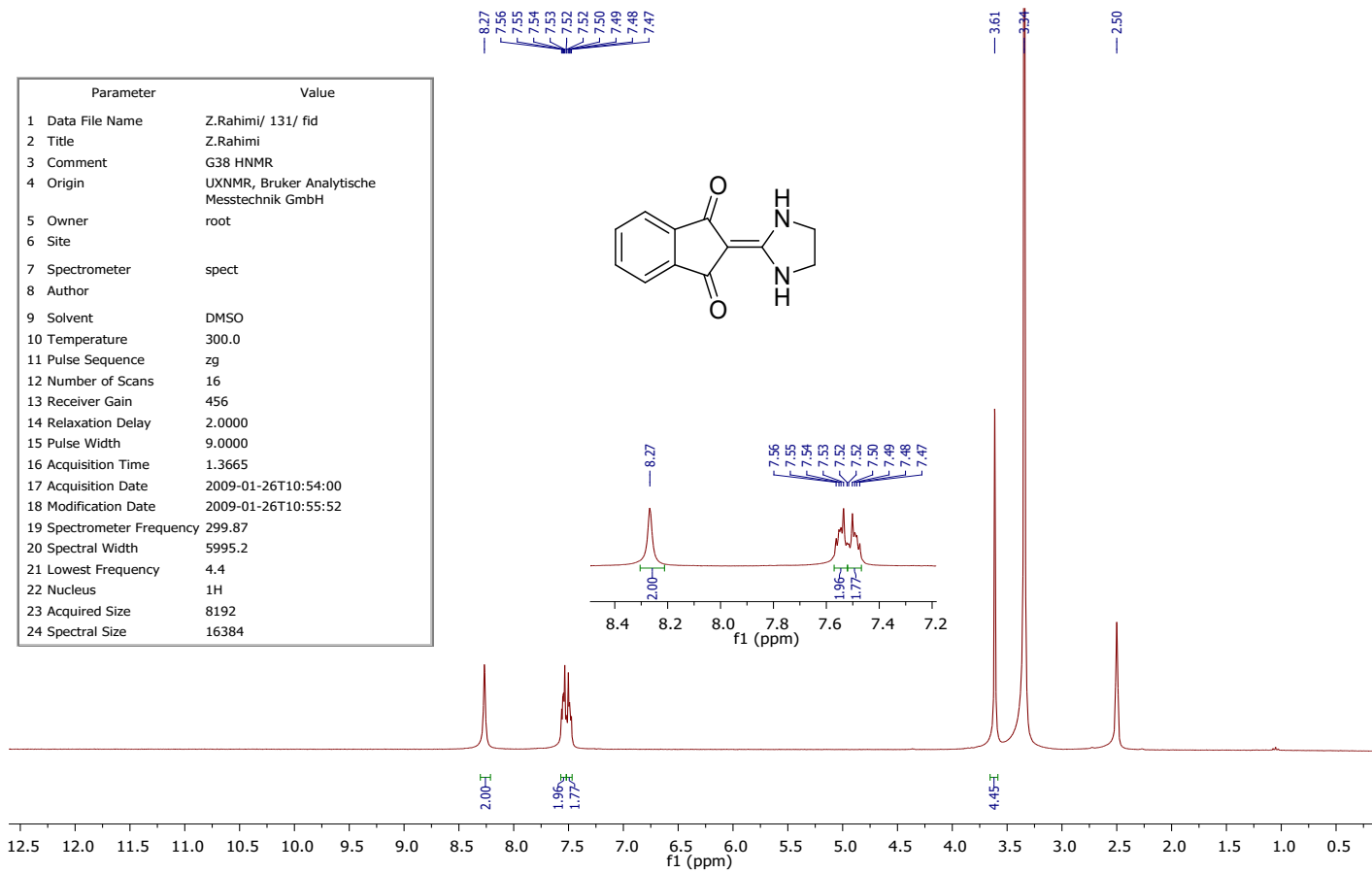
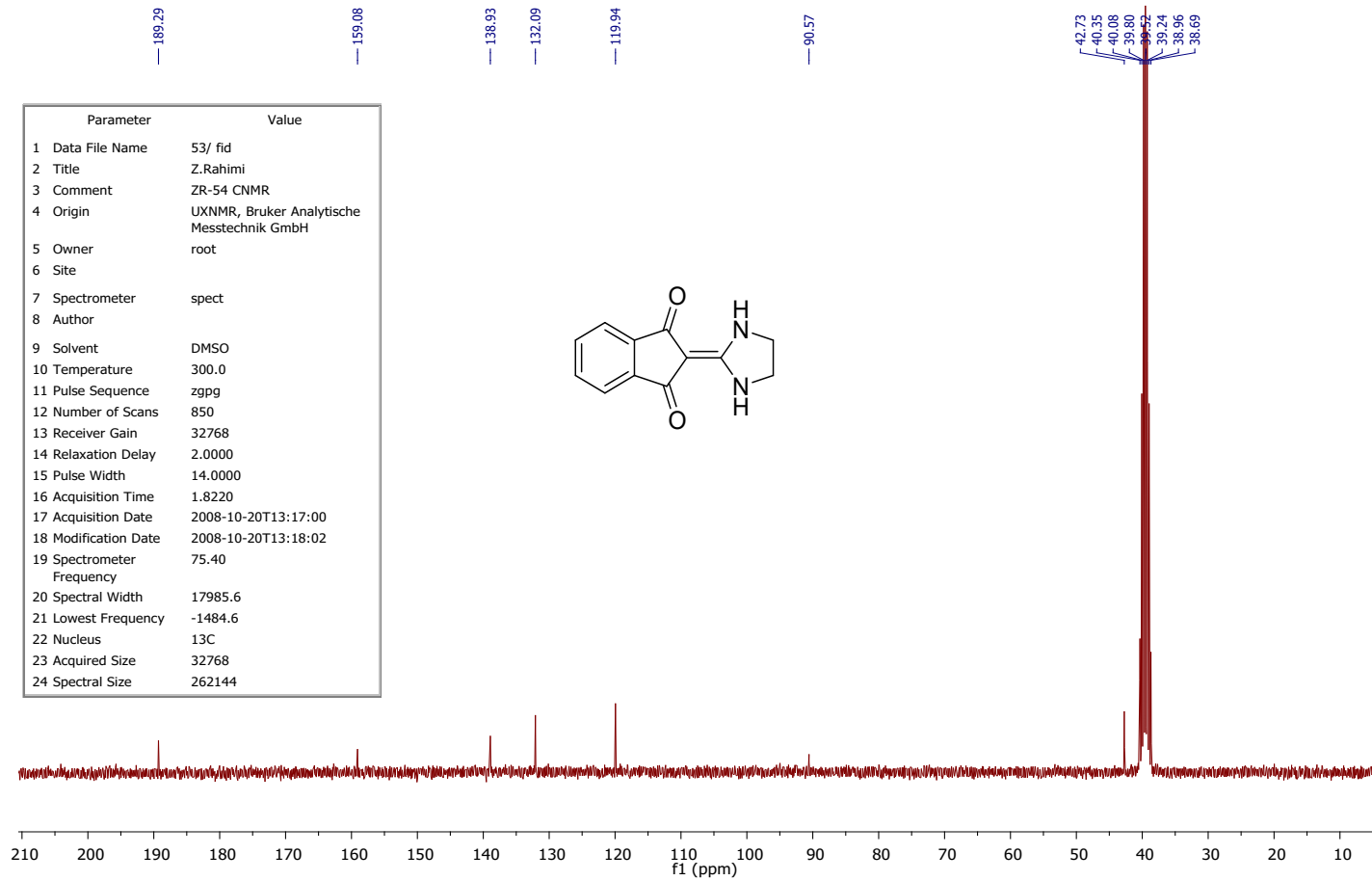


Figure 1. Structure of all products **4,6,8,10,12,14**.

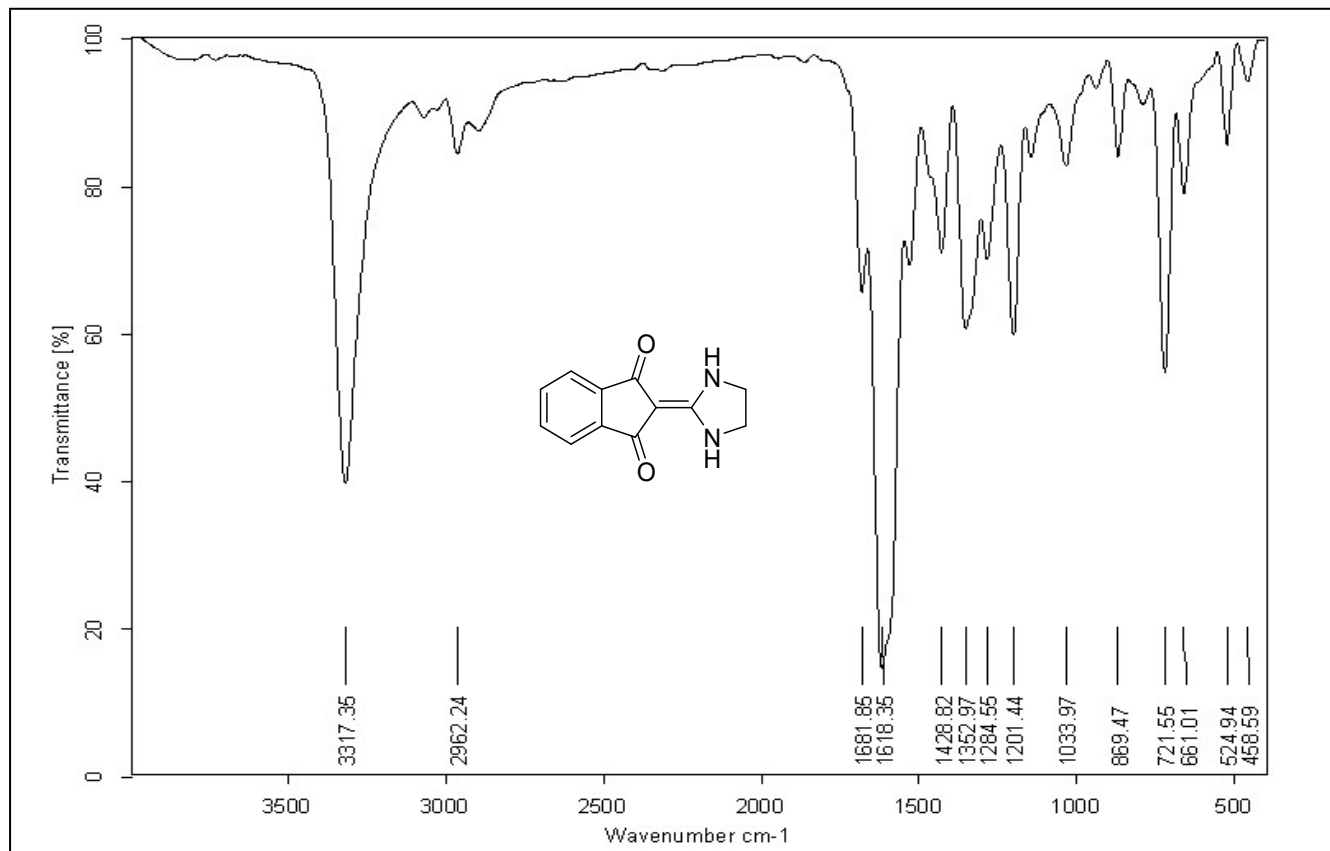
The structure of the products were deduced from their IR, Mass, ^1H NMR, and ^{13}C NMR spectra (see the following images).

The ^1H and ^{13}C NMR spectra are taken in $\text{DMSO}-d_6$, but two derivatives **6a,6c** have low solubility, so they have no clear carbon spectra.

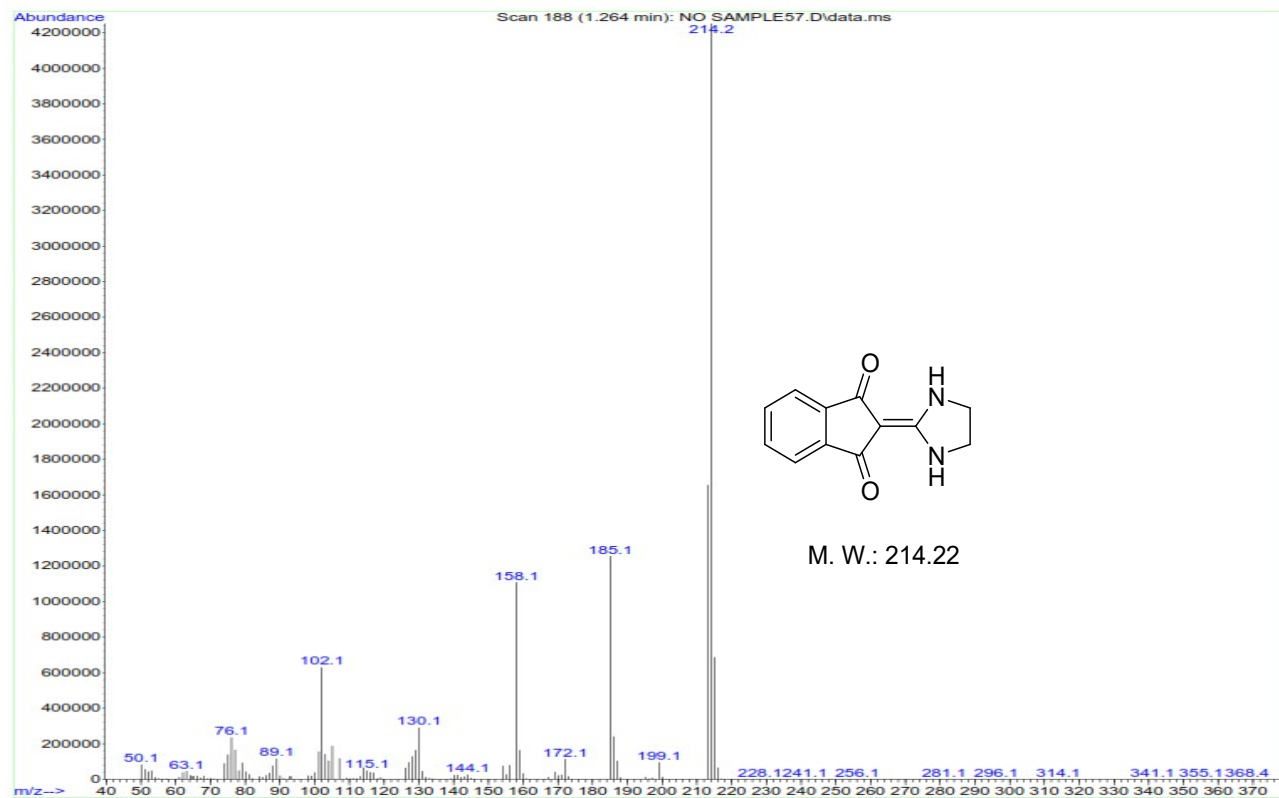
**¹H NMR of 4a**



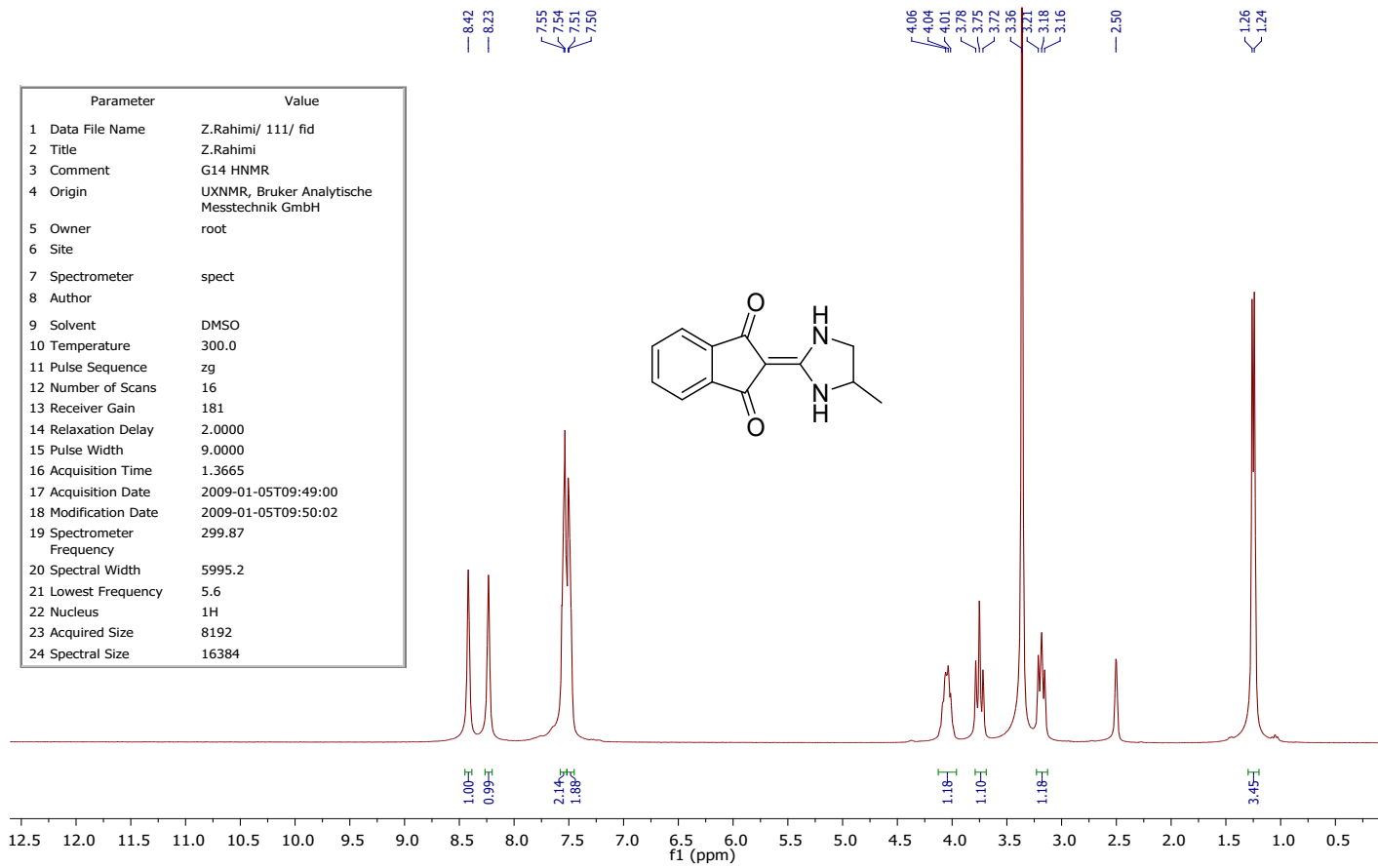
¹³C NMR of 4a

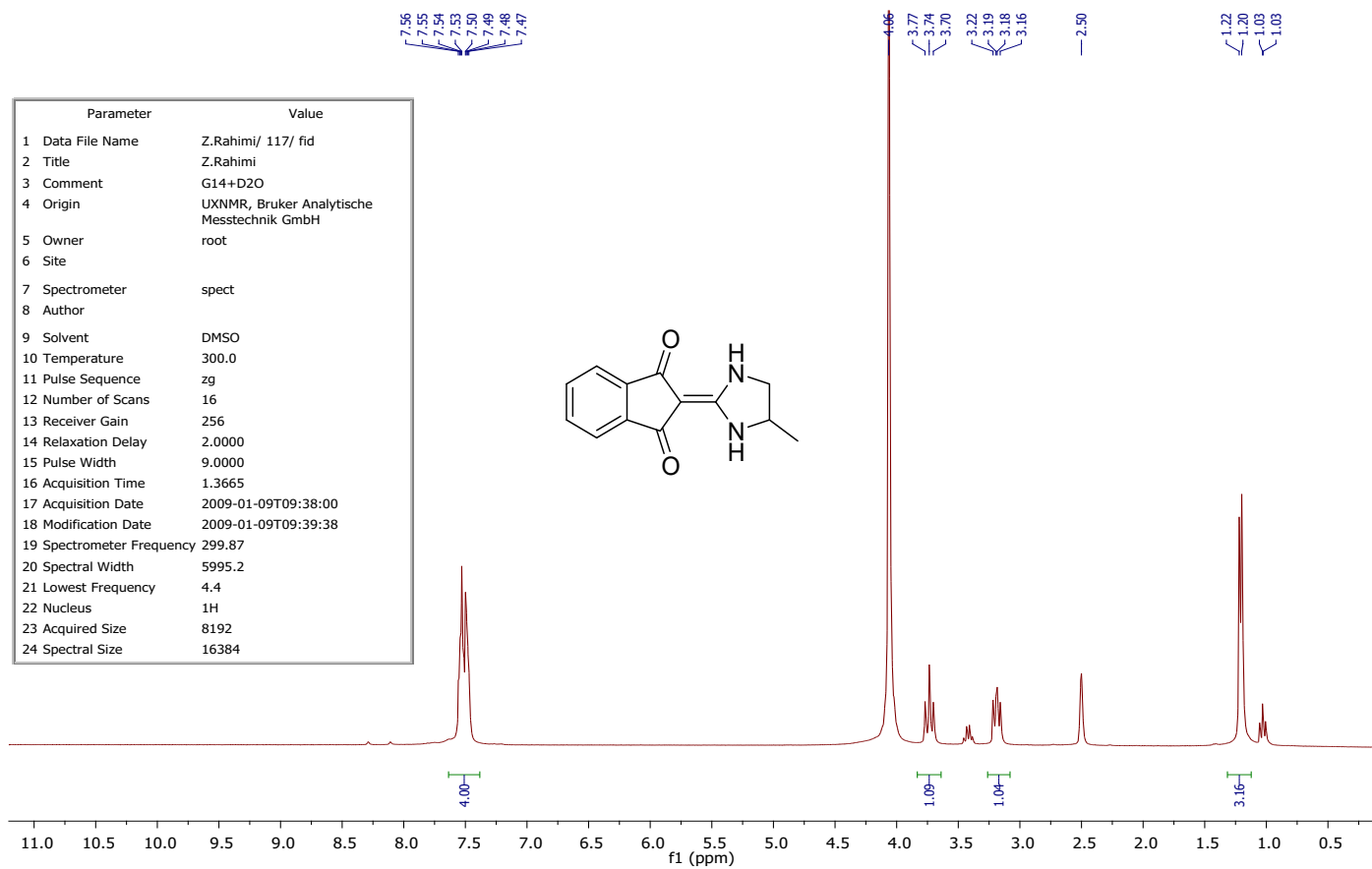


IR of 4a

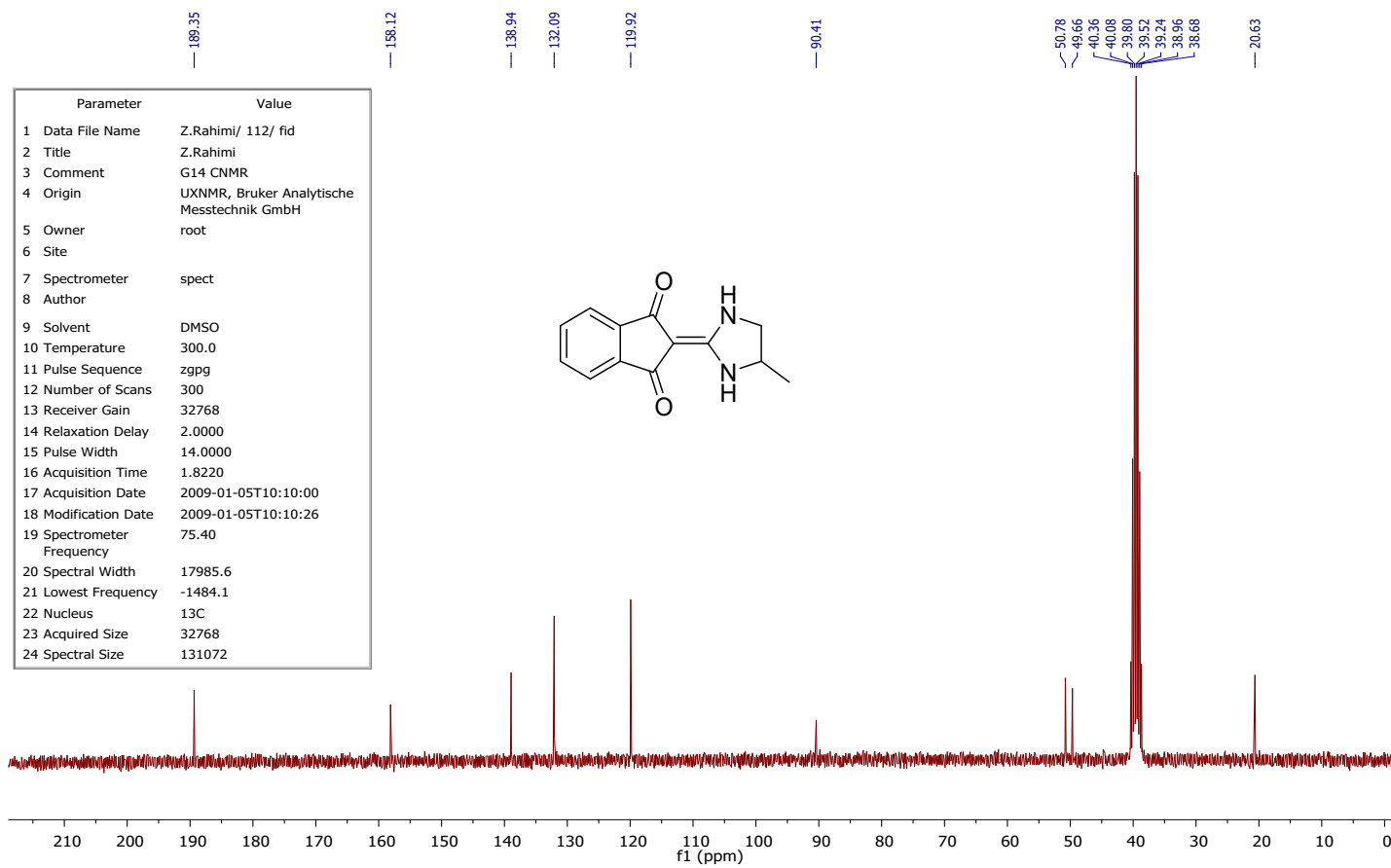


MS of 4a

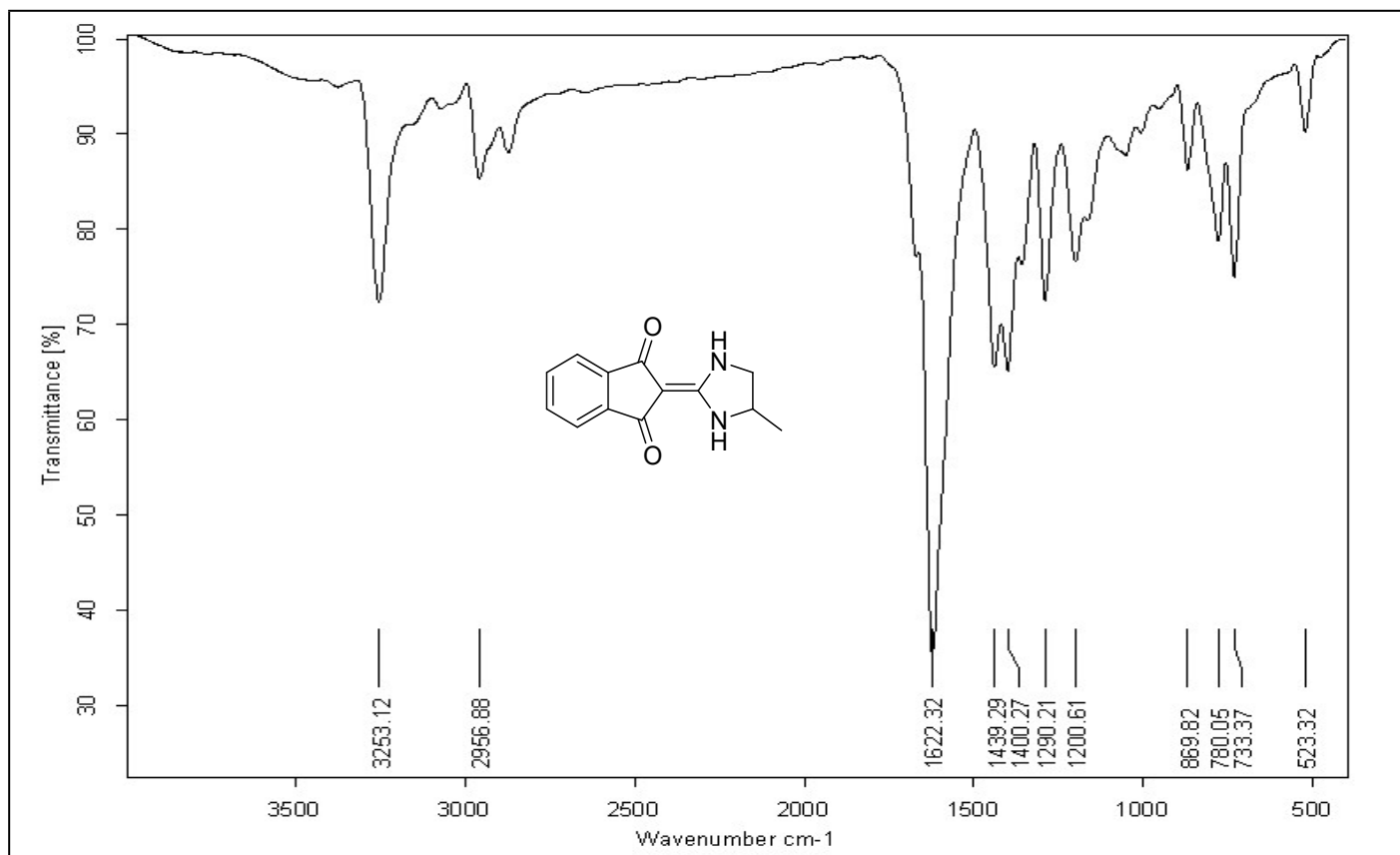
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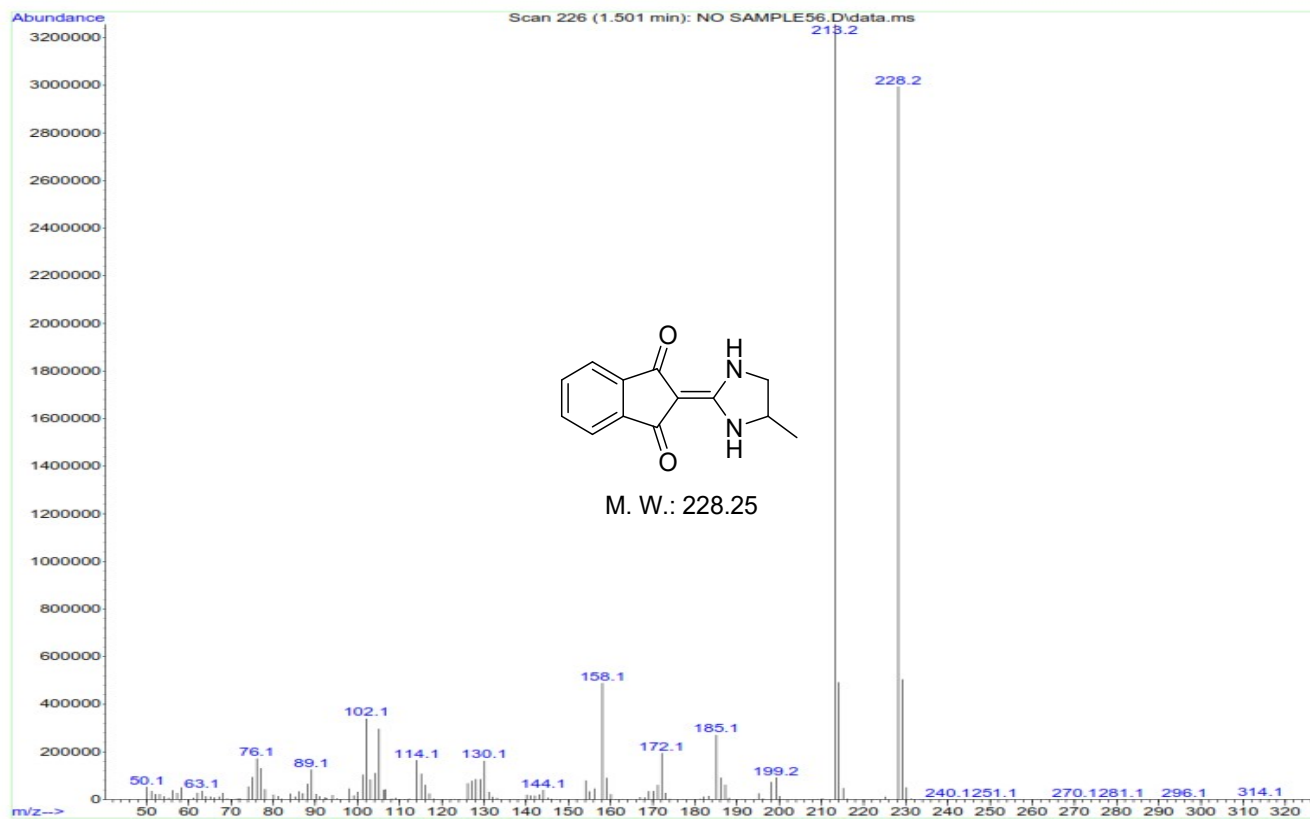


¹H-NMR with D₂O exchange of 4b

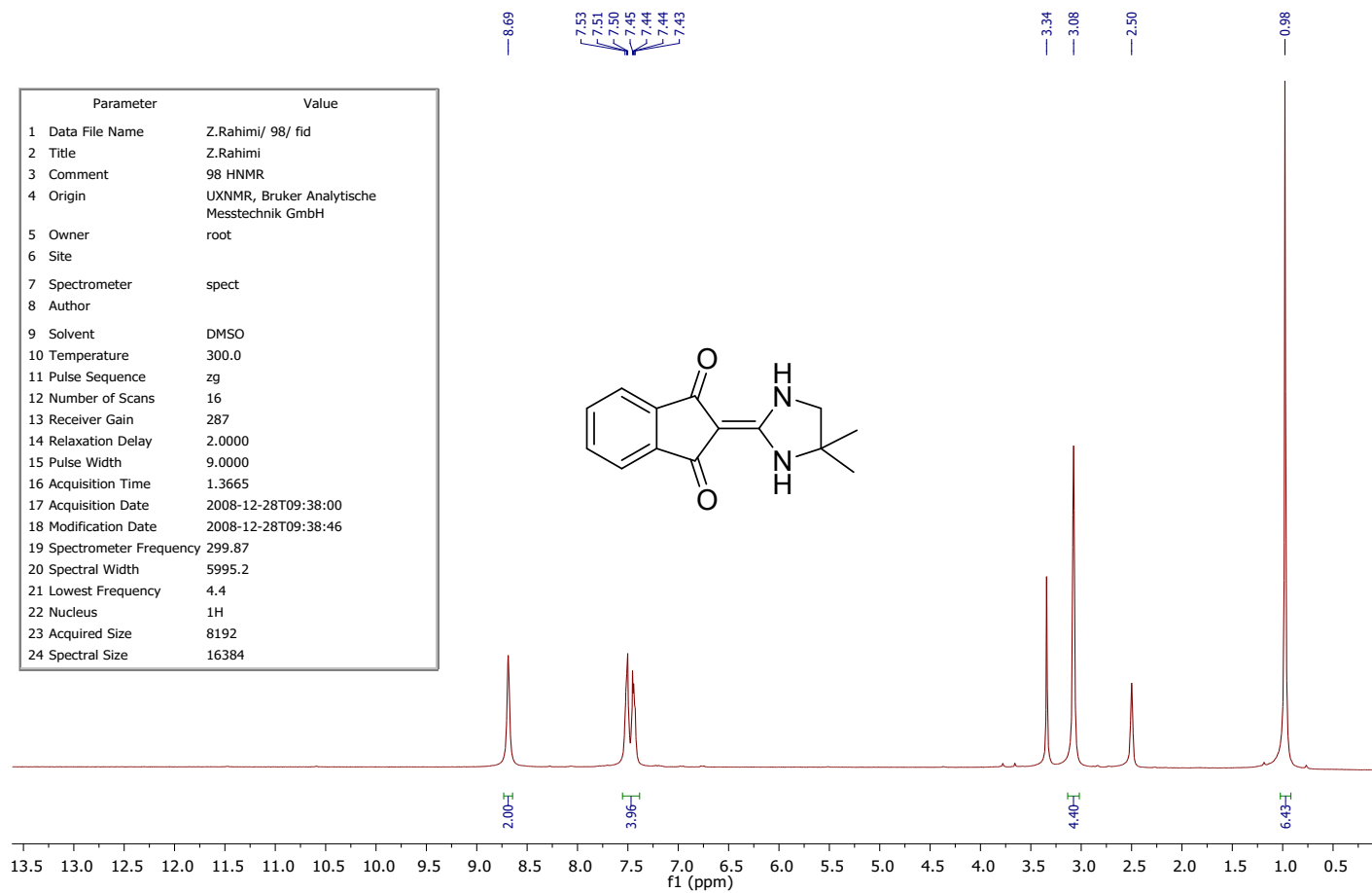


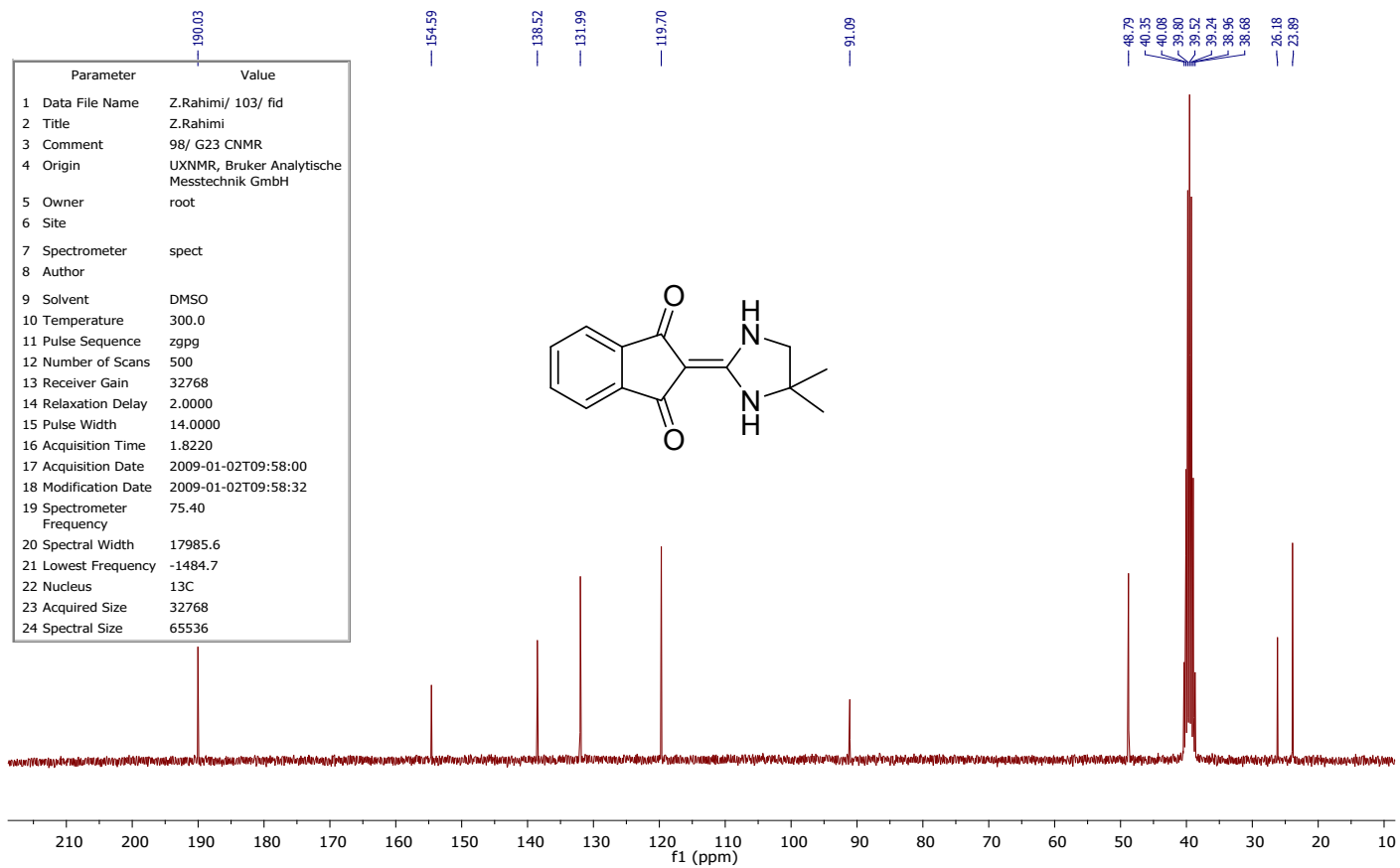
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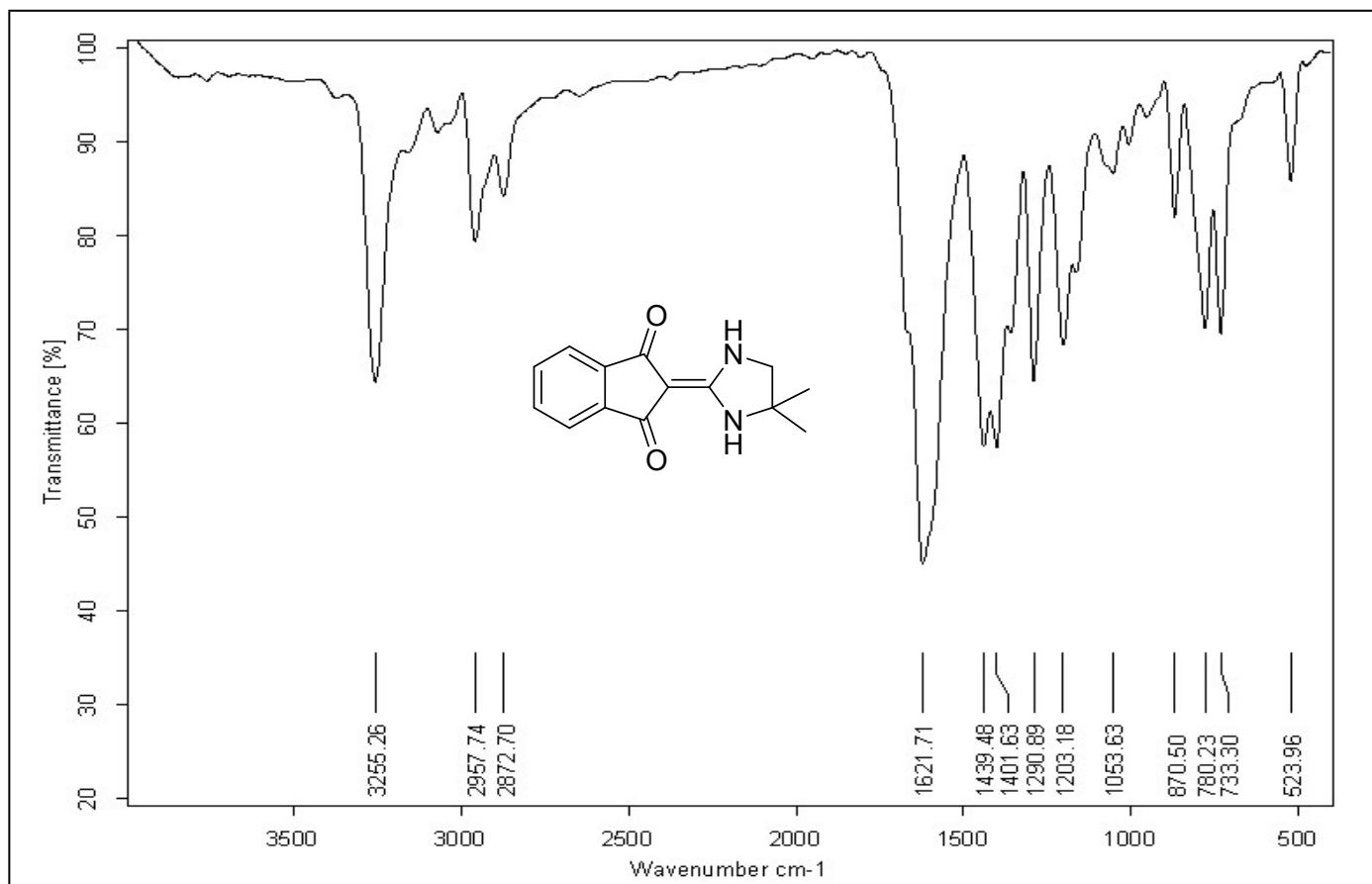
**IR of 4b**



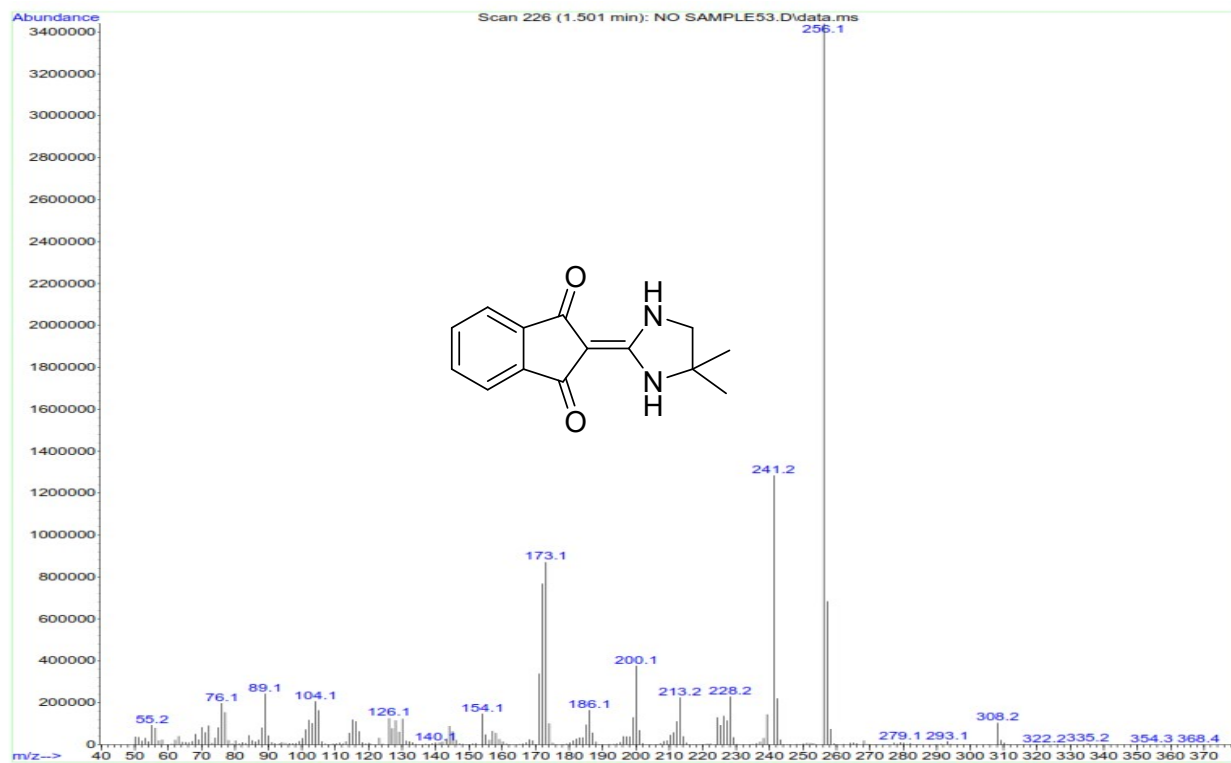
MS of 4b

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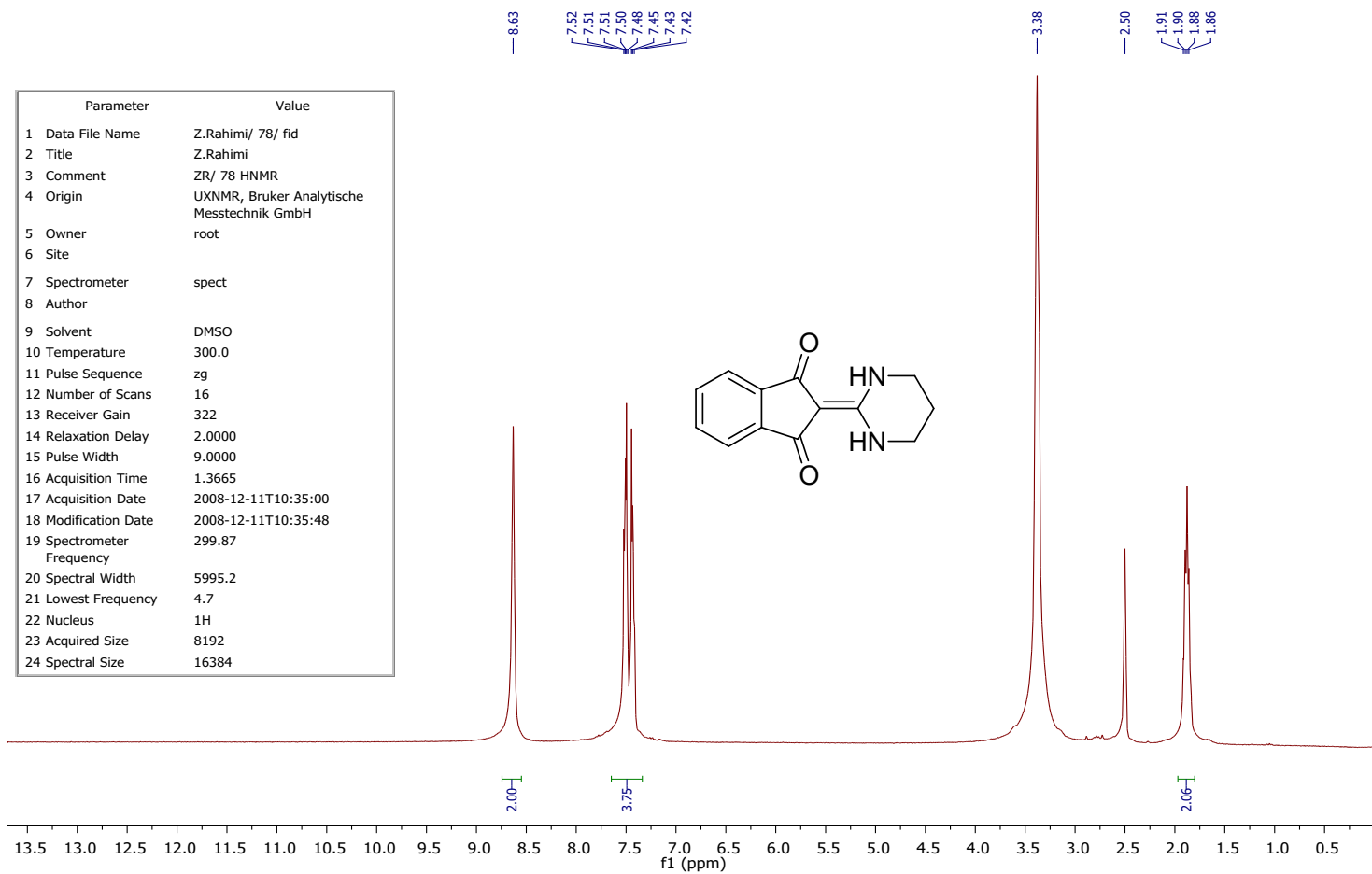
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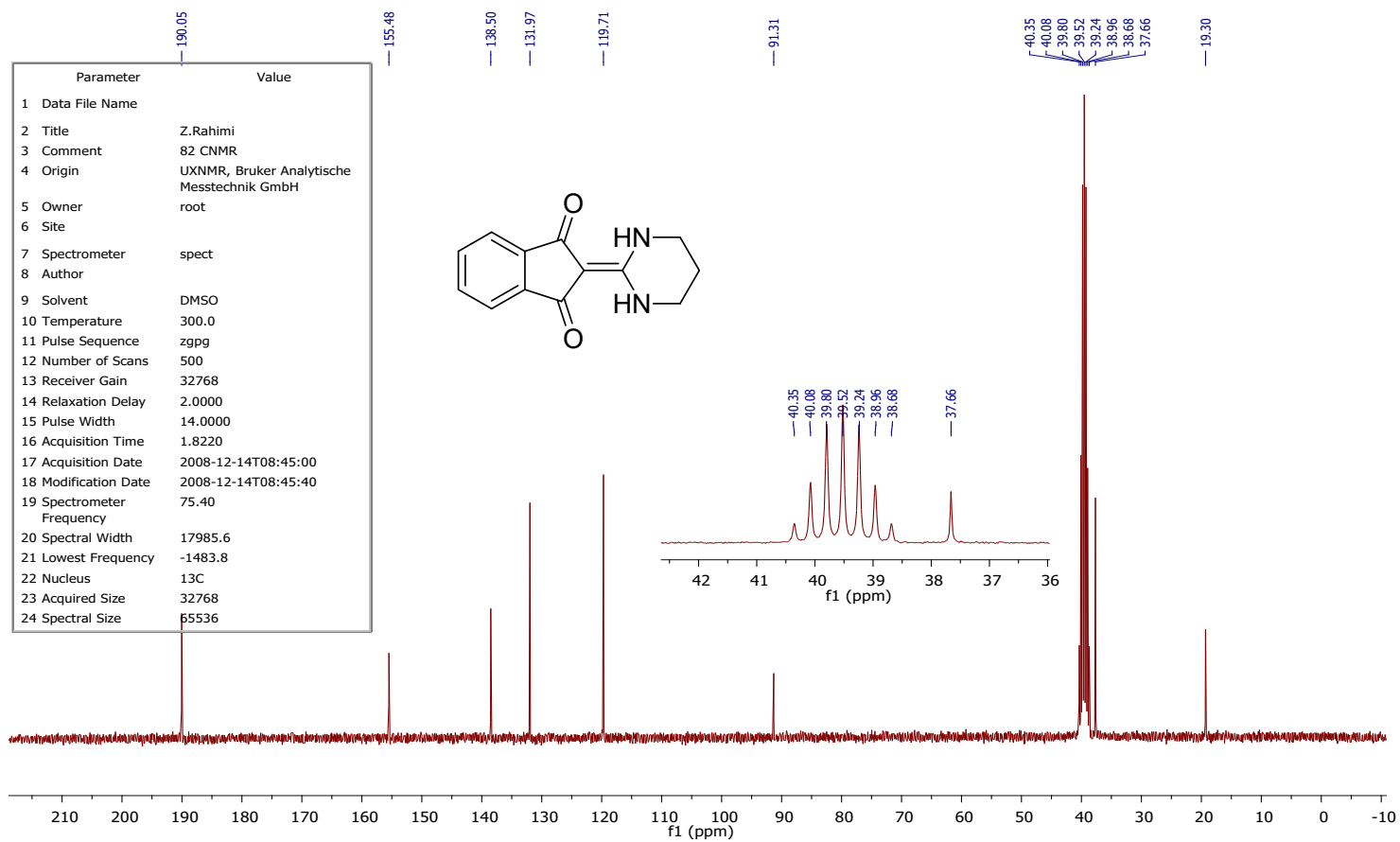


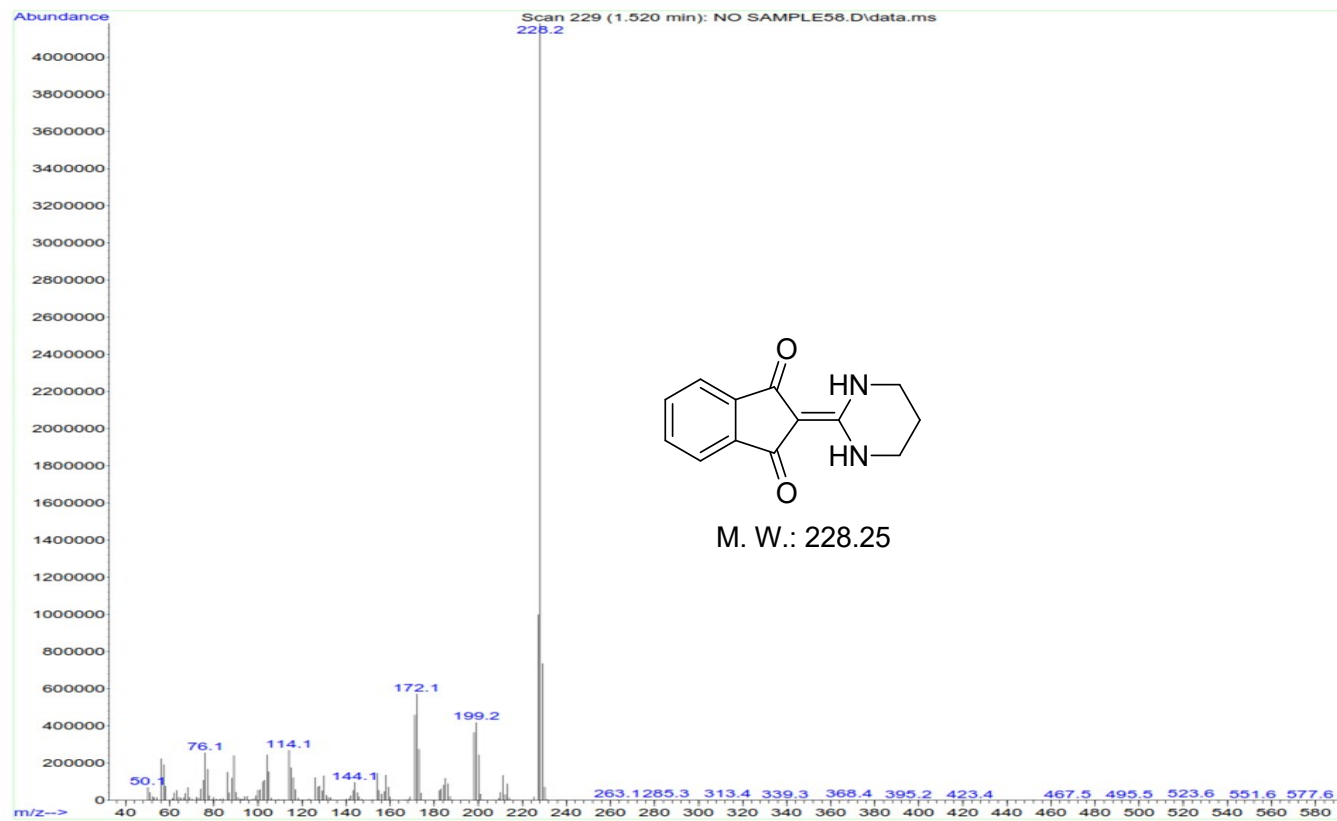
IR of 4c



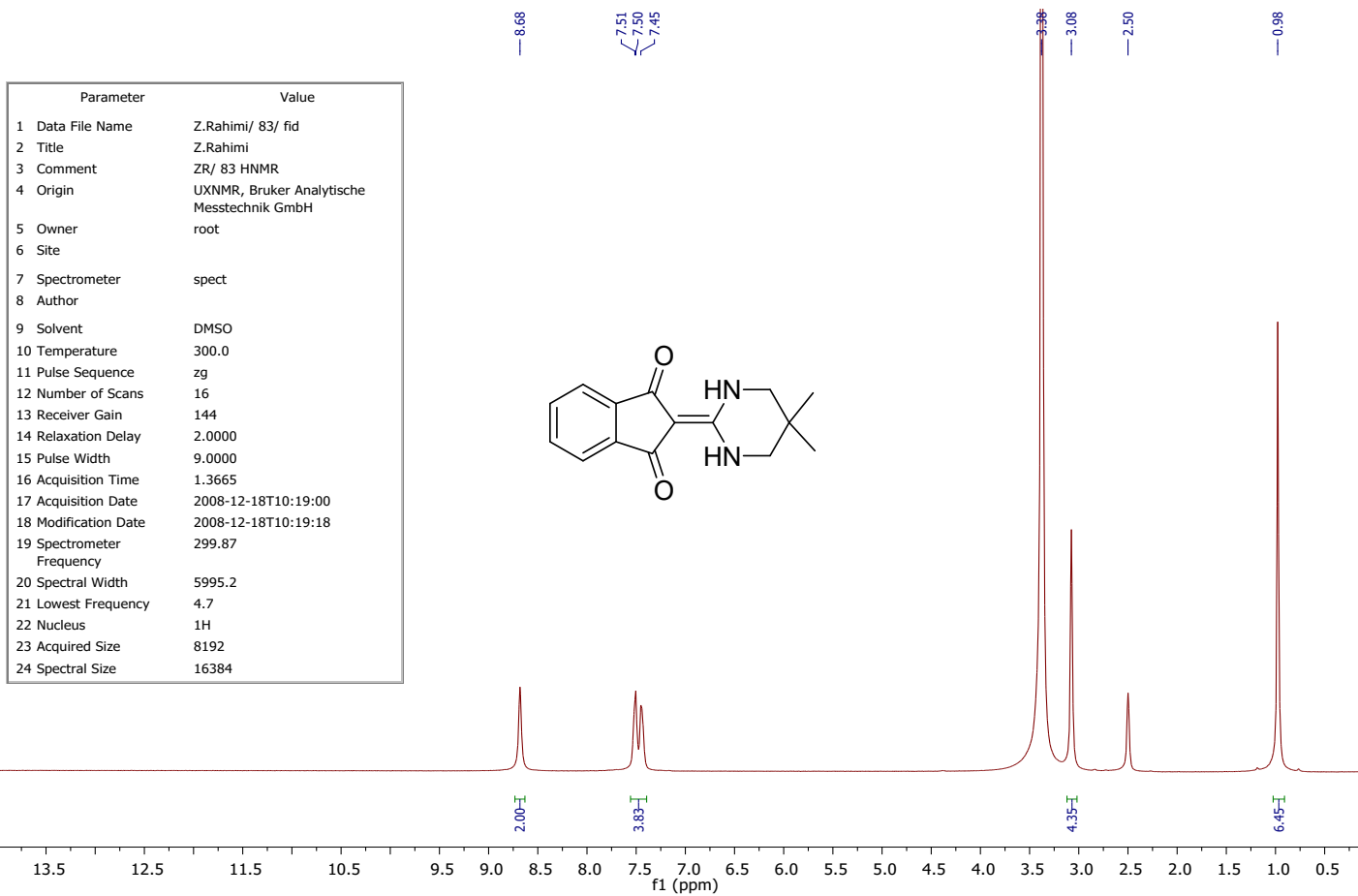
MS of 4c

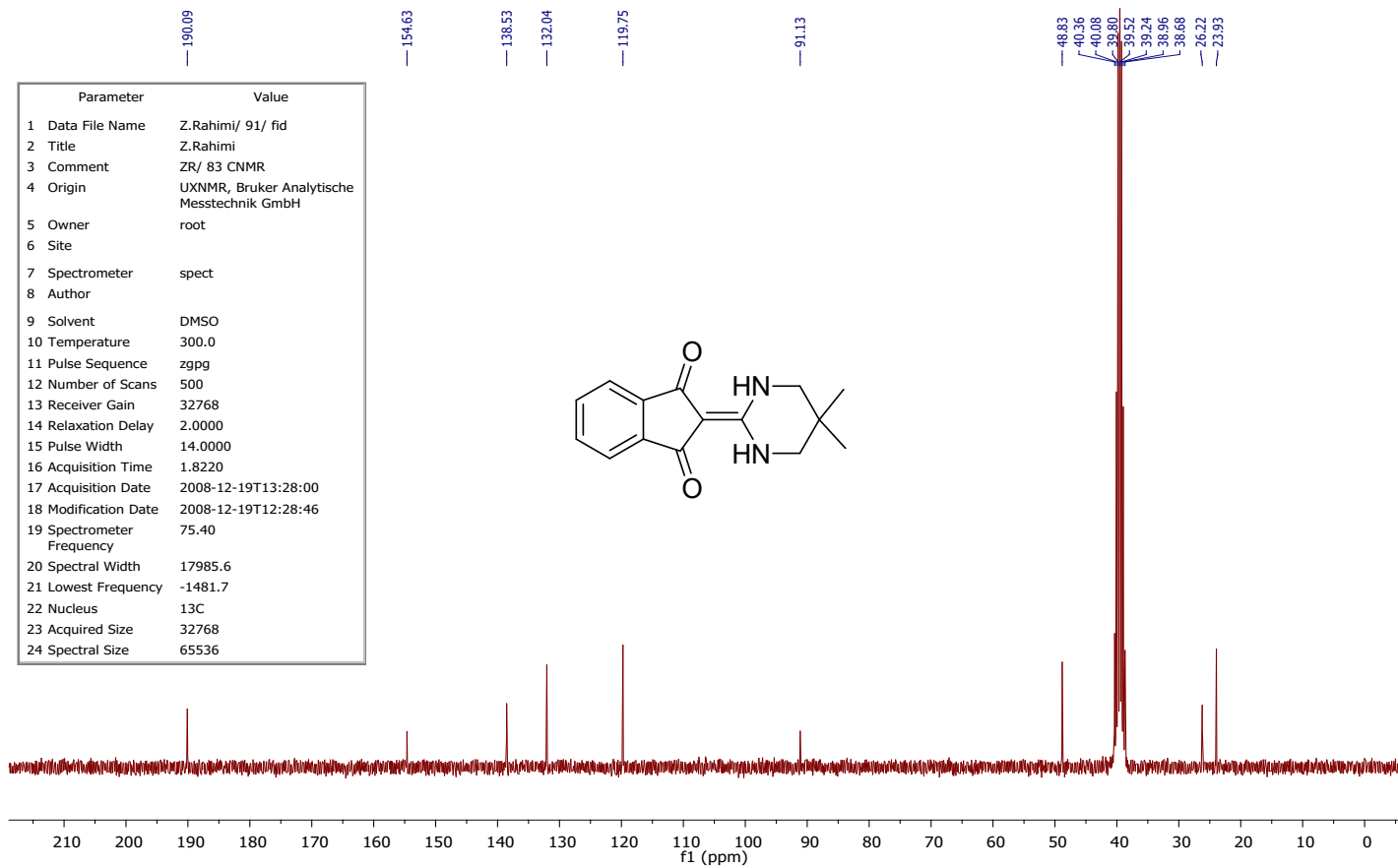
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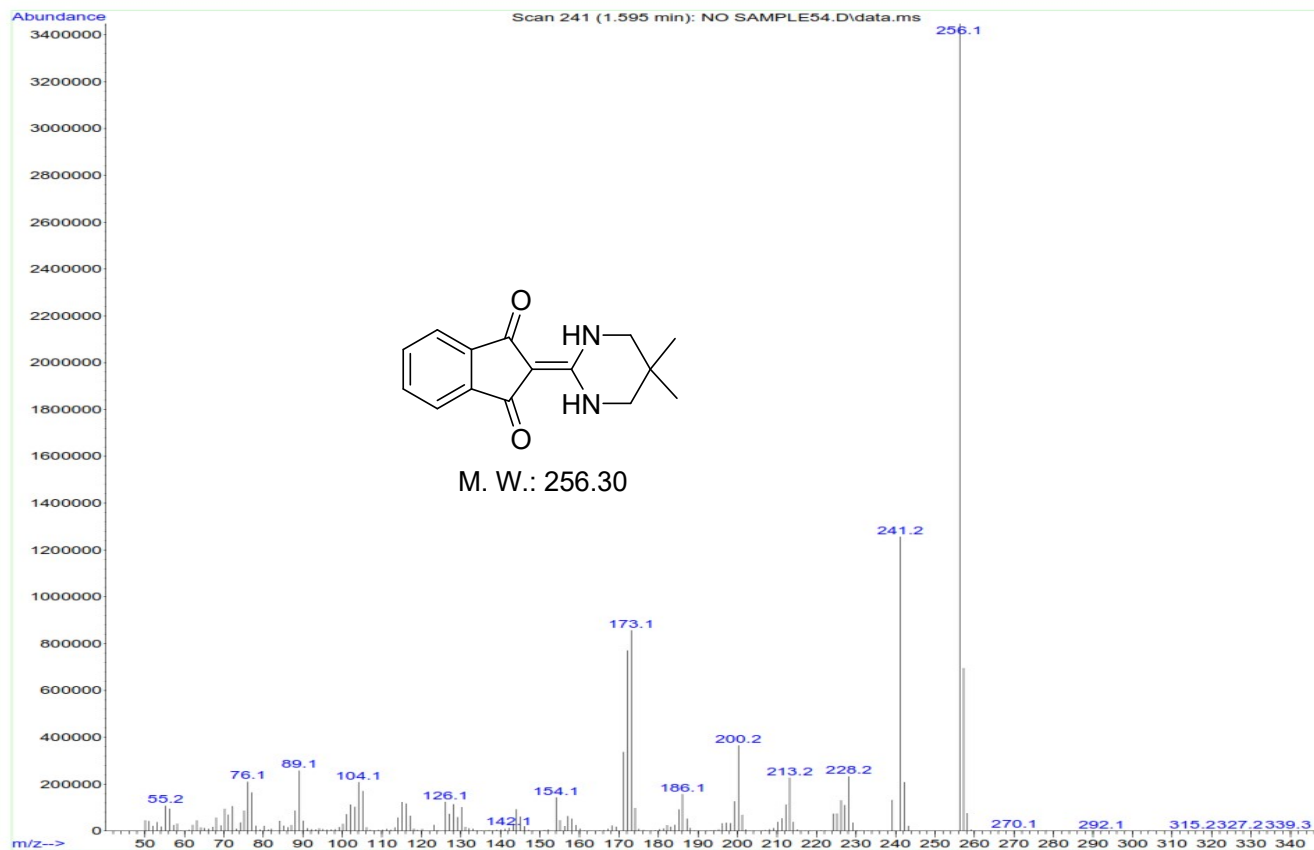
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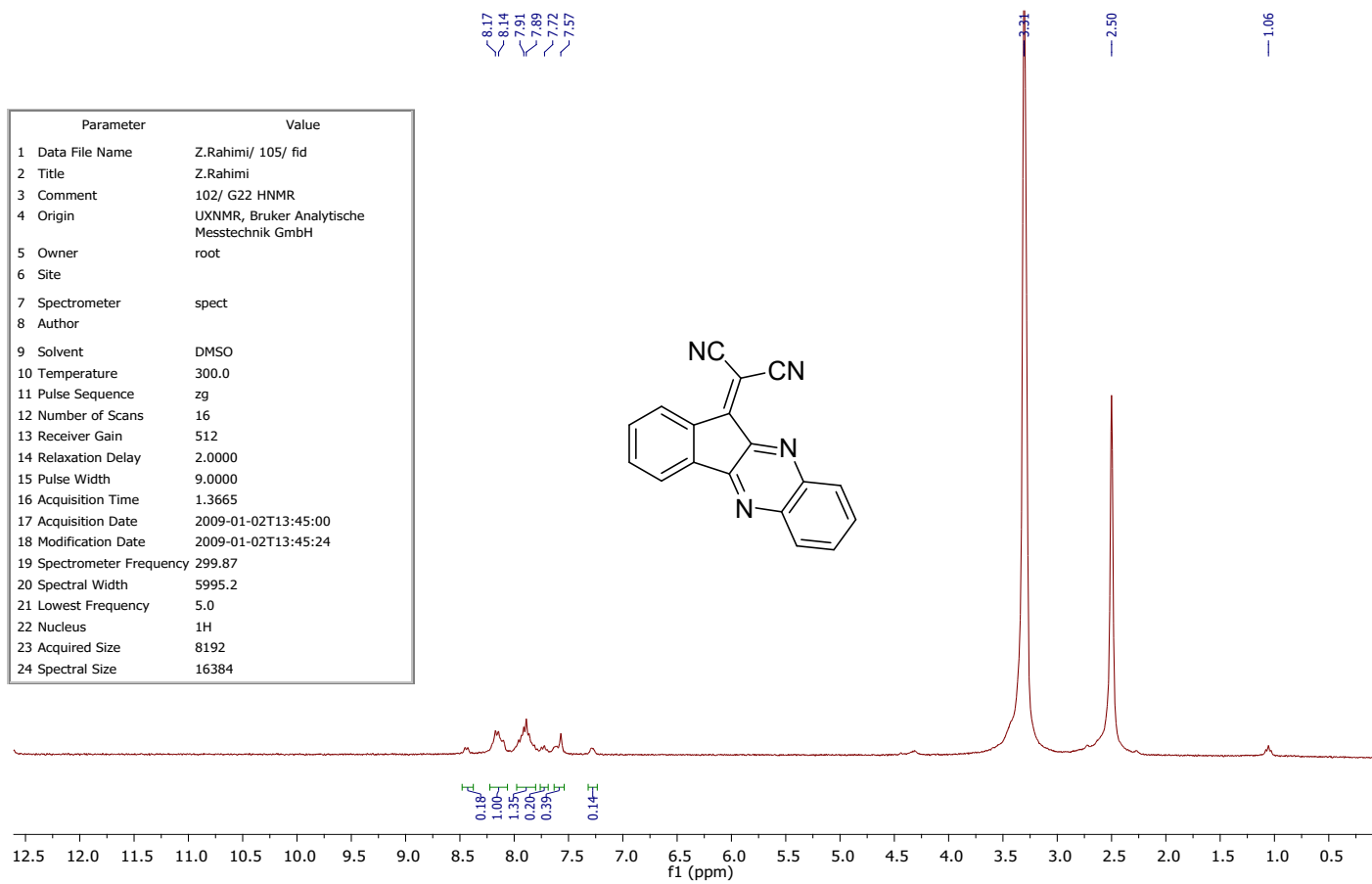
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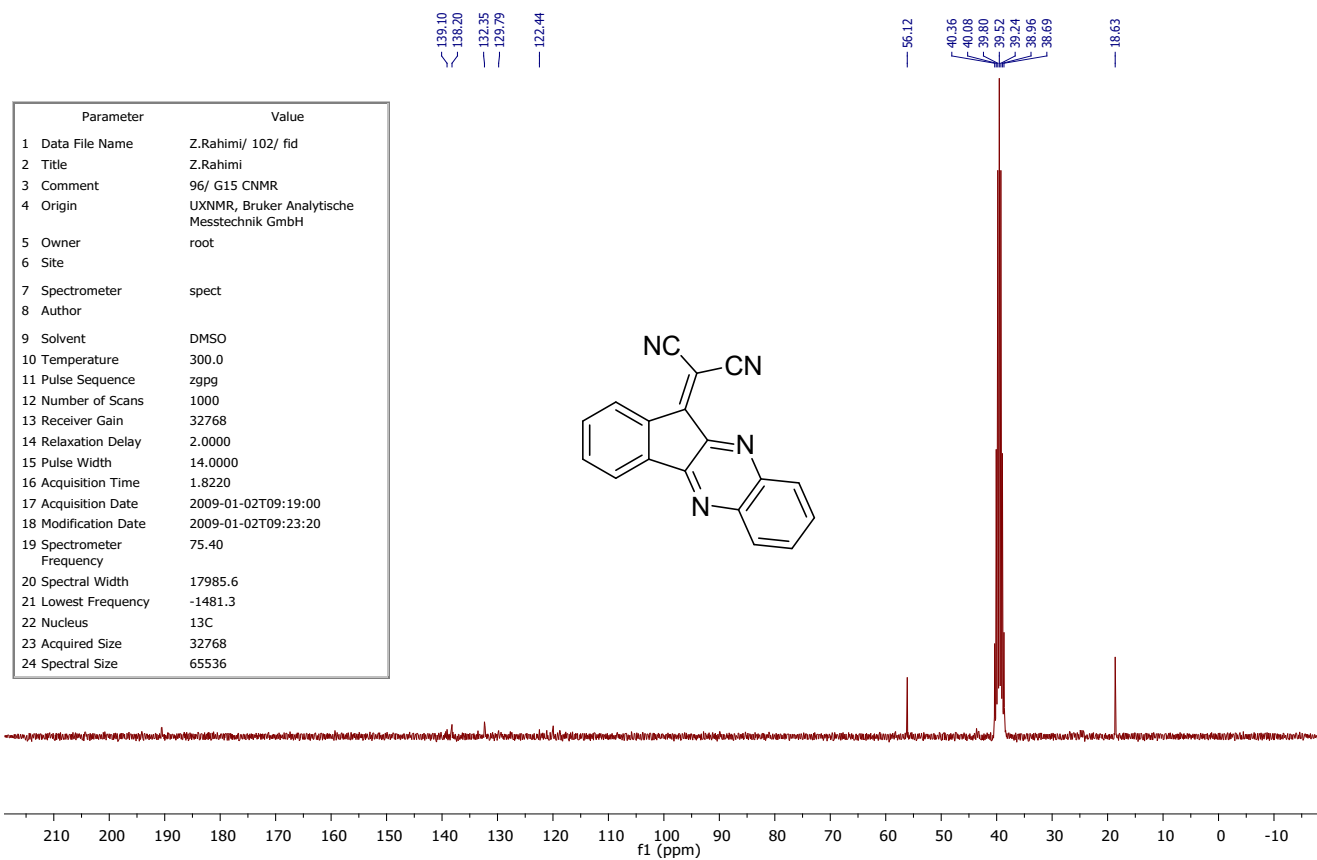
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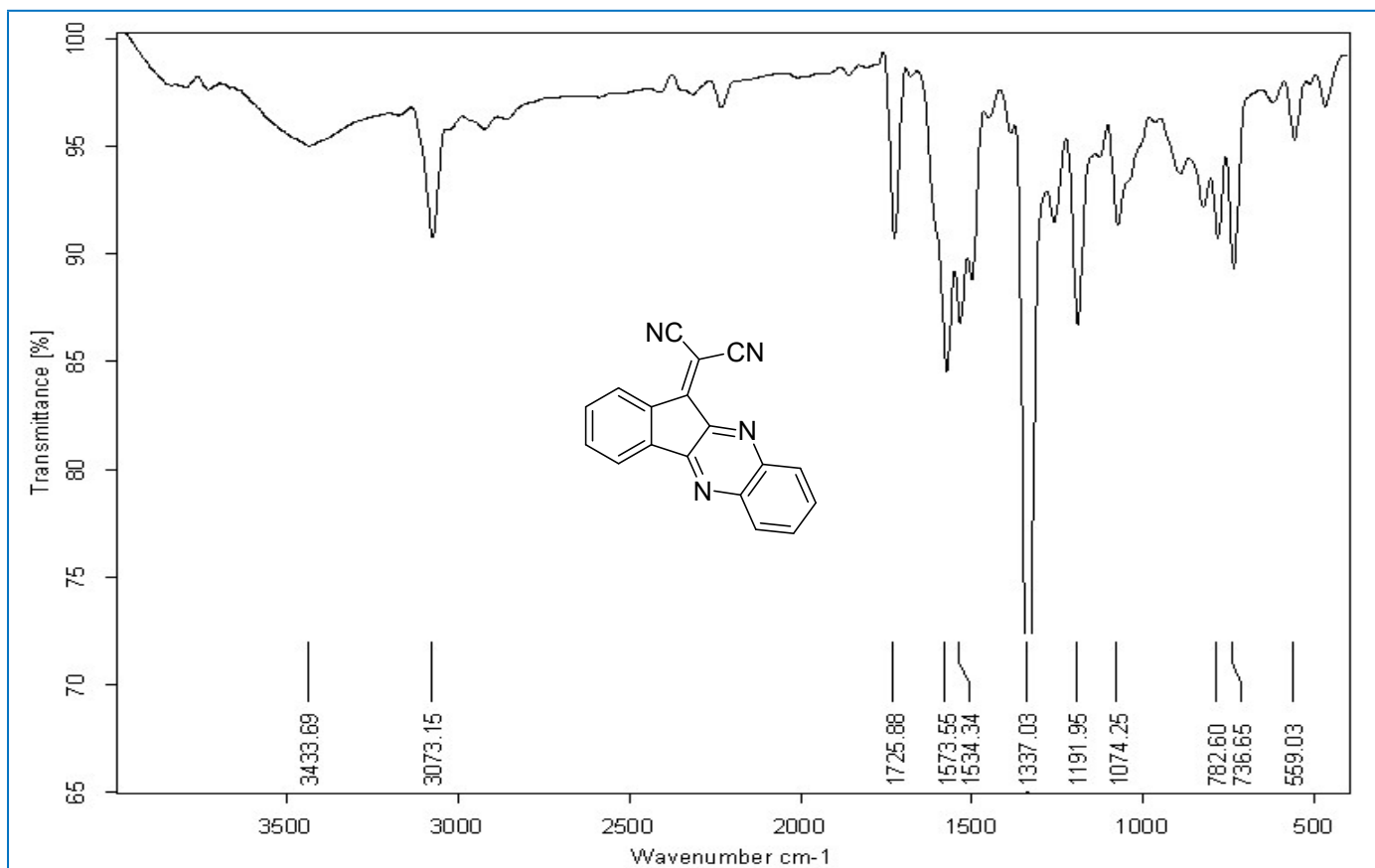
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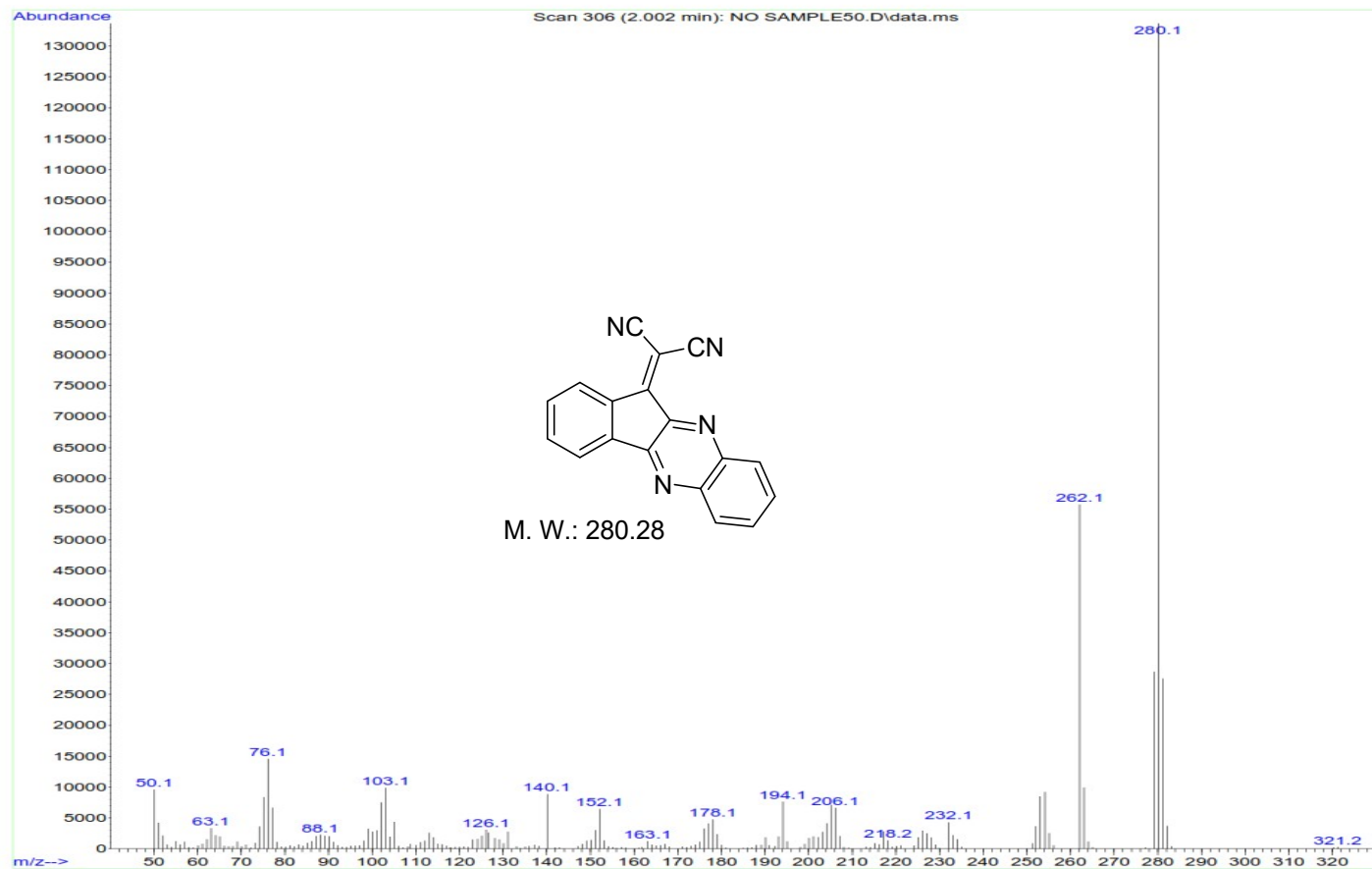


MS of 4e

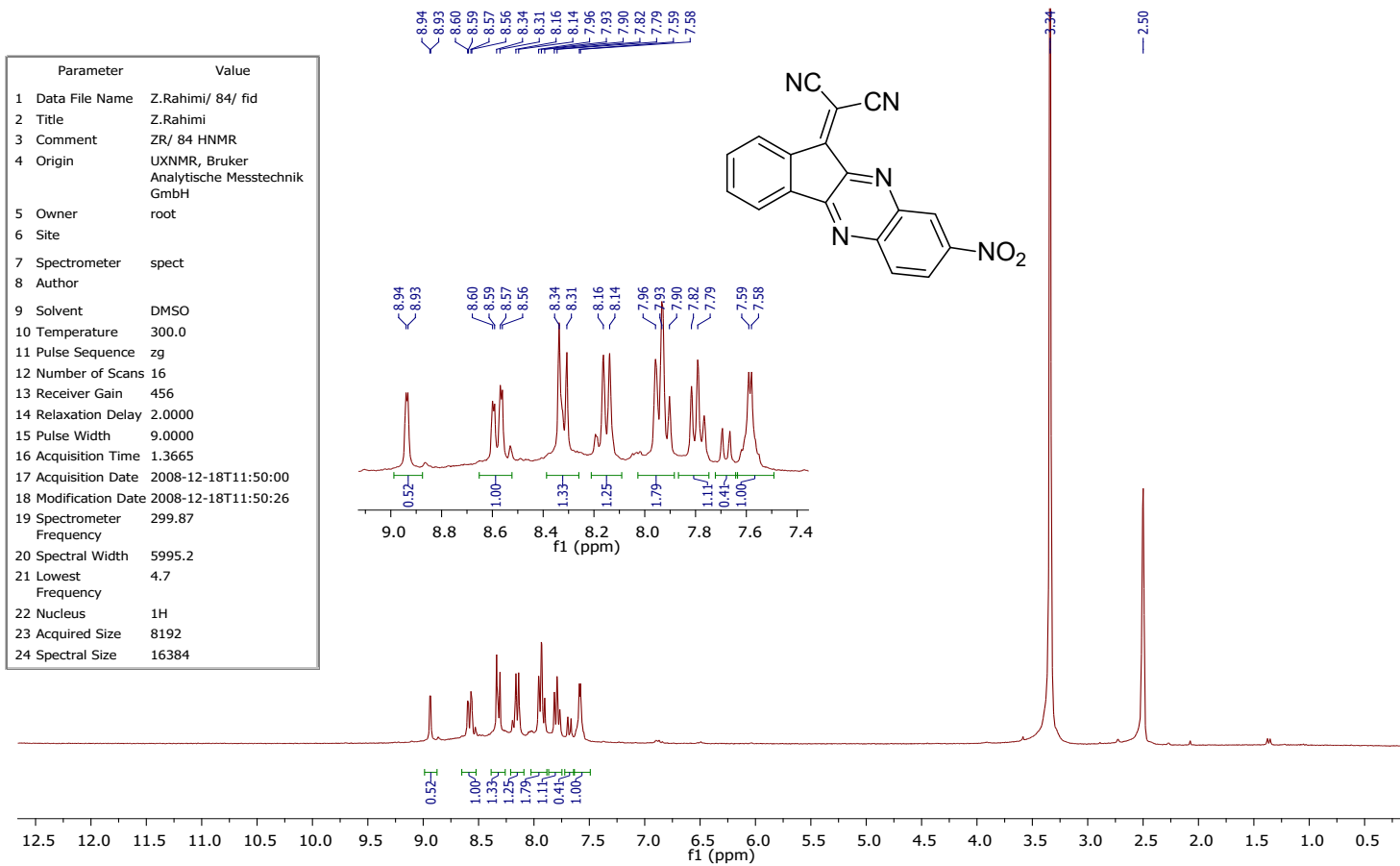


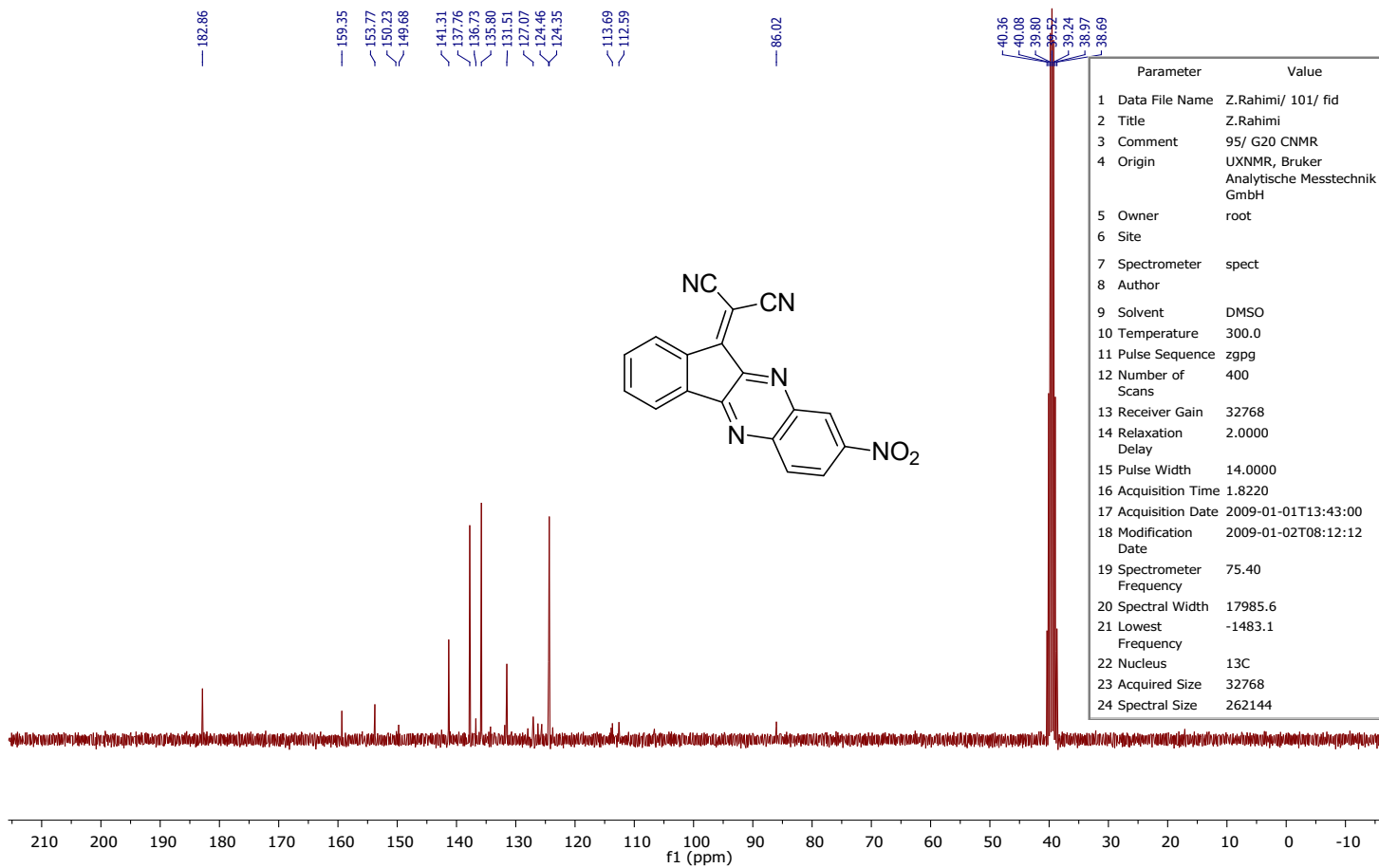
**¹³C NMR of 6a**

**IR of 6a**



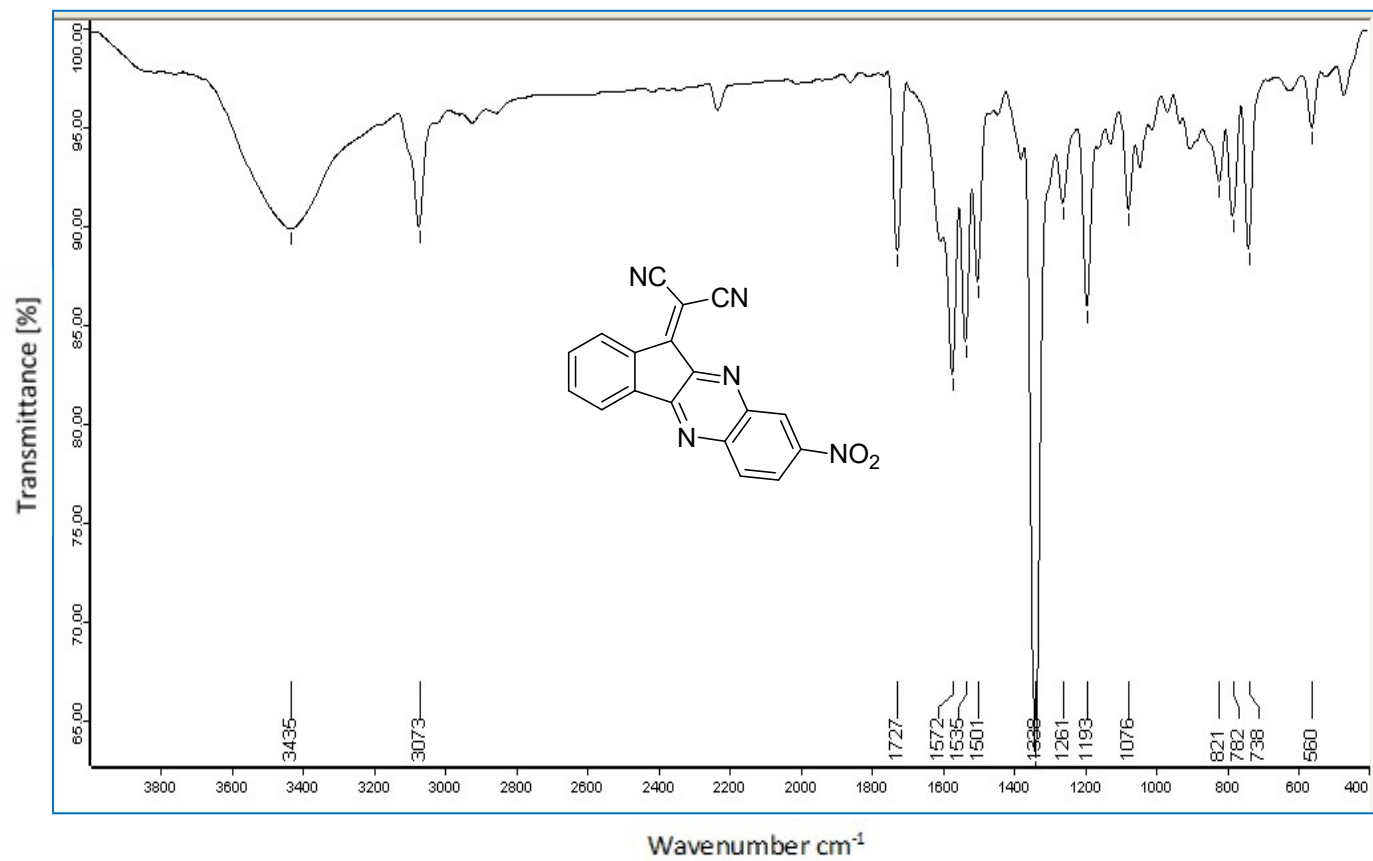
MS of 6a

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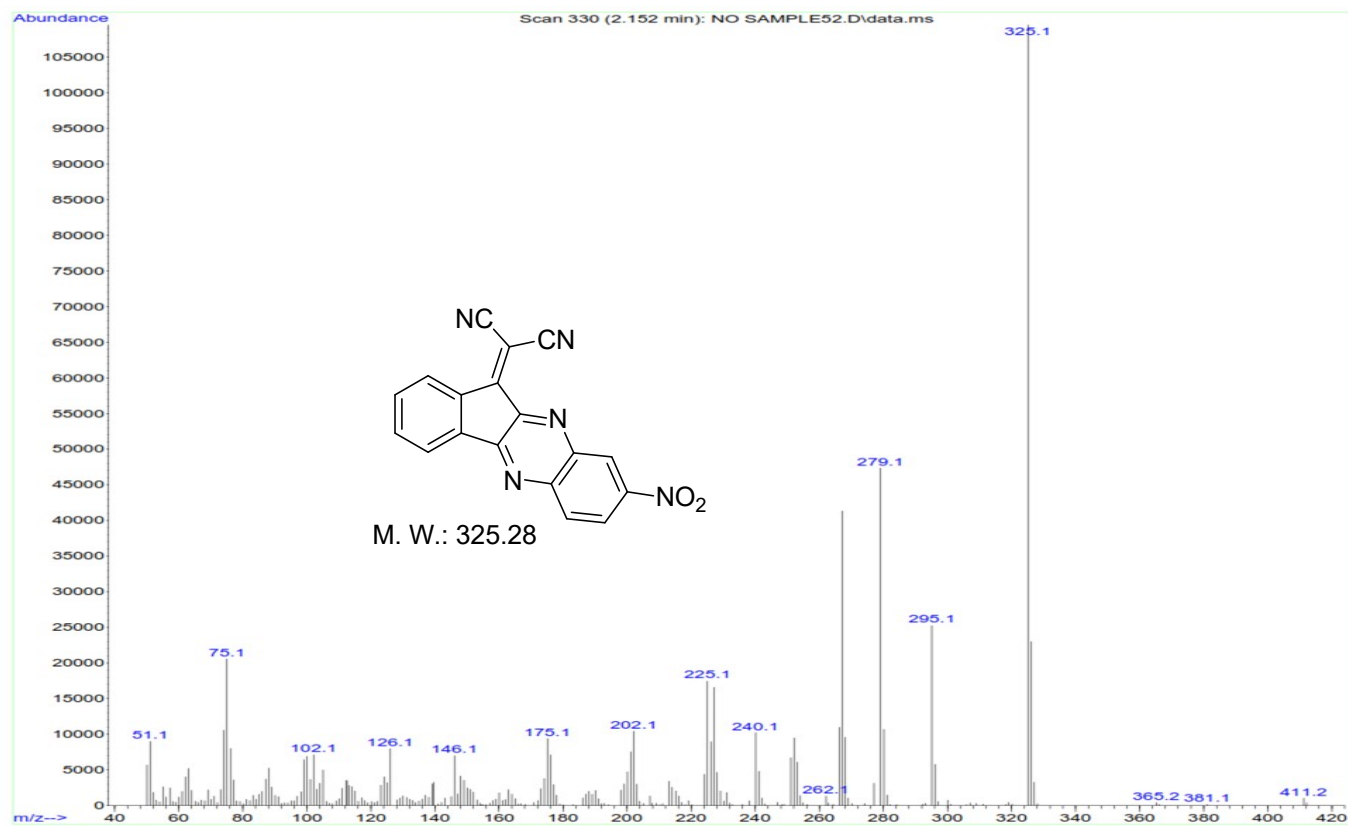


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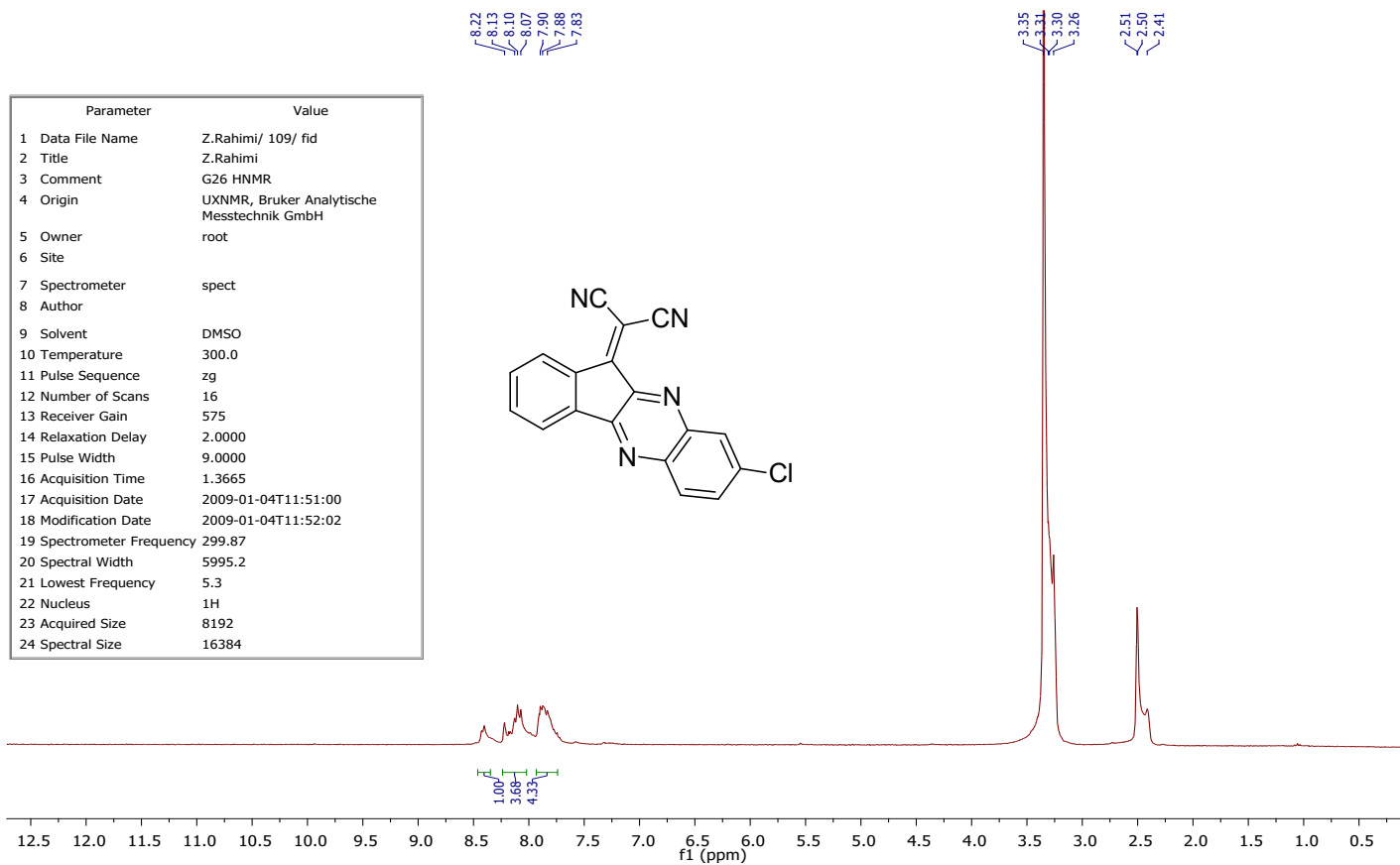
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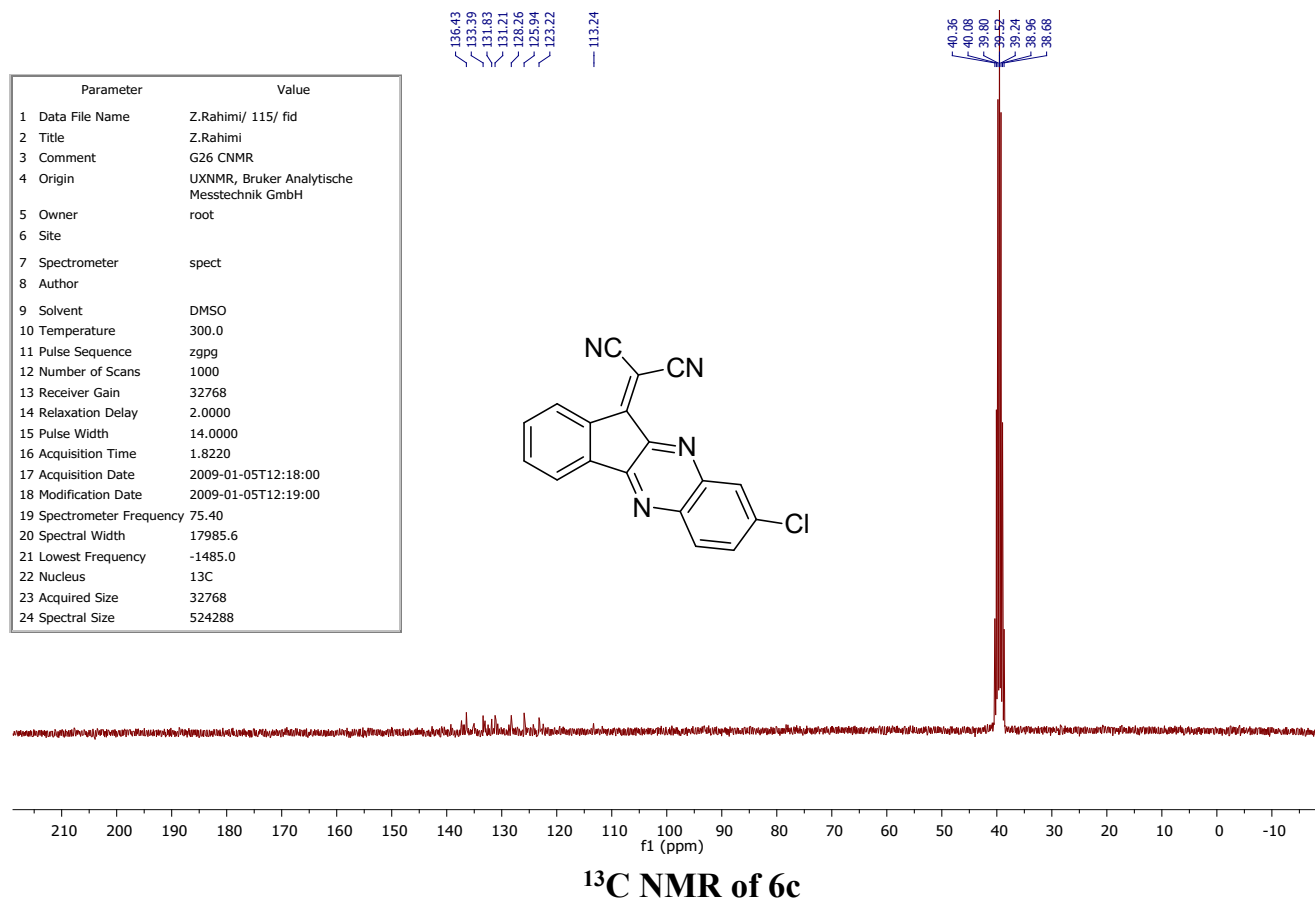


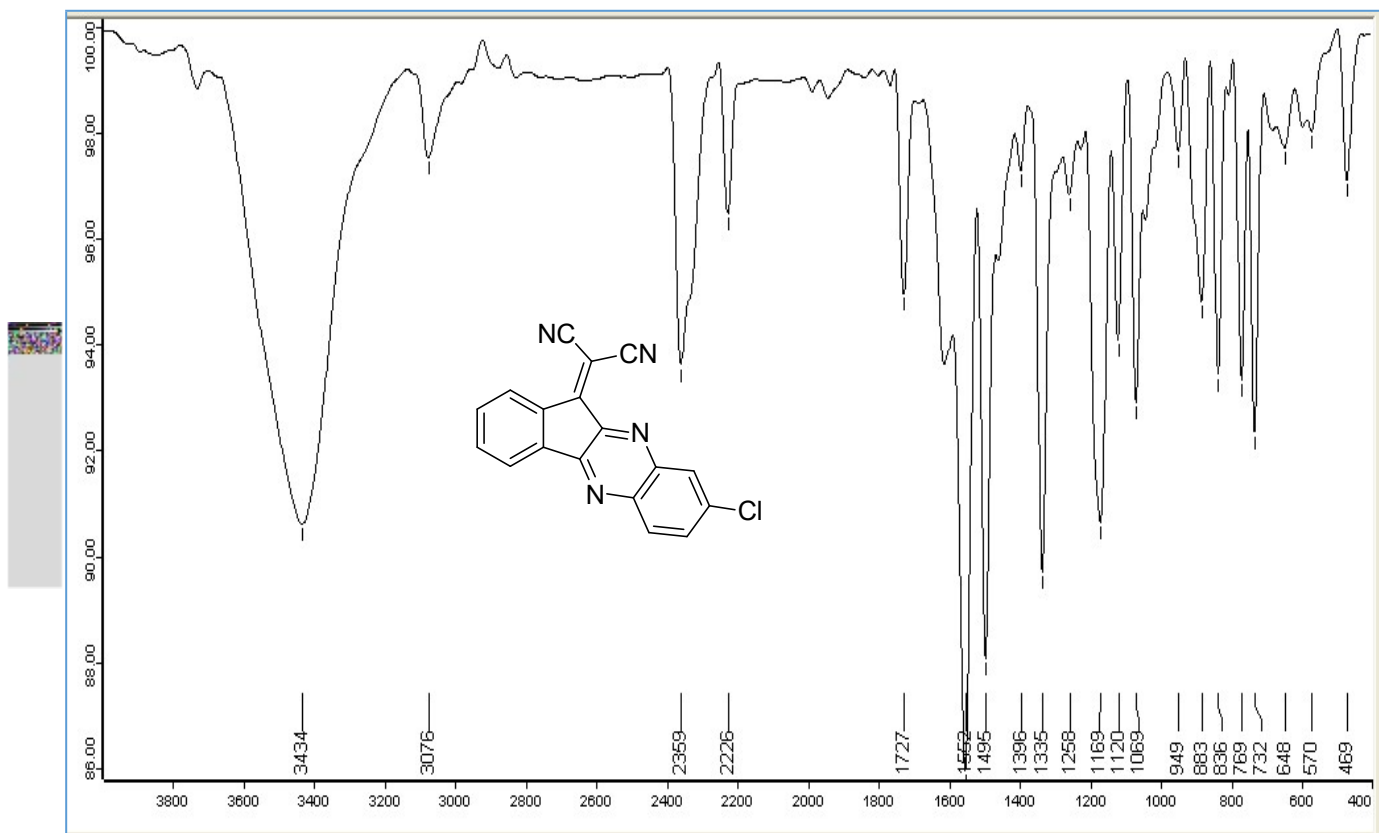
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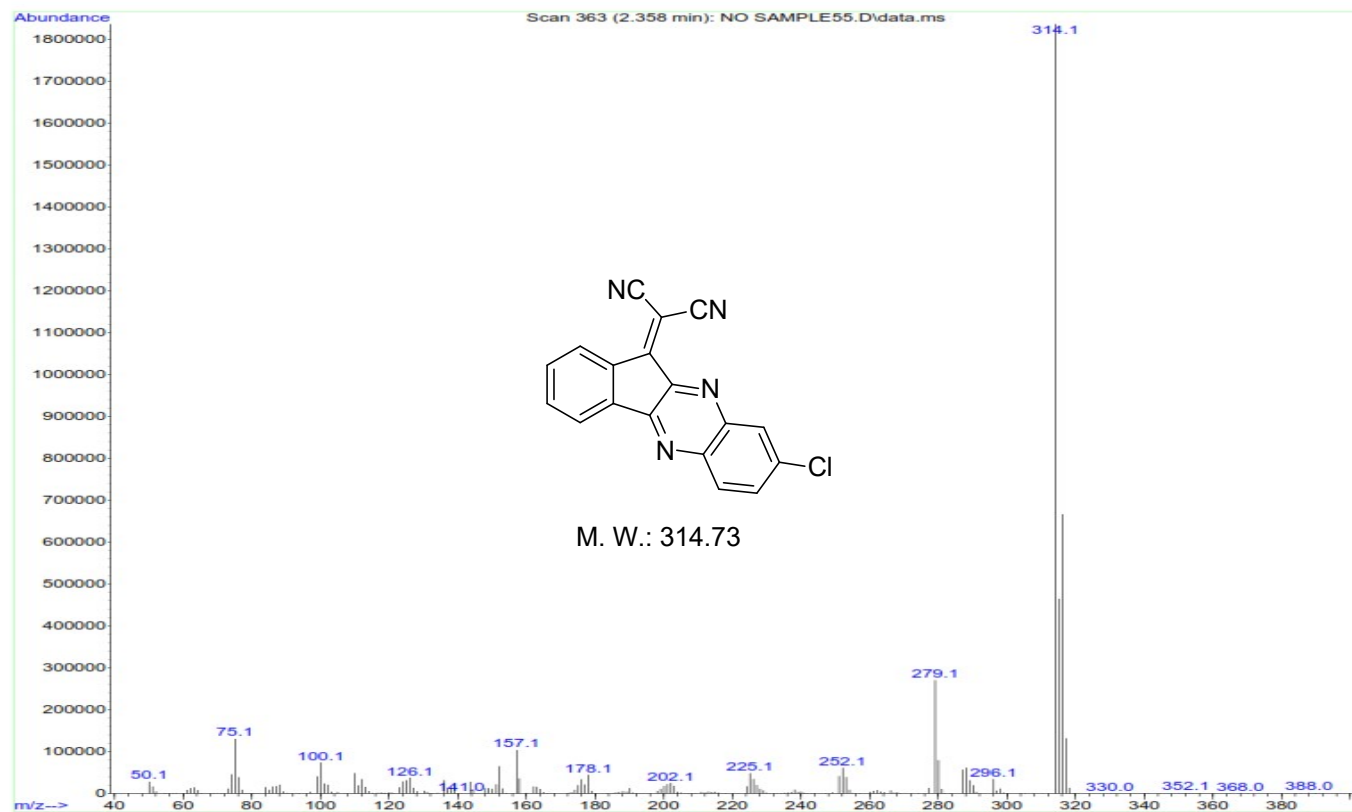
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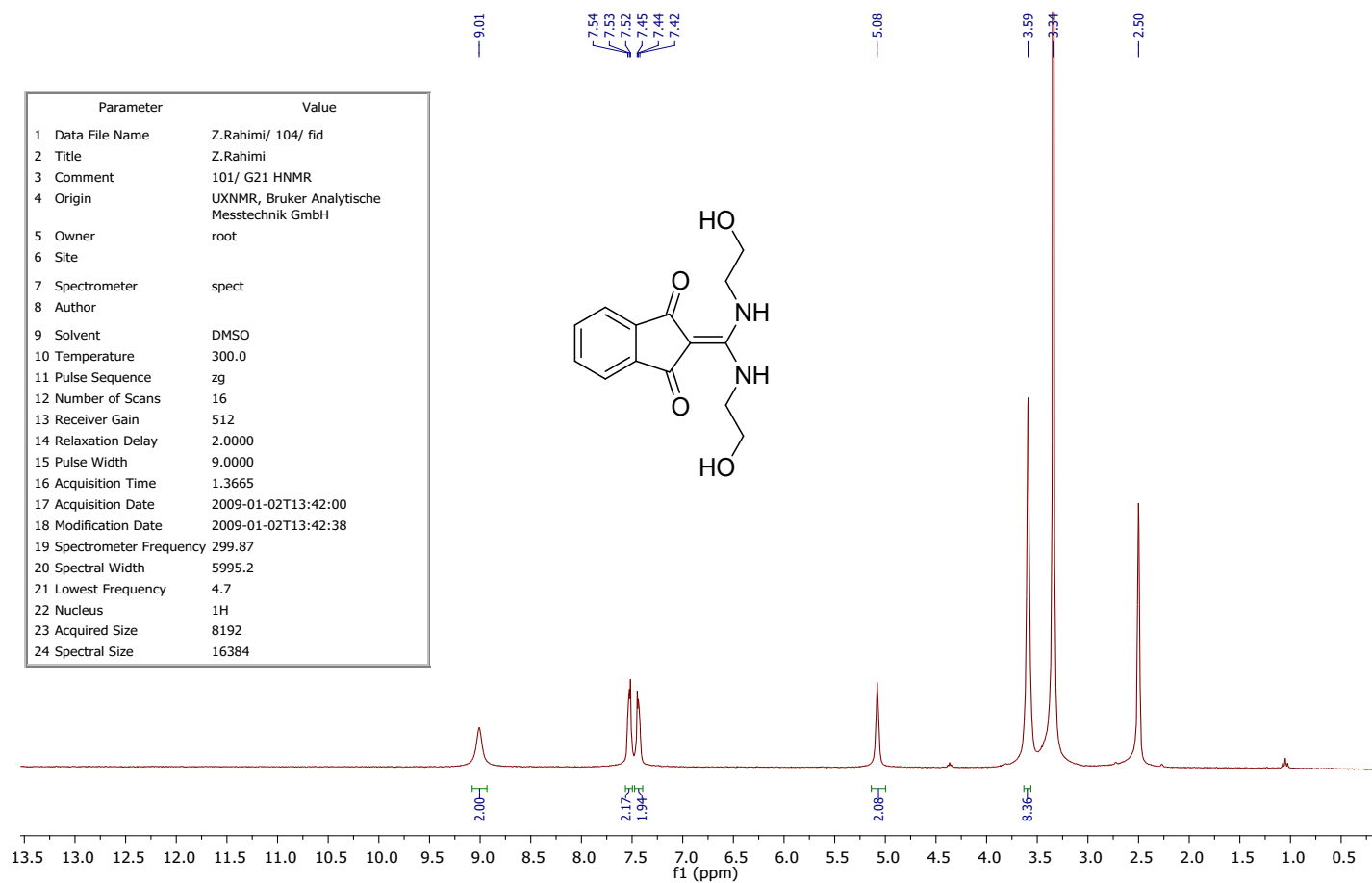


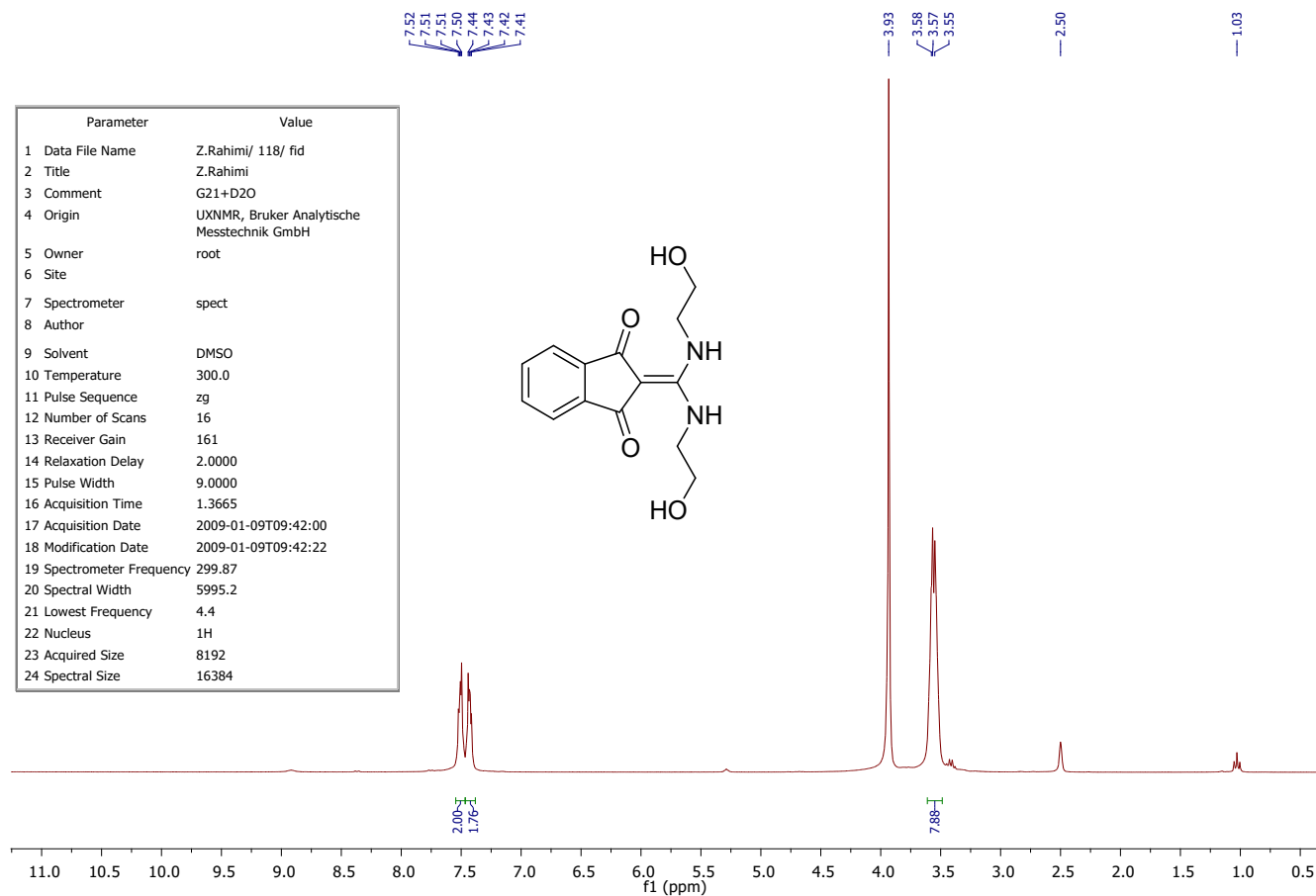


IR of 6c

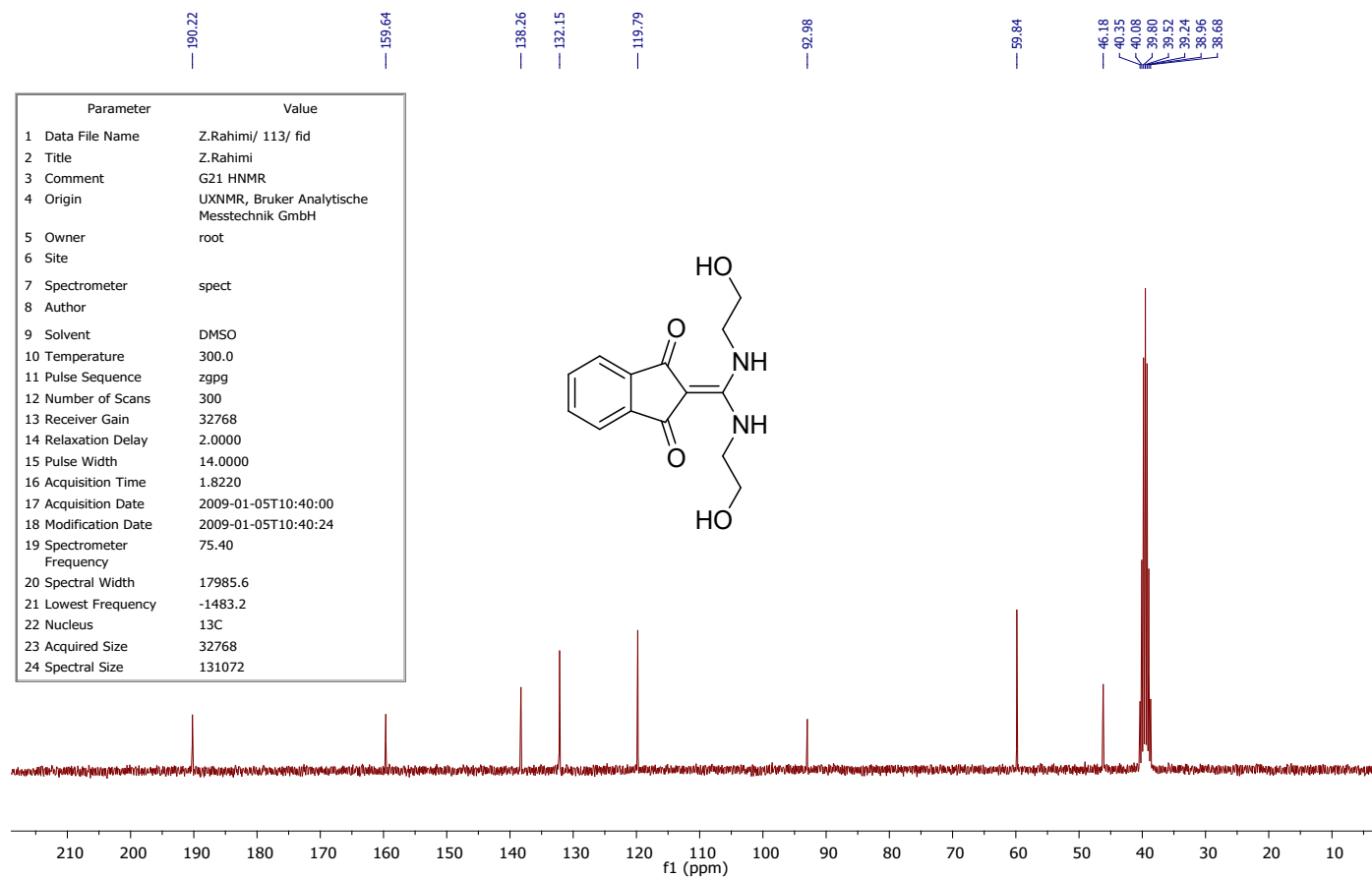


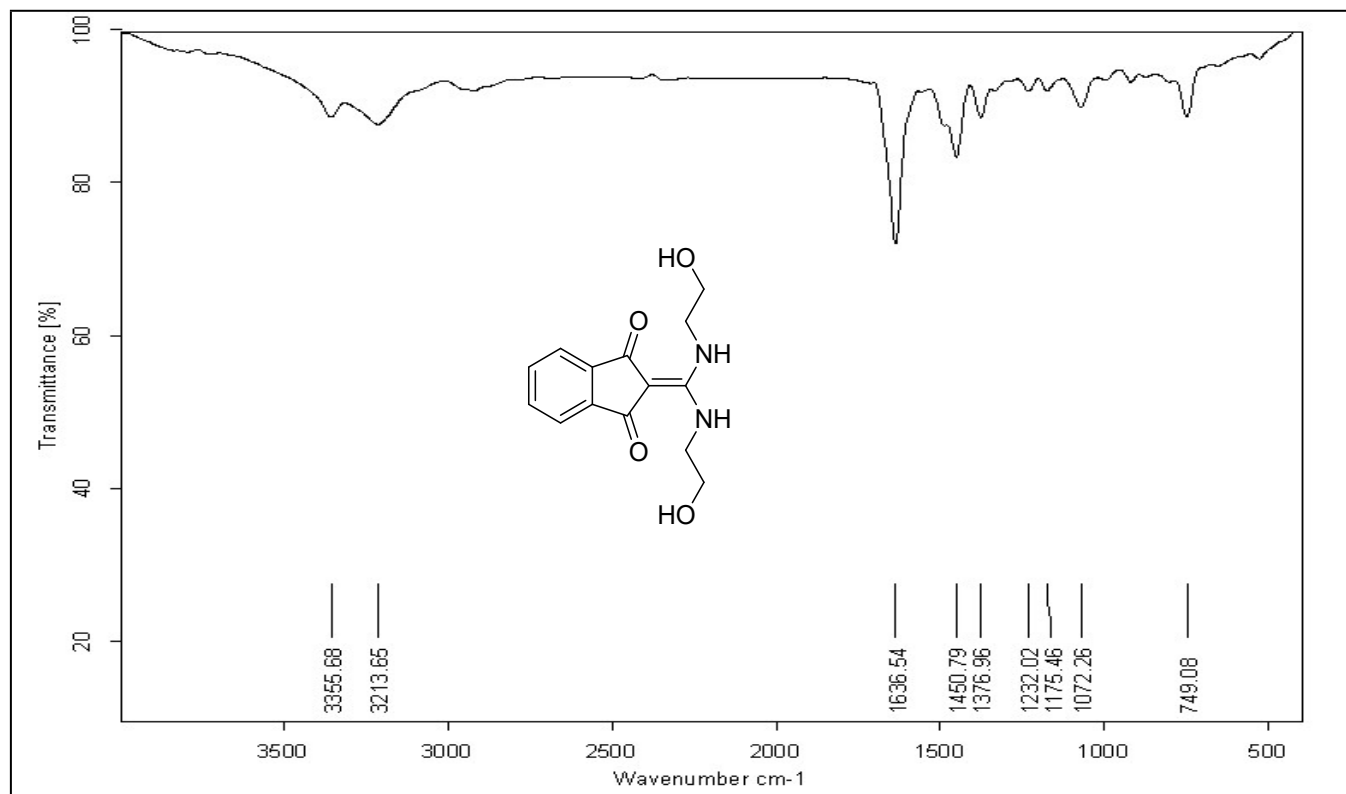
MS of 6c

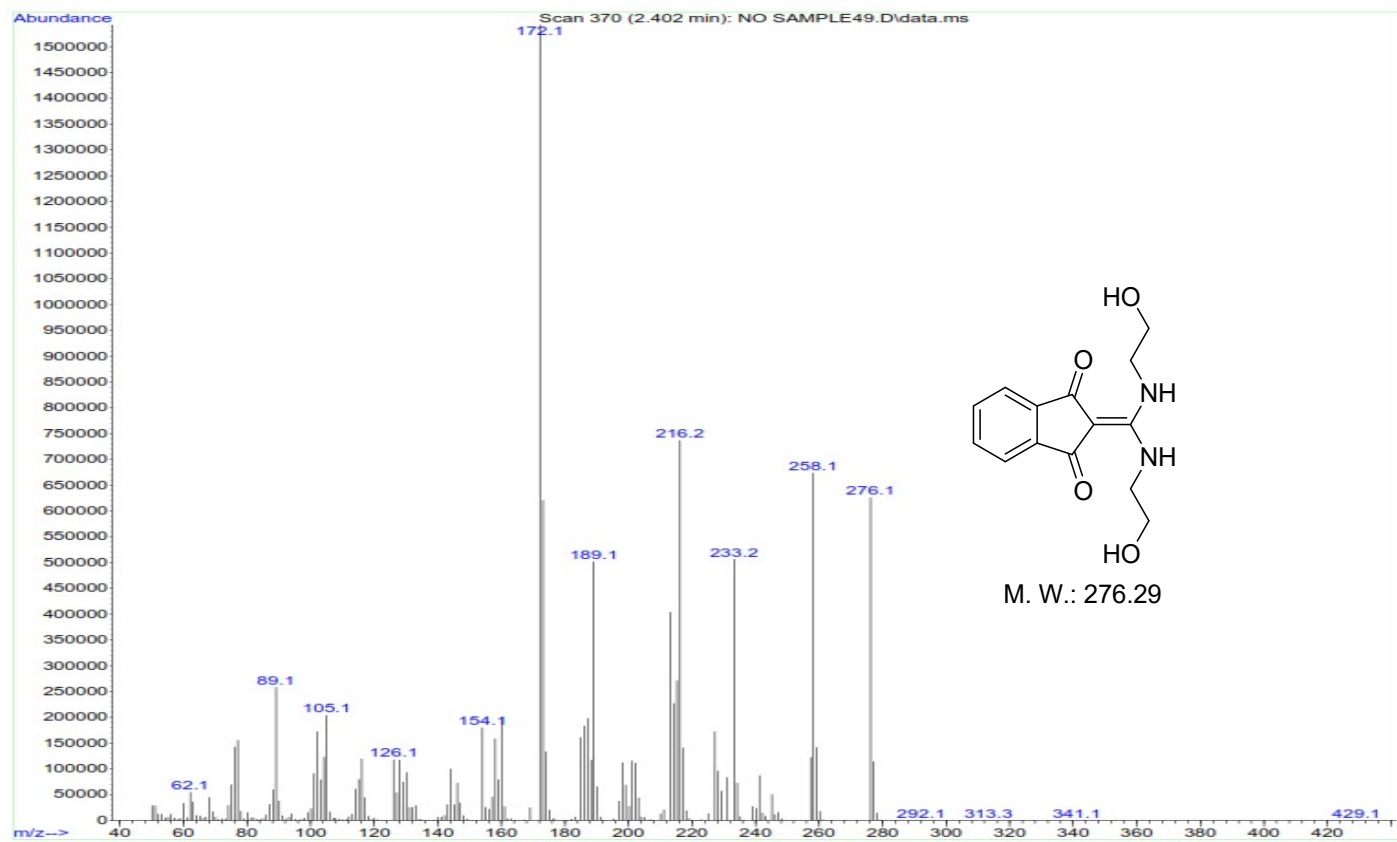
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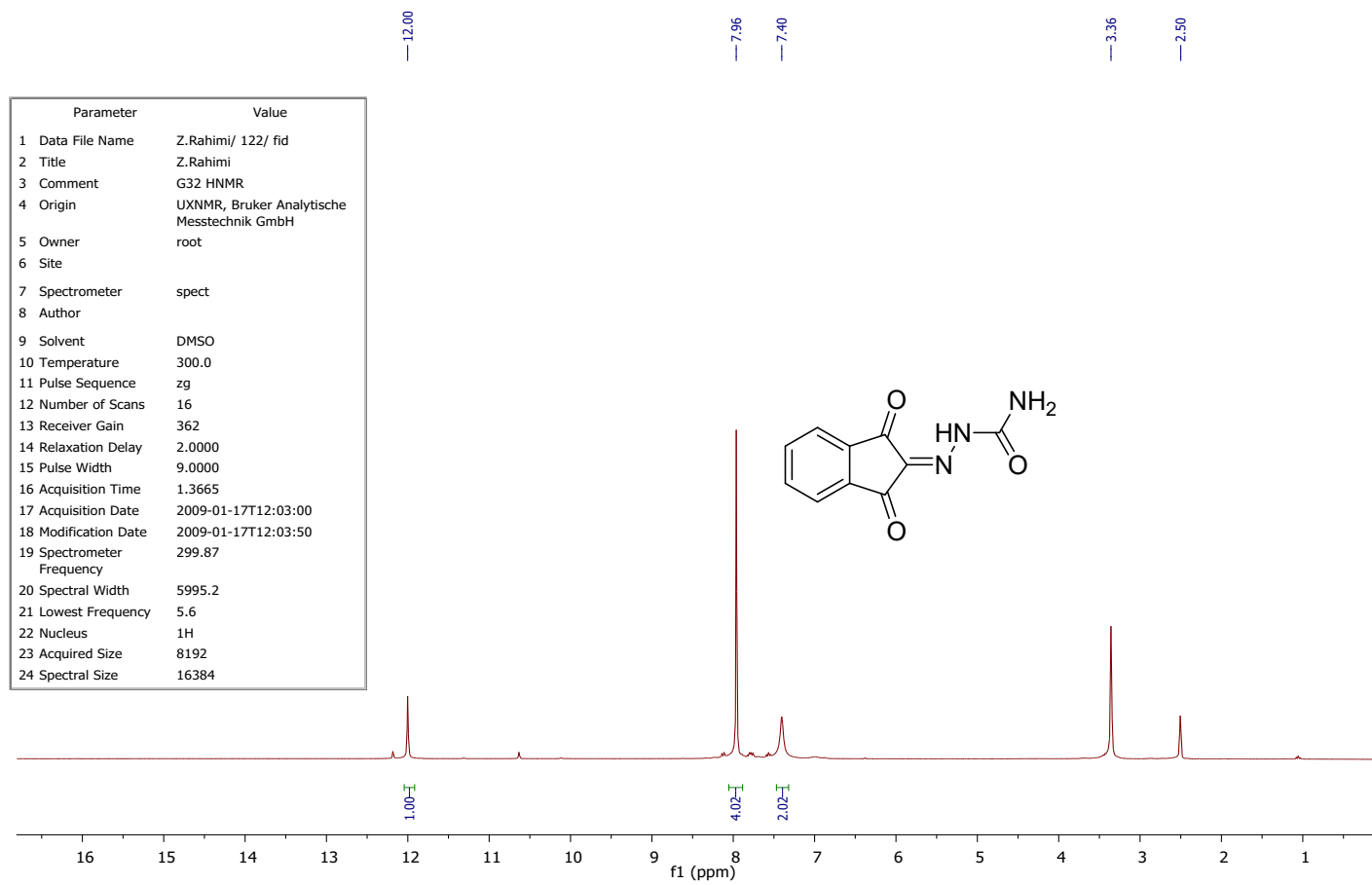
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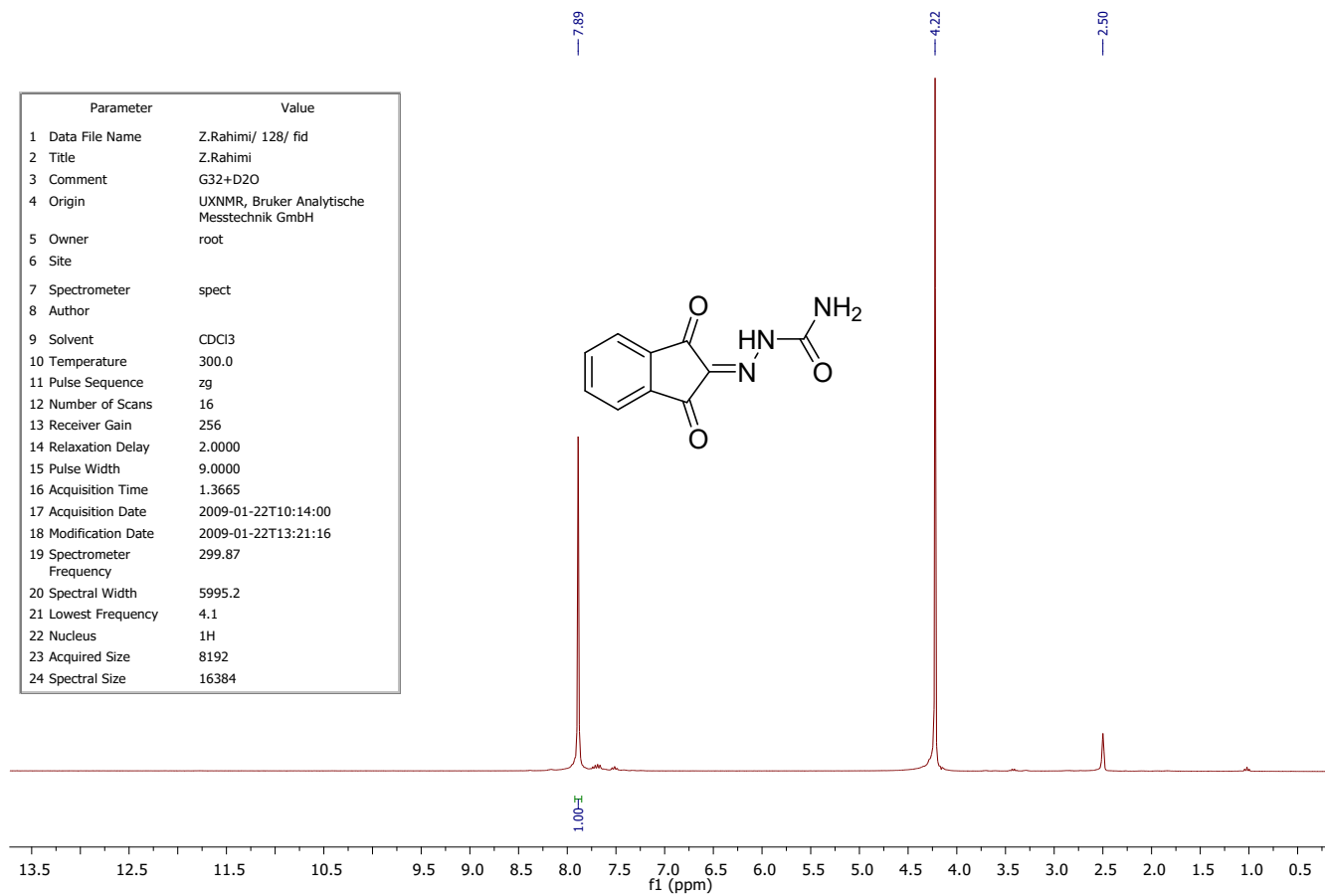
**¹³C NMR of 8**

**IR of 8**

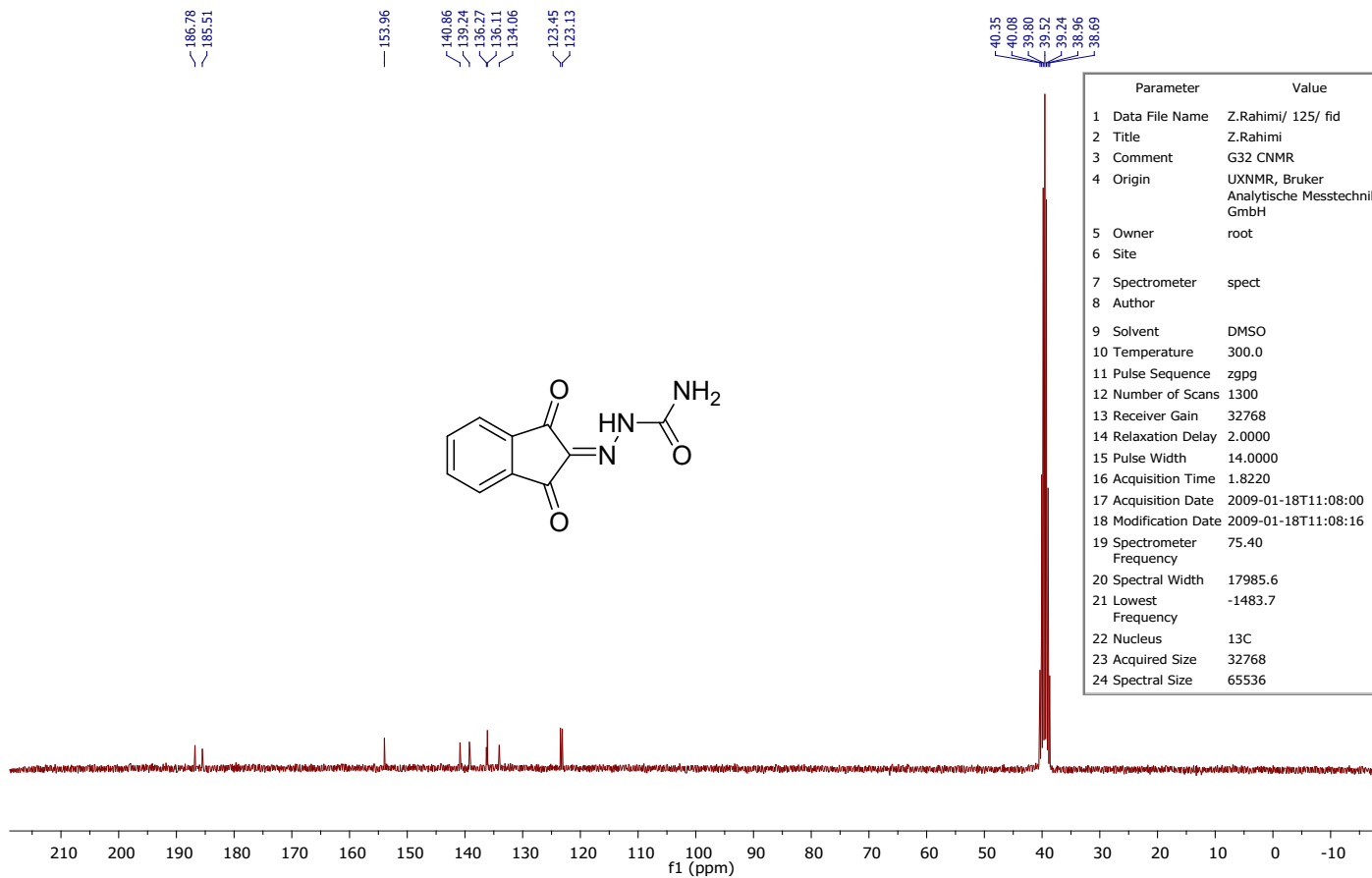


MS of 8

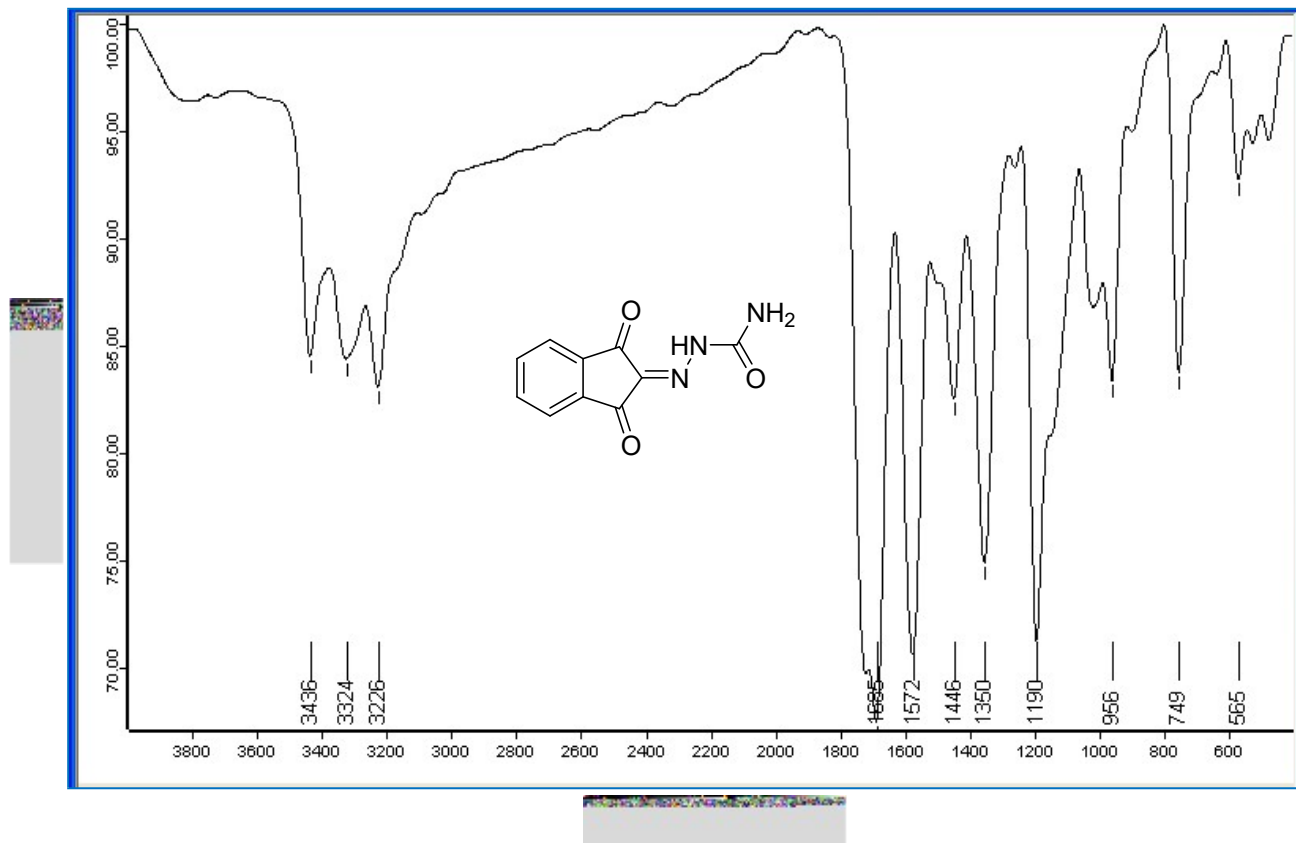
**¹H NMR of 10**



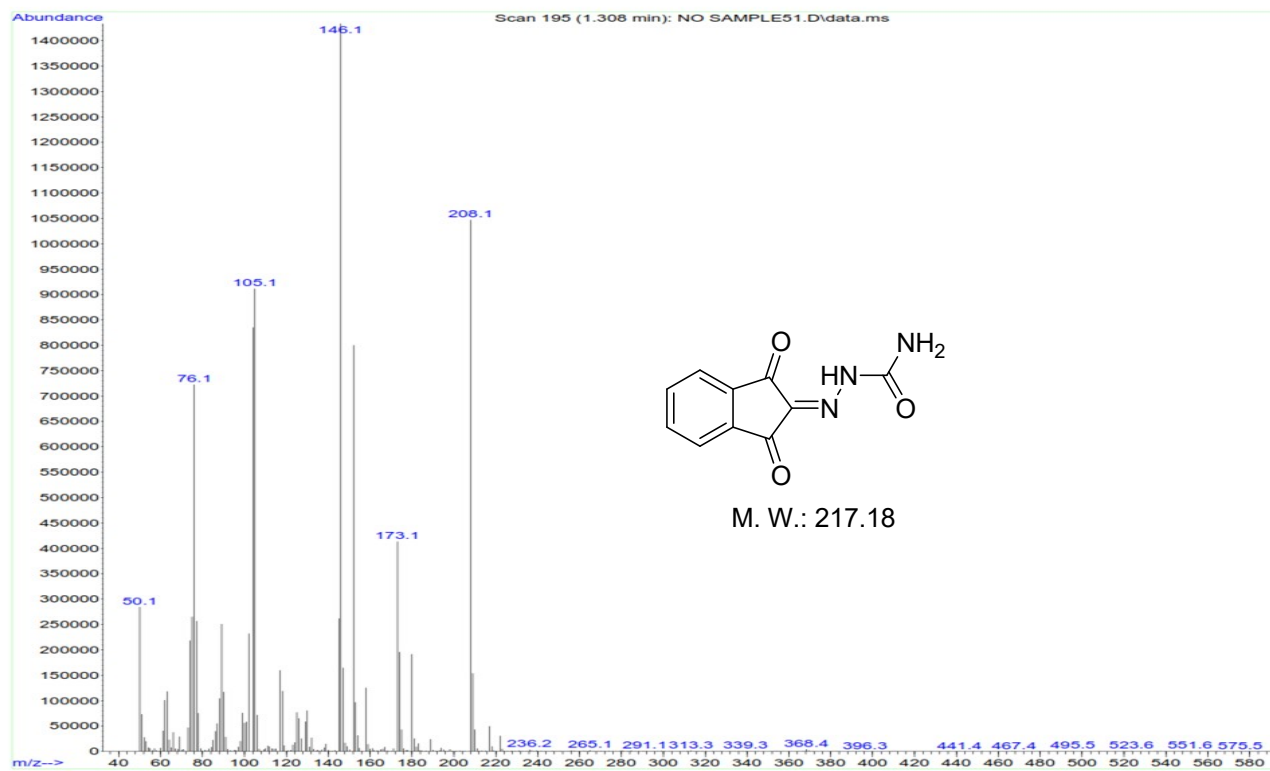
¹H-NMR with D₂O exchange of 10



¹³C NMR of 10



IR of 10



MS of 10

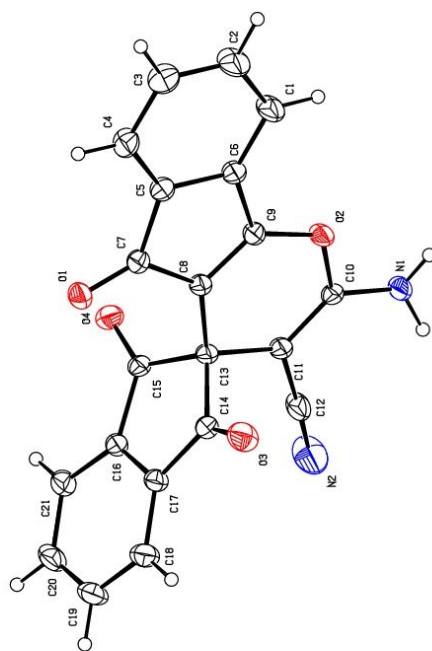
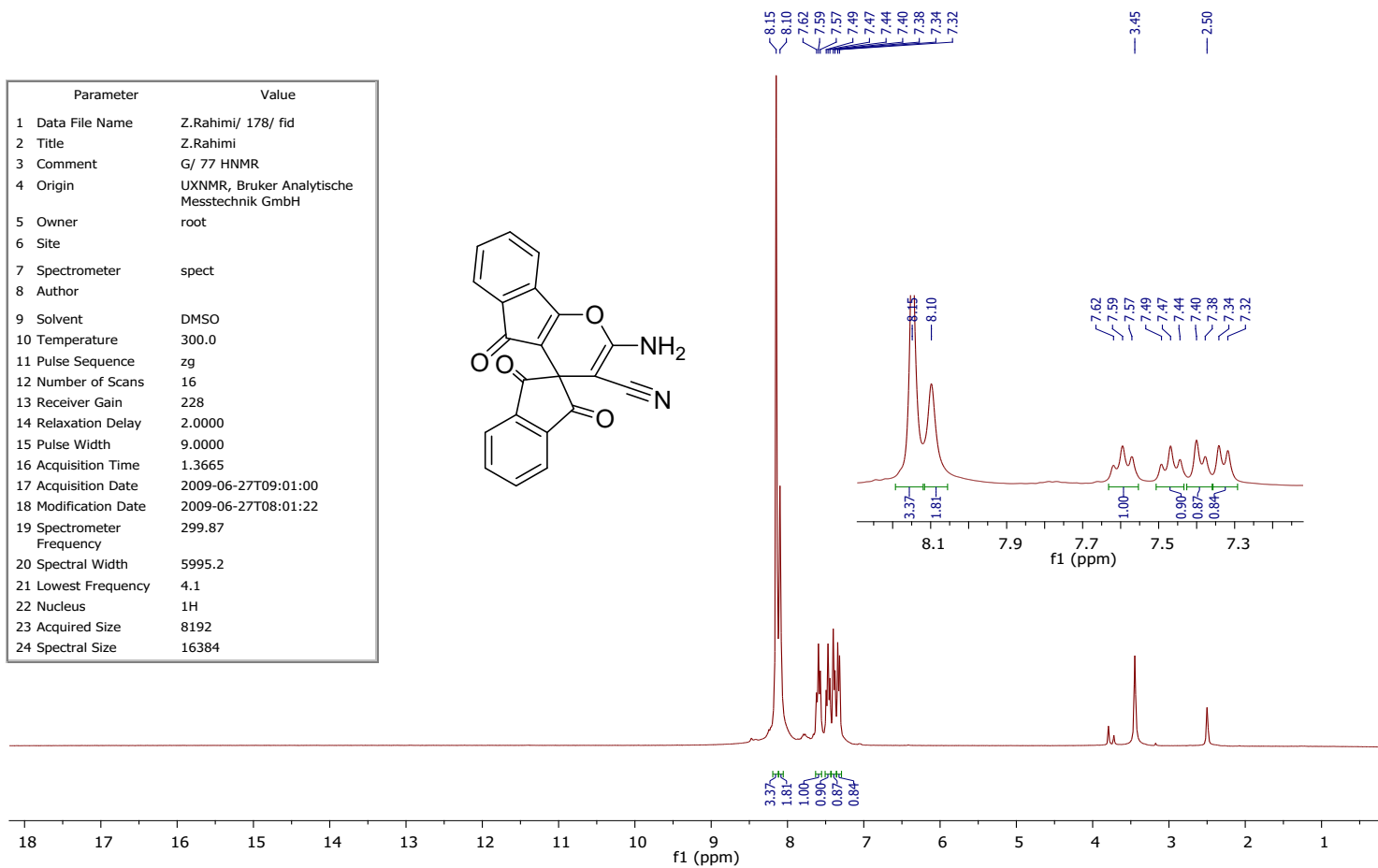
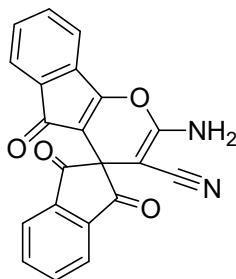
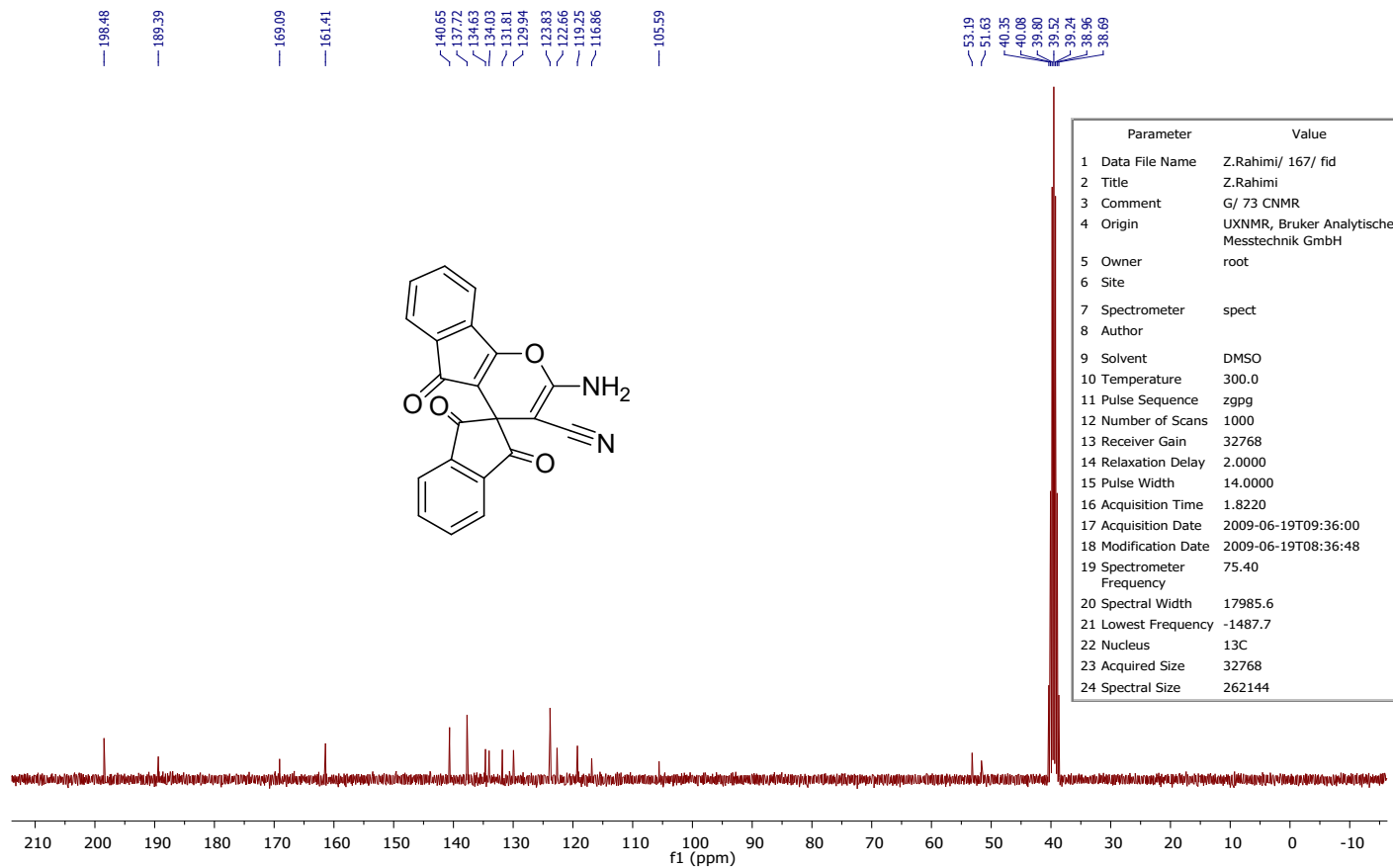


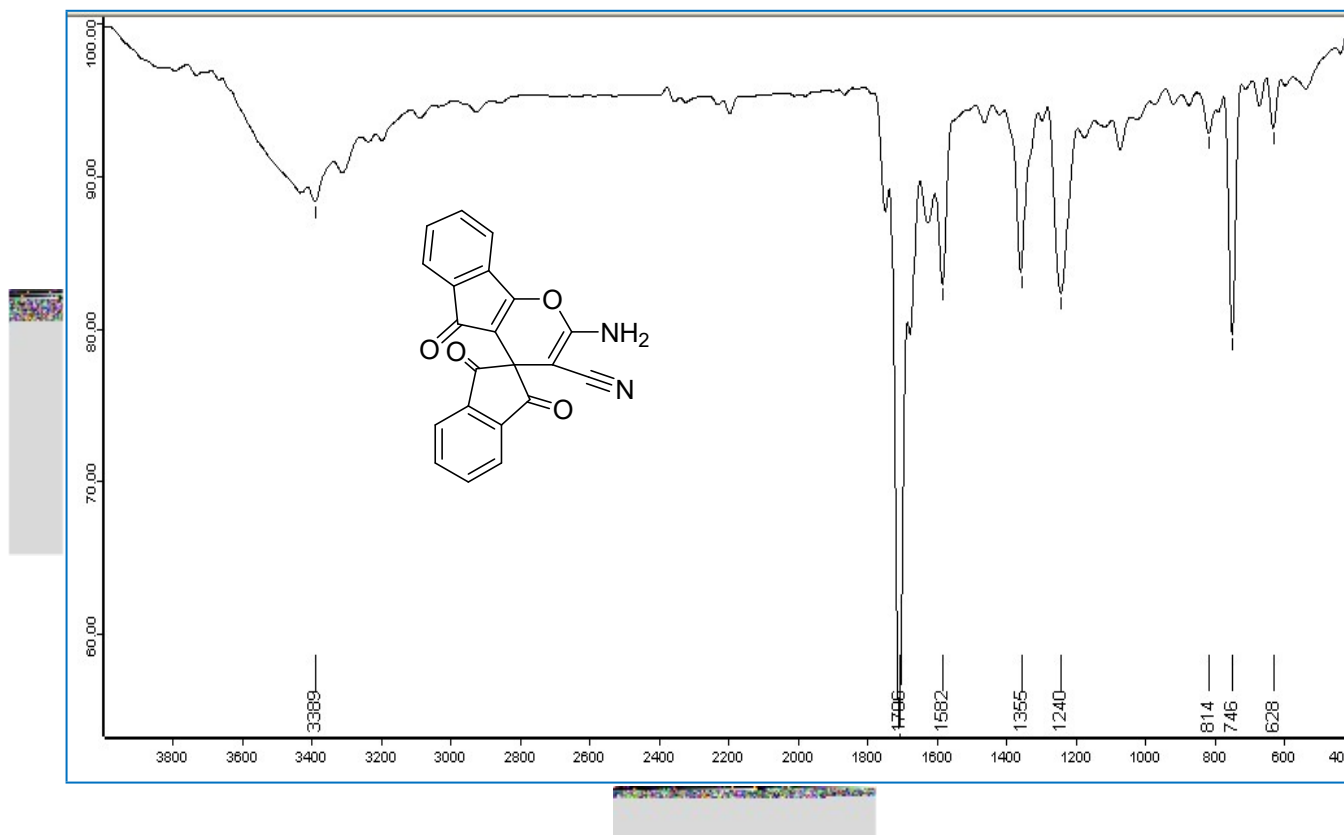
Figure 2. The X-ray structure of compound 12.

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8 Author	
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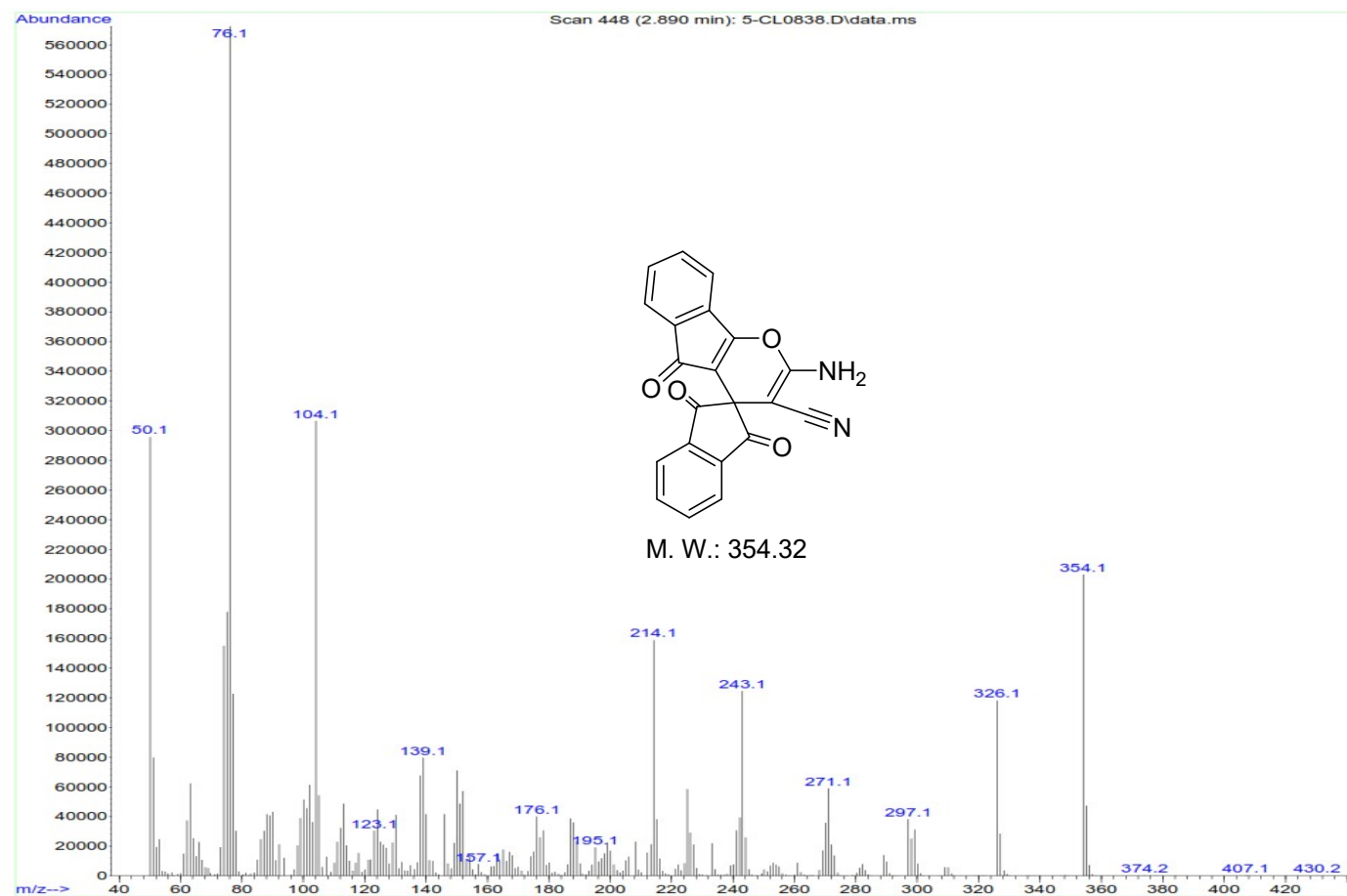


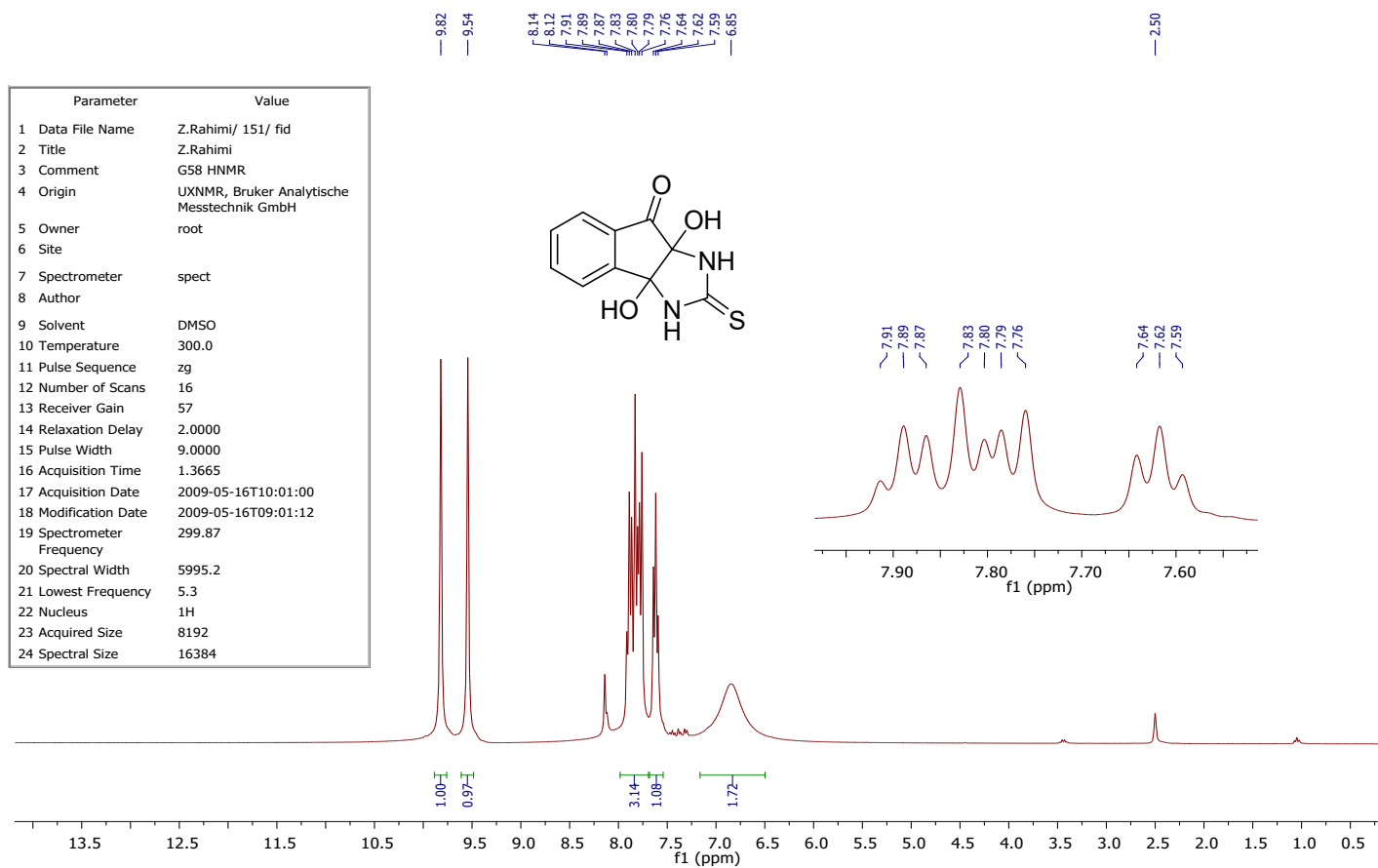
¹H NMR of 12

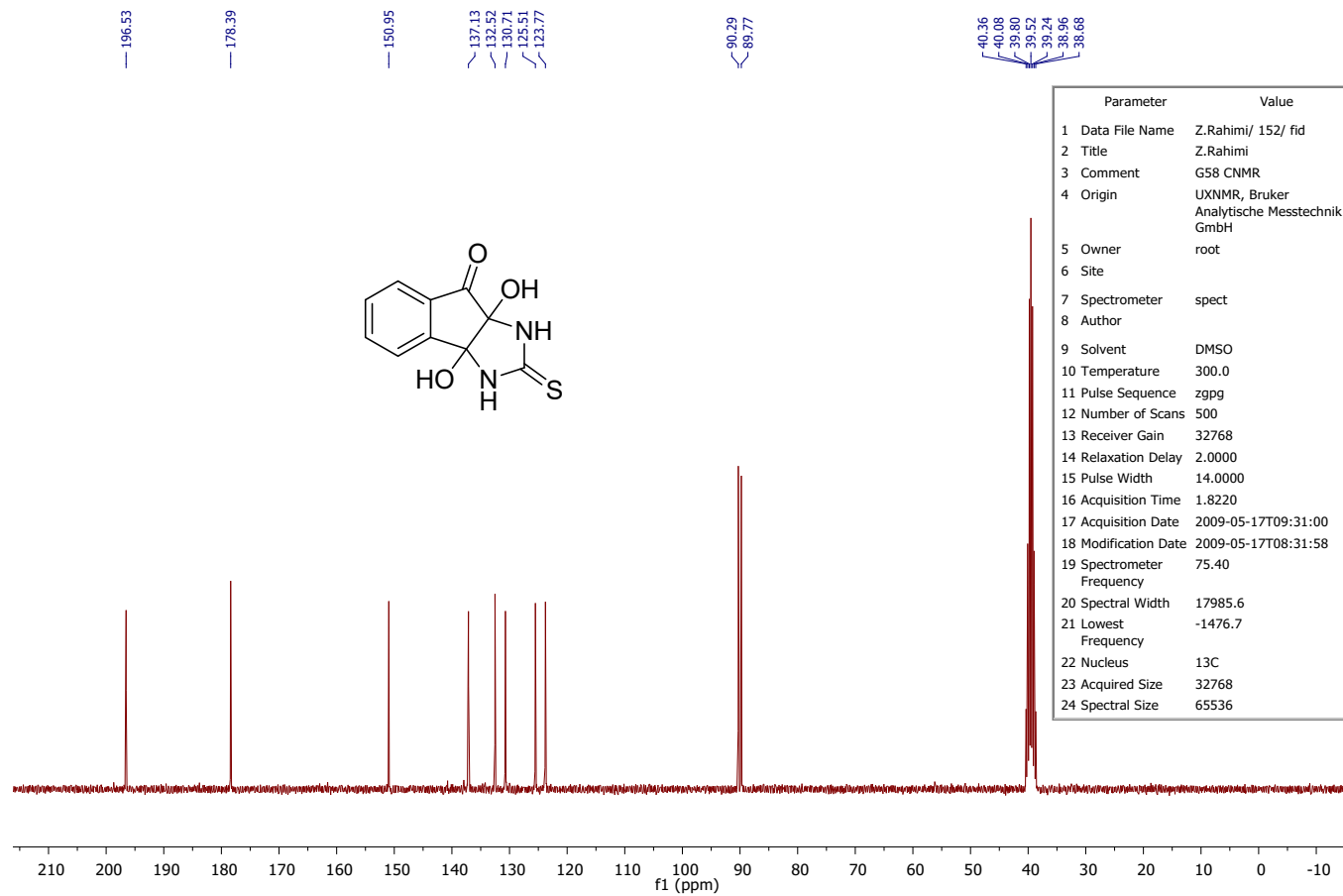
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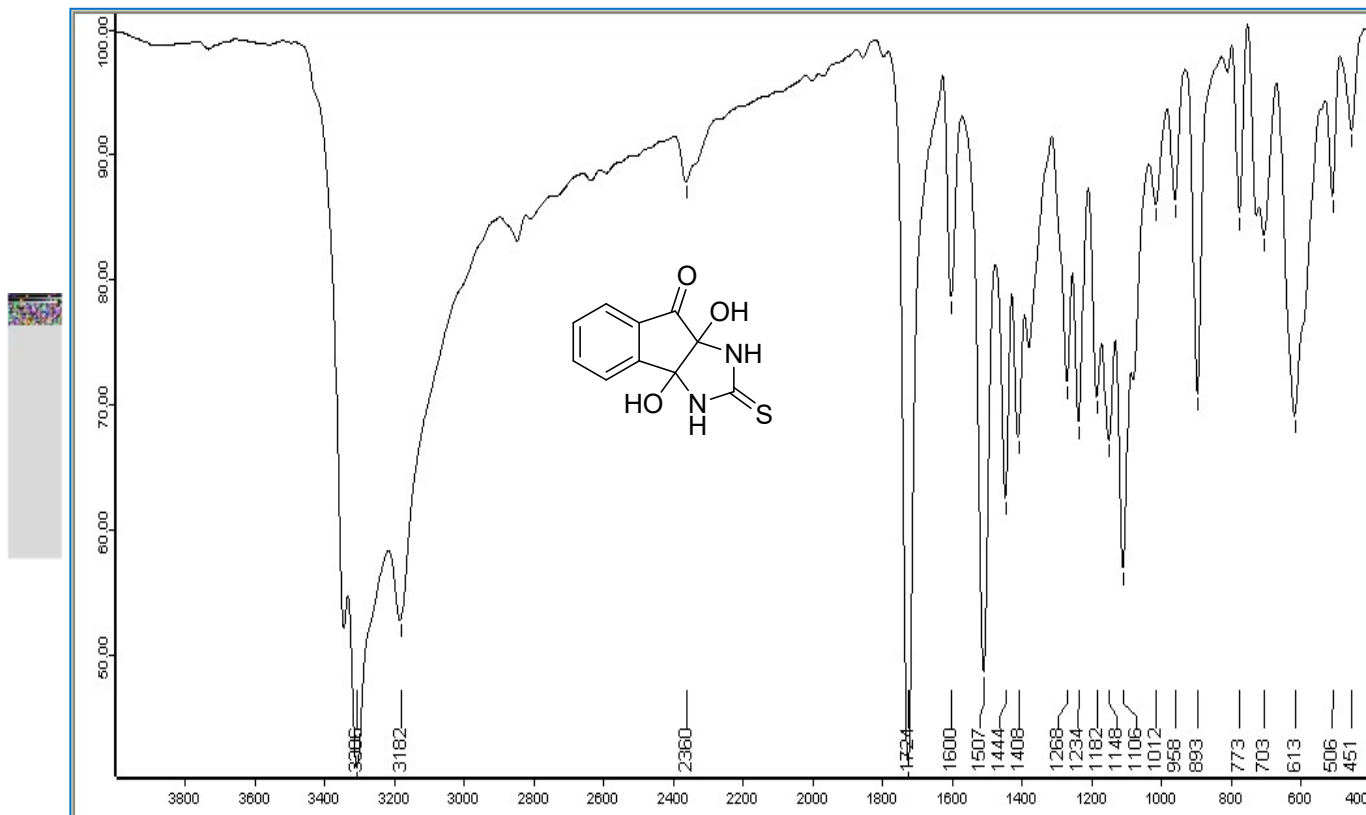


IR of 12

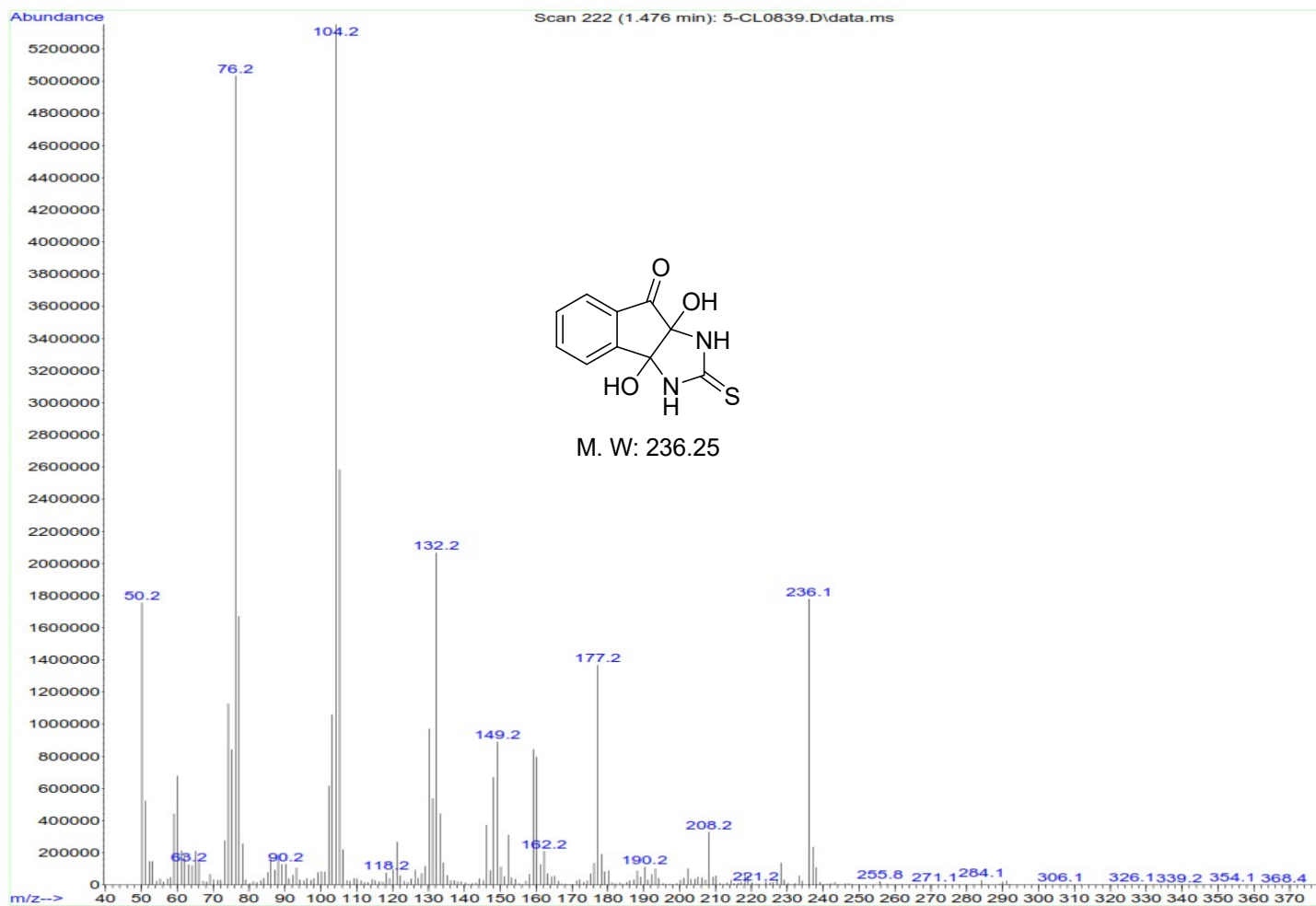
**MS of 12**

 **^1H NMR of 14**

**¹³C NMR of 14**



IR of 14



MS of 14