

**Cp<sub>2</sub>TiCl<sub>2</sub>-Catalyzed Hydrocarboxylation of Alkynes with CO<sub>2</sub>: Formation of  $\alpha,\beta$ -  
Unsaturated Carboxylic Acids**

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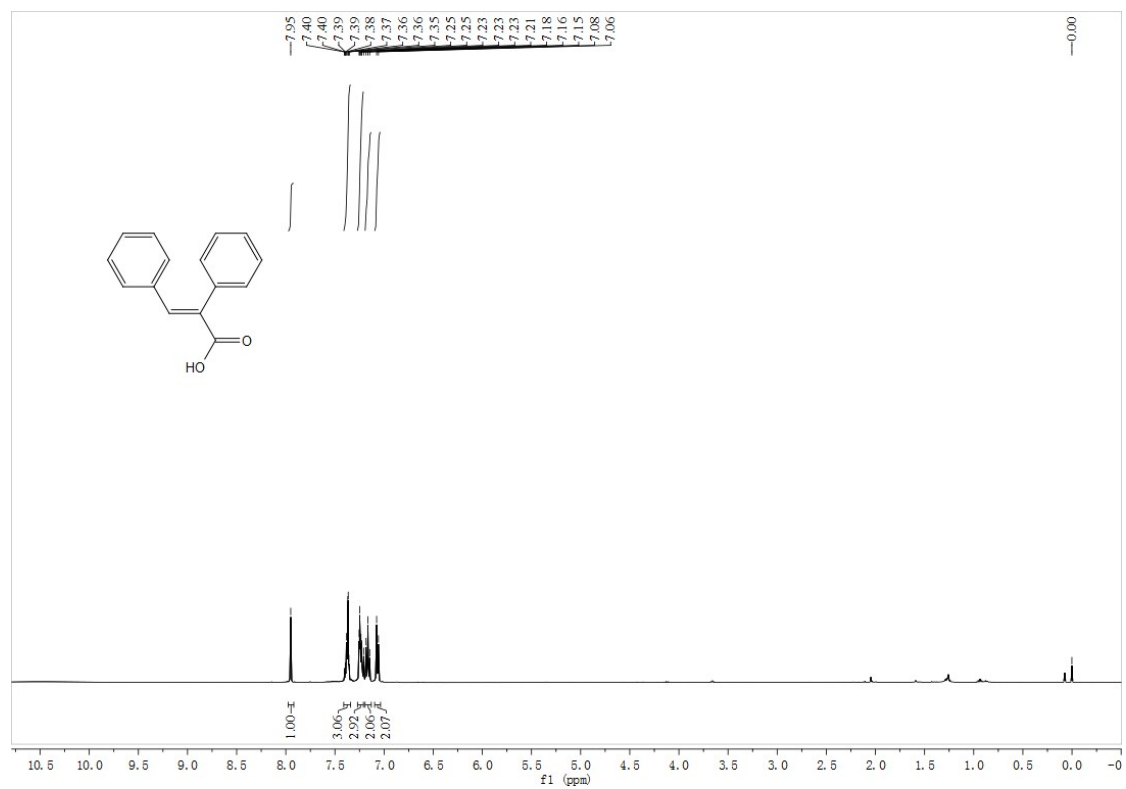
<sup>†</sup>*Key Laboratory of Bioorganic Phosphorus Chemistry & Chemical Biology (Ministry of Education), Department of Chemistry, Tsinghua University, Beijing 100084, China*

<sup>‡</sup>*State Key Laboratory of Elemento-Organic Chemistry, Nankai University, Tianjin 300071, China*

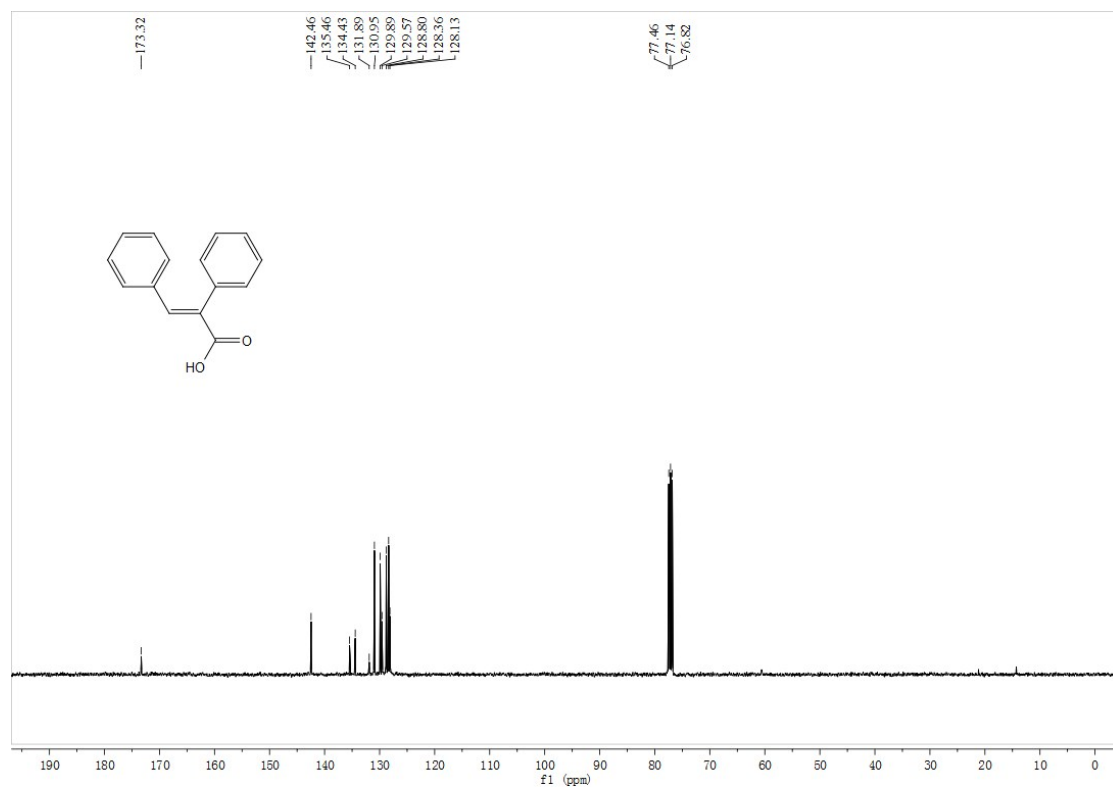
Email: cjxi@tsinghua.edu.cn

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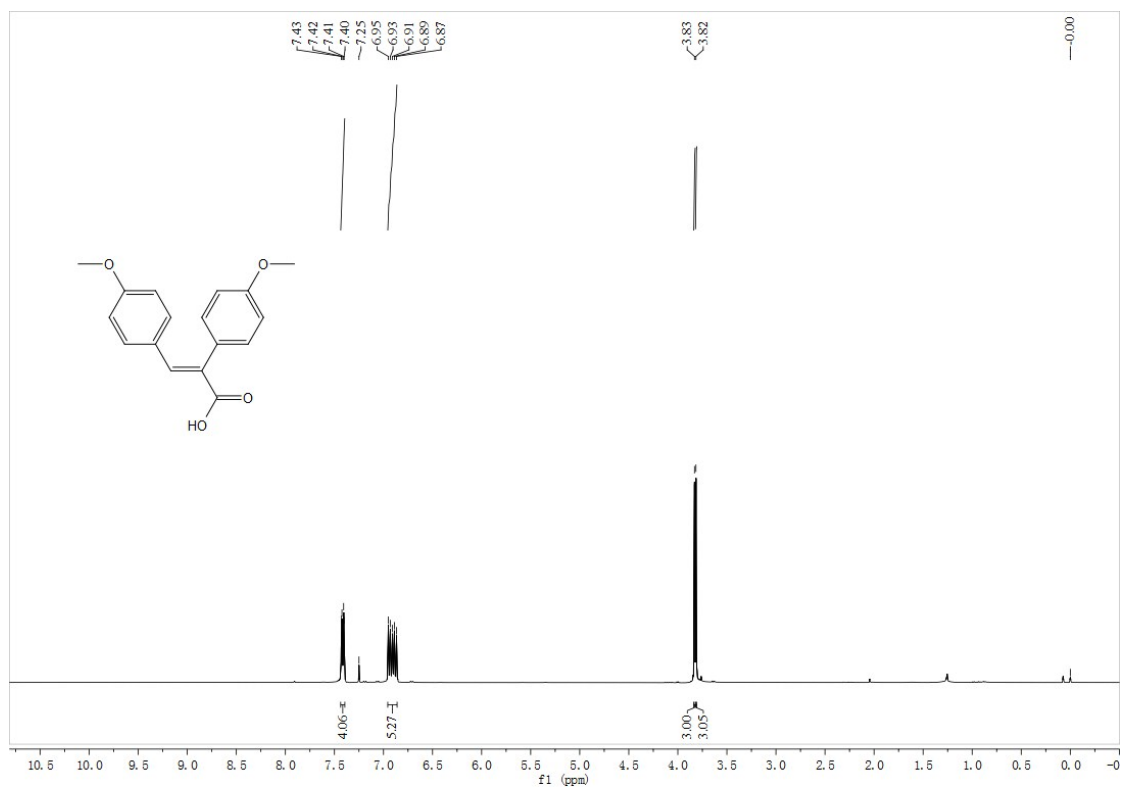
Copies of <sup>1</sup>H and <sup>13</sup>C NMR Spectra.....S2



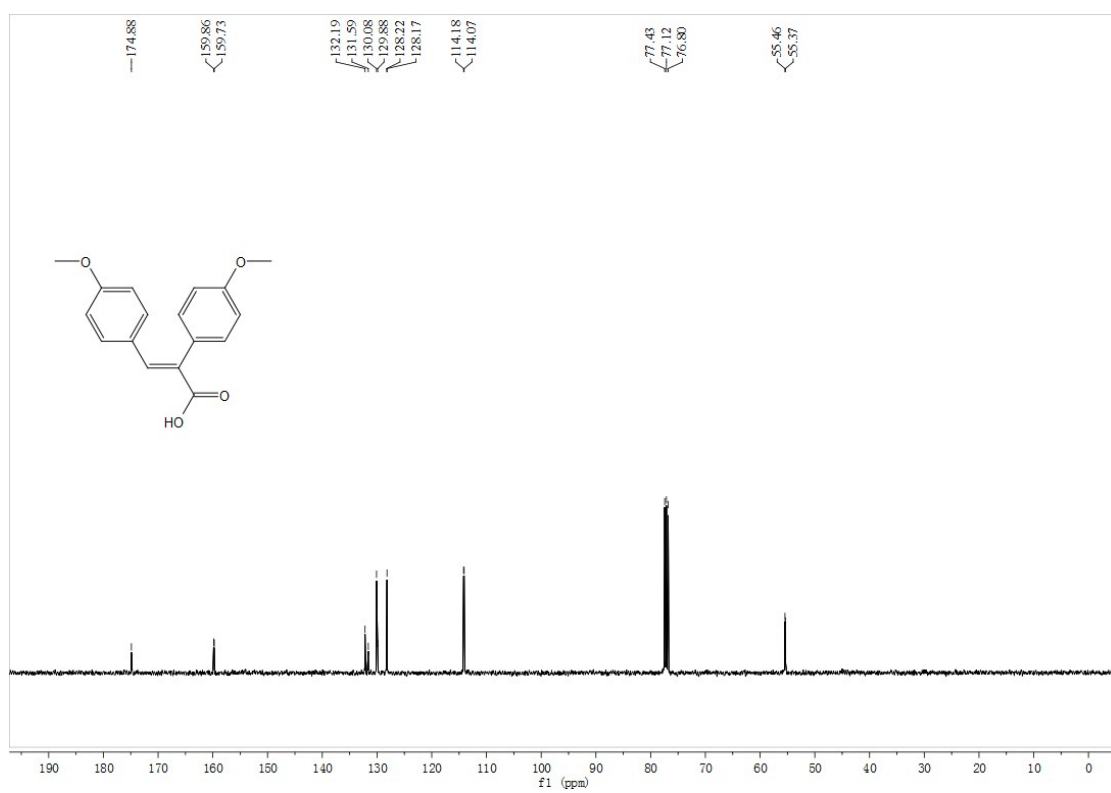
$^1\text{H NMR}$  of **2a**



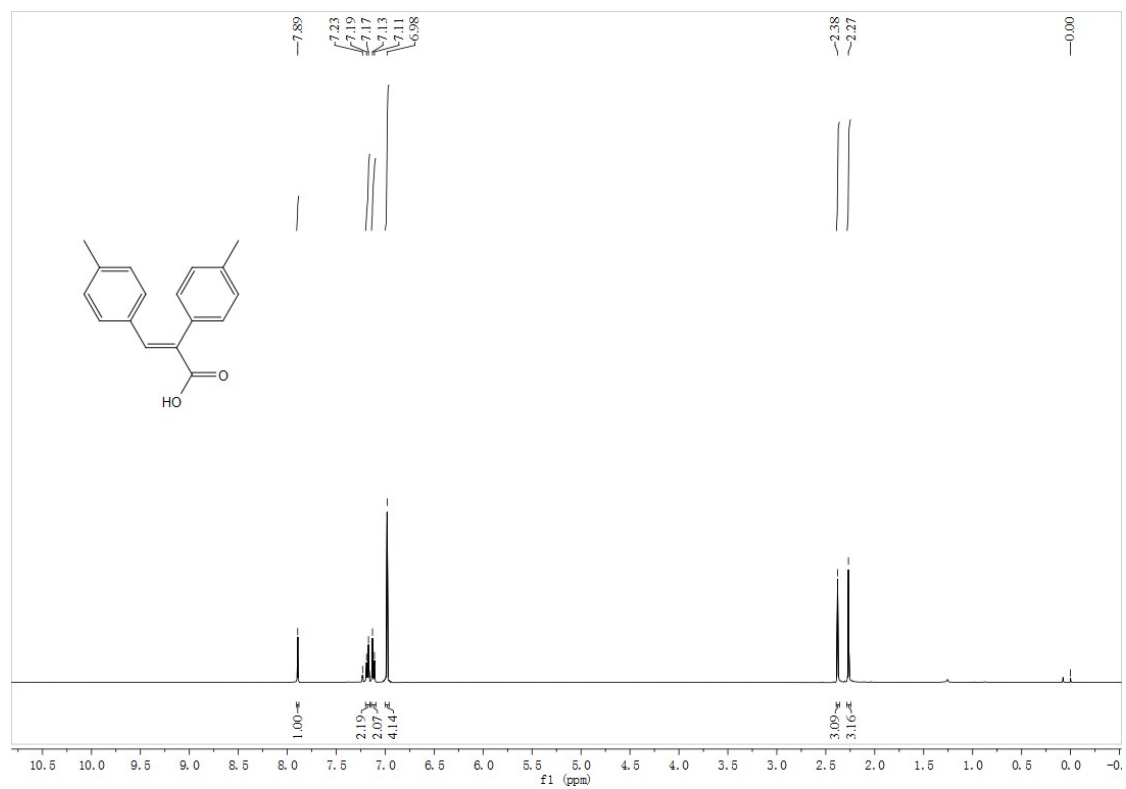
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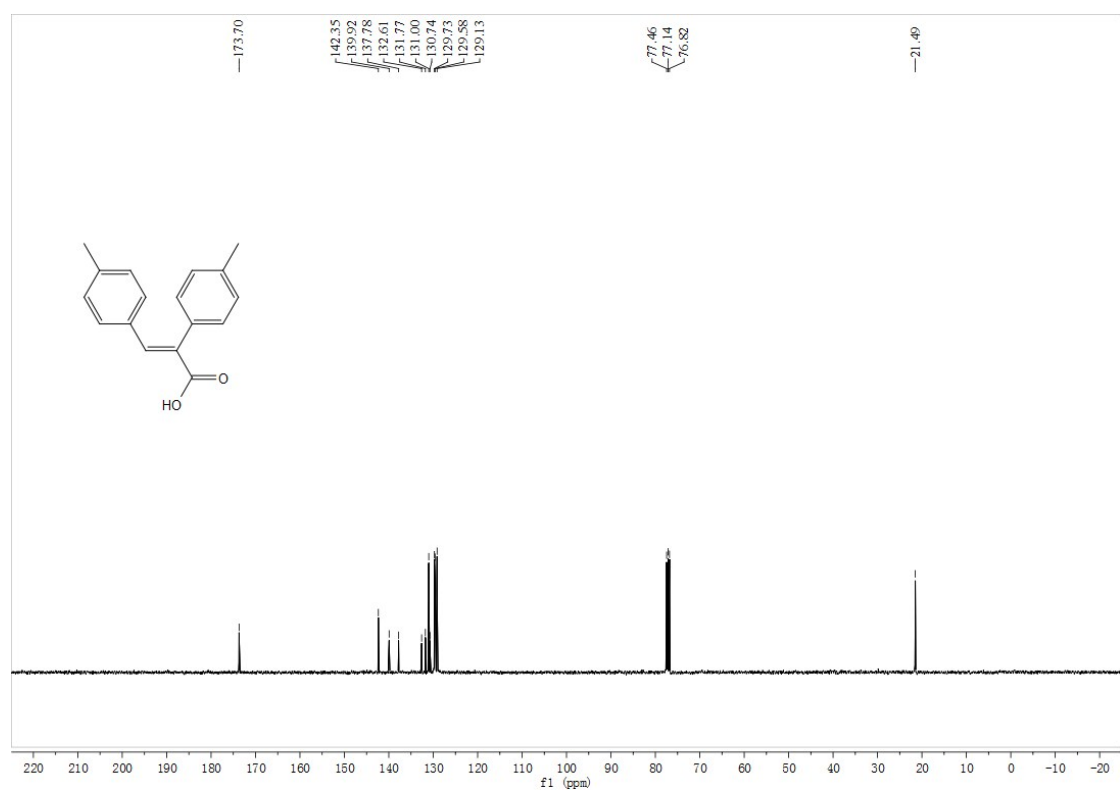
<sup>1</sup>H NMR of **2b**



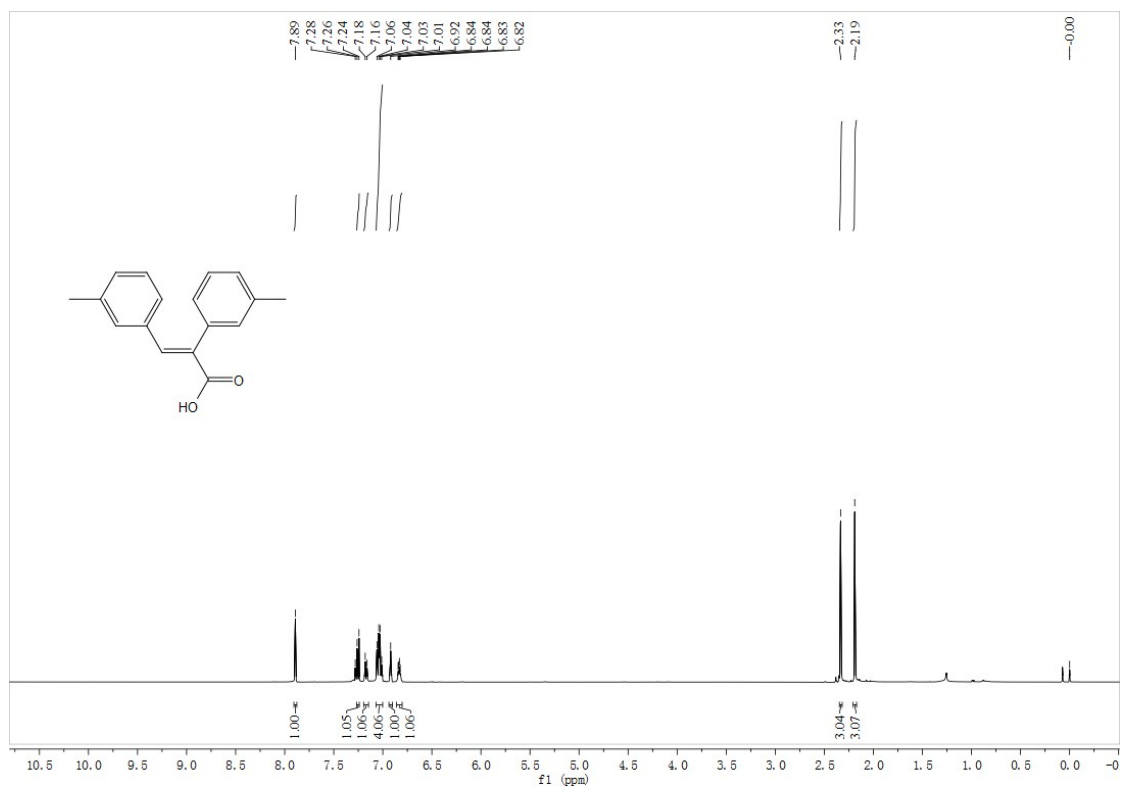
<sup>13</sup>C NMR of **2b**



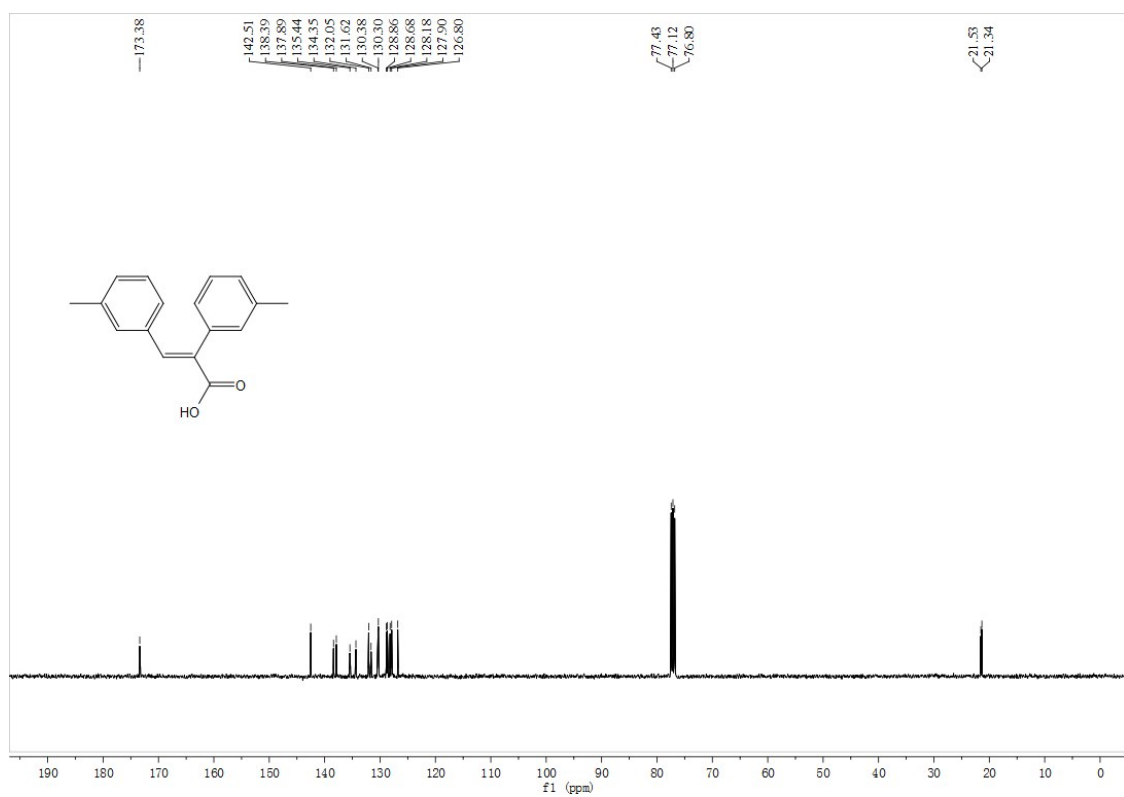
<sup>1</sup>H NMR of **2c**



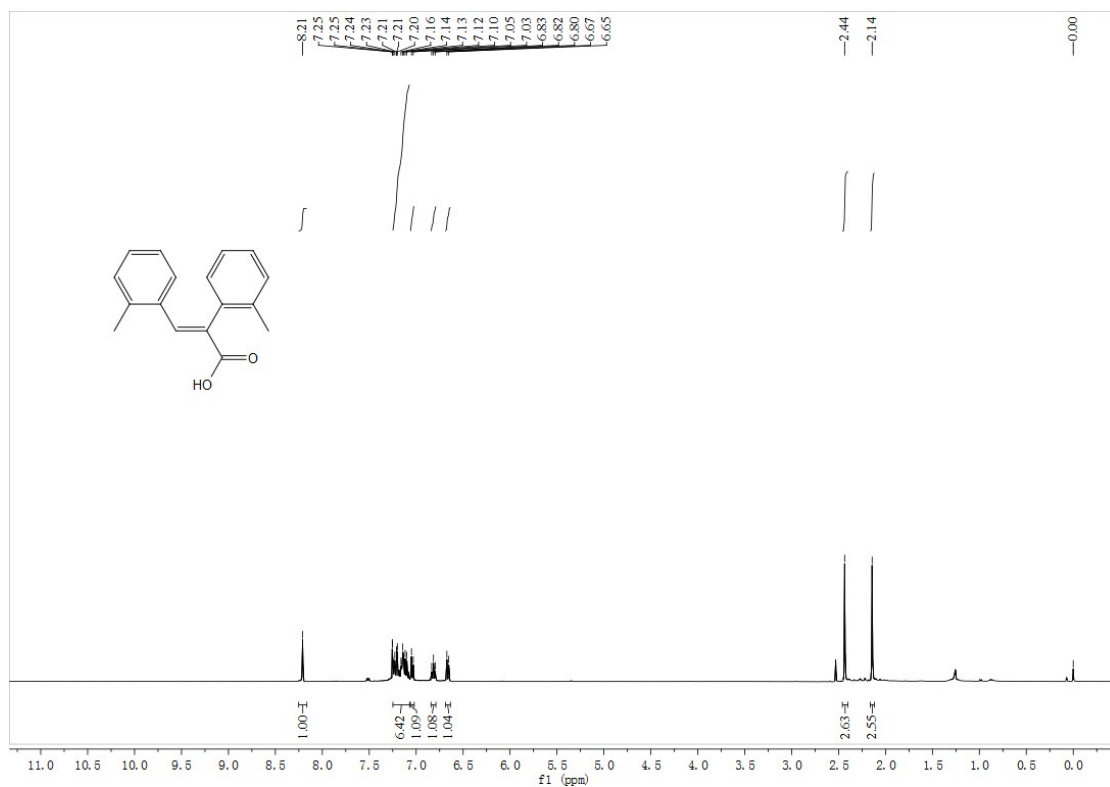
<sup>13</sup>C NMR of **2c**



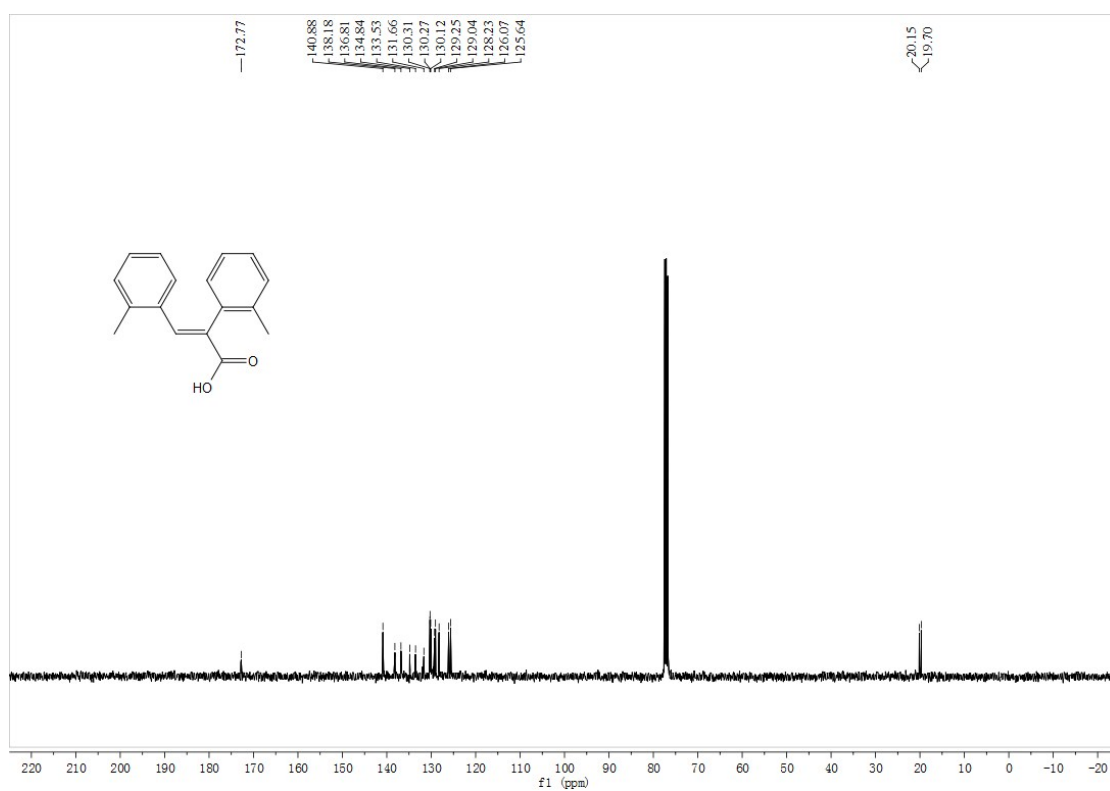
<sup>1</sup>H NMR of 2d



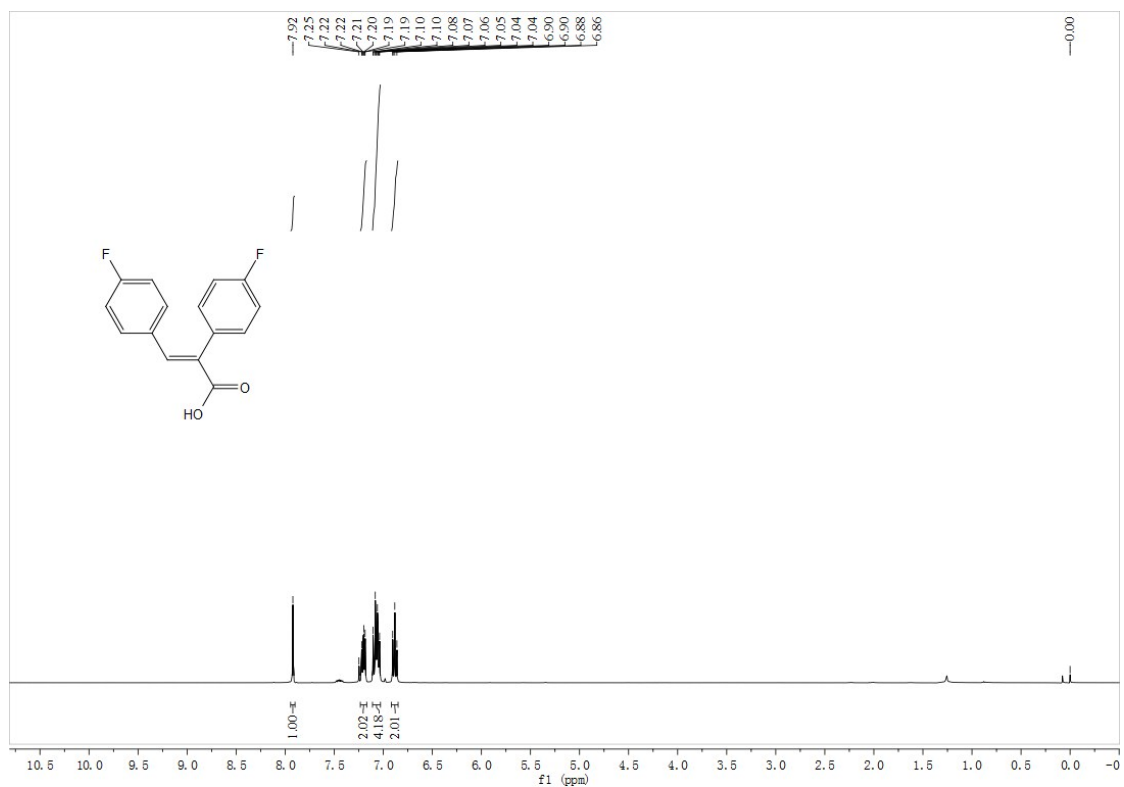
<sup>13</sup>C NMR of 2d



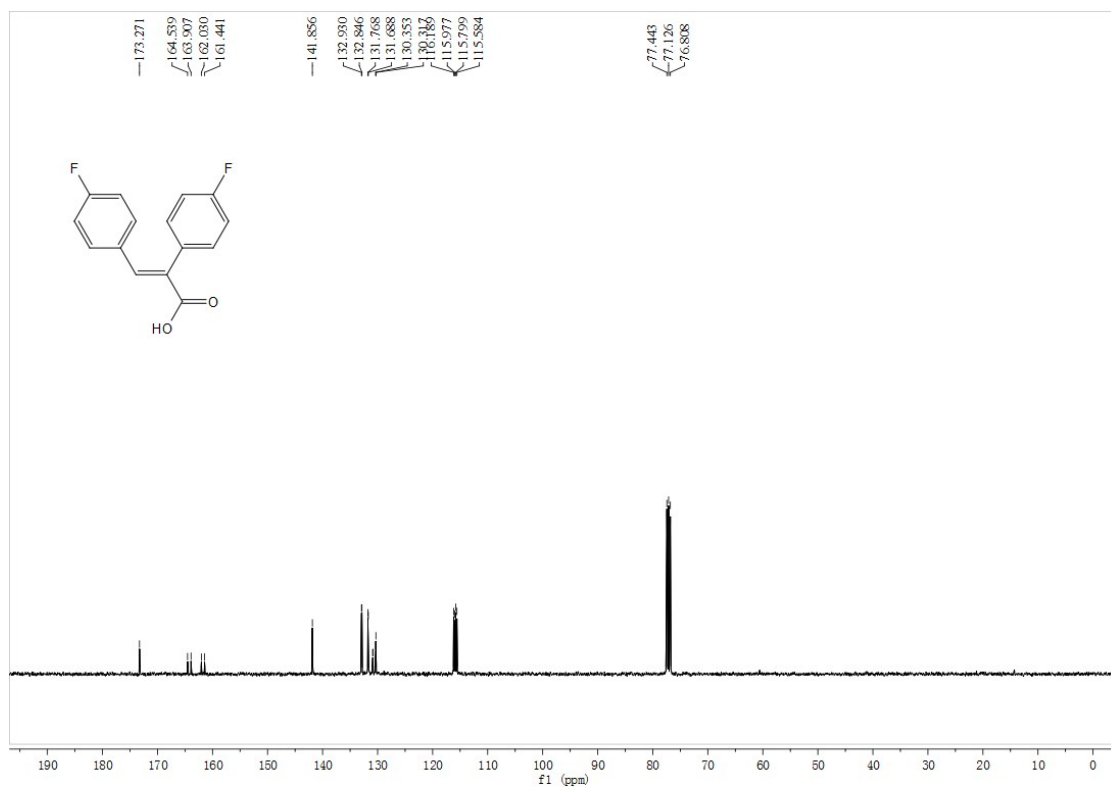
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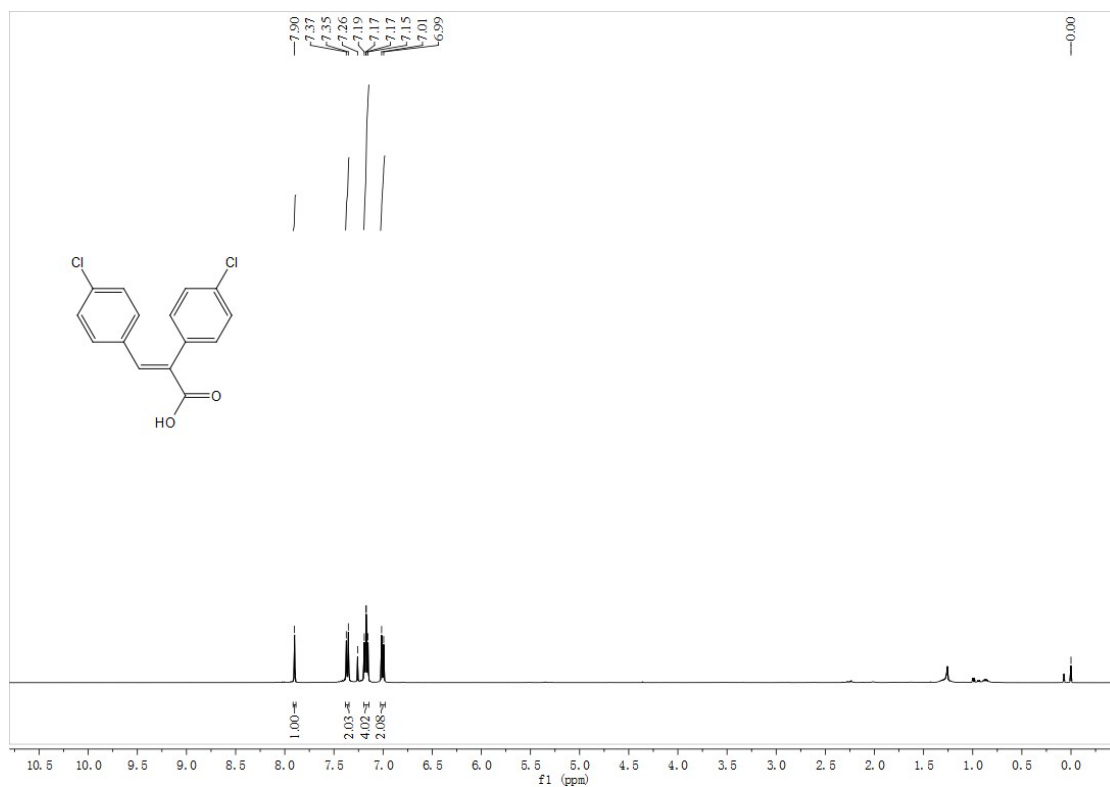
<sup>13</sup>C NMR of 2e



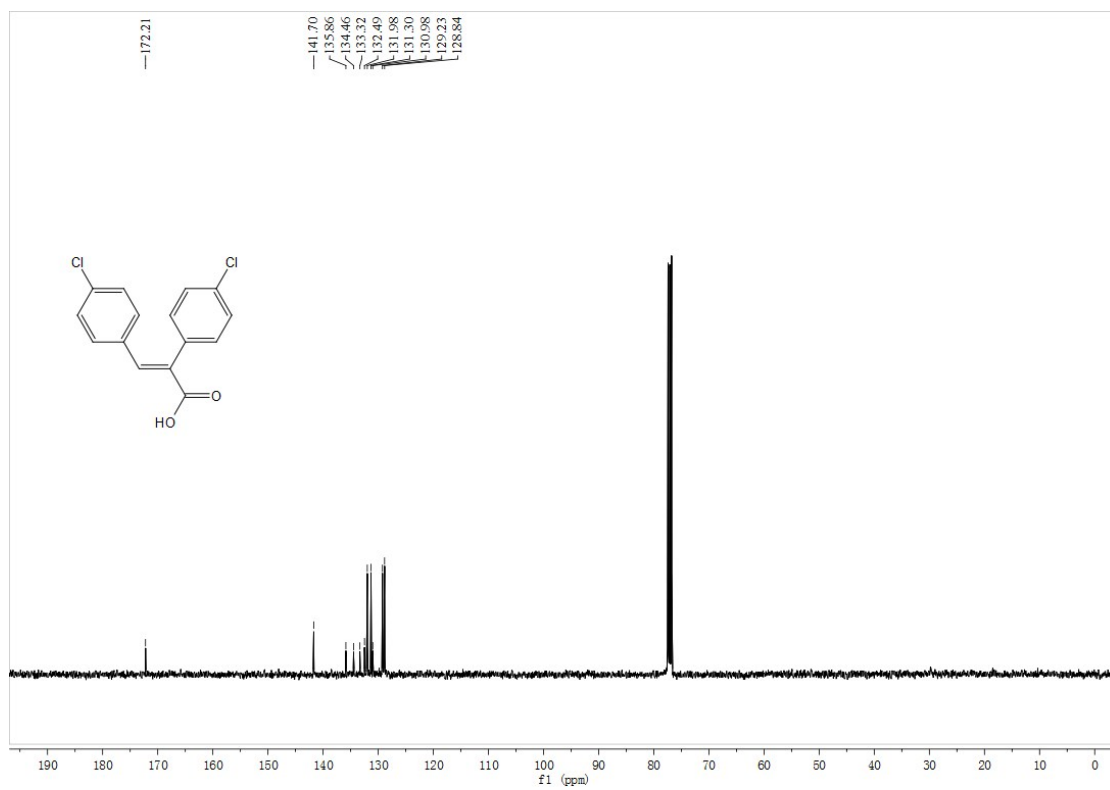
<sup>1</sup>H NMR of 2f



<sup>13</sup>C NMR of 2f

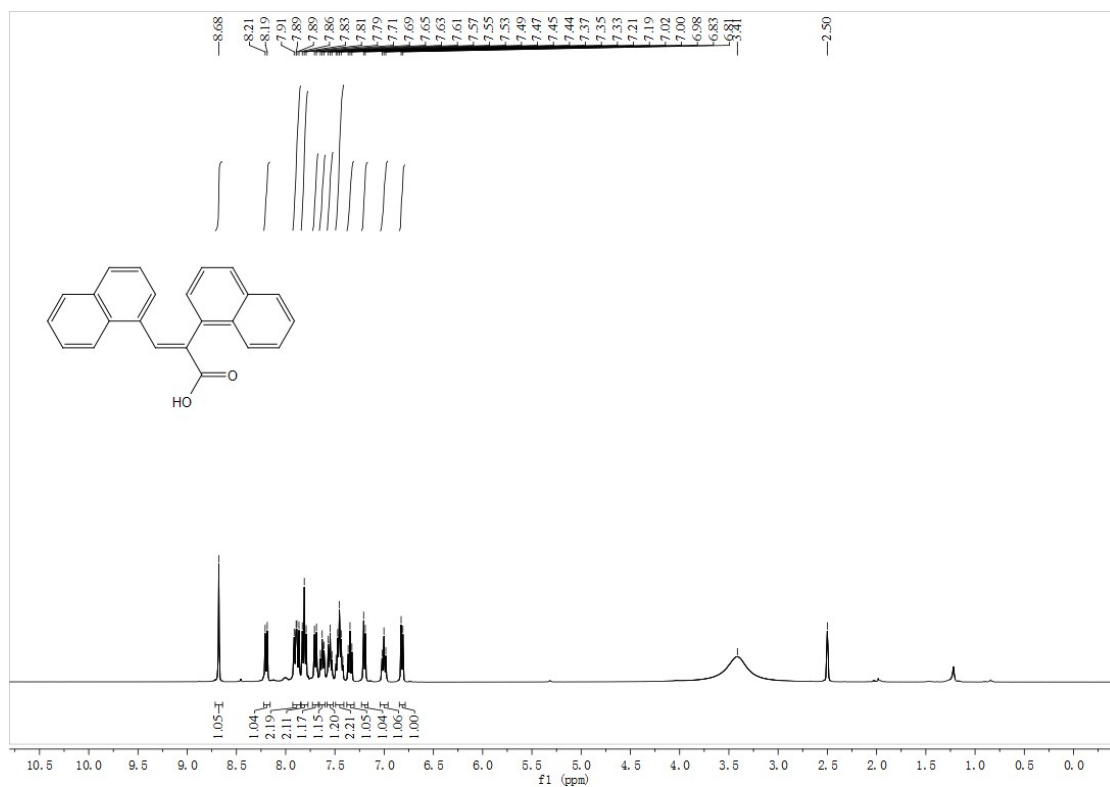


<sup>1</sup>H NMR of **2g**

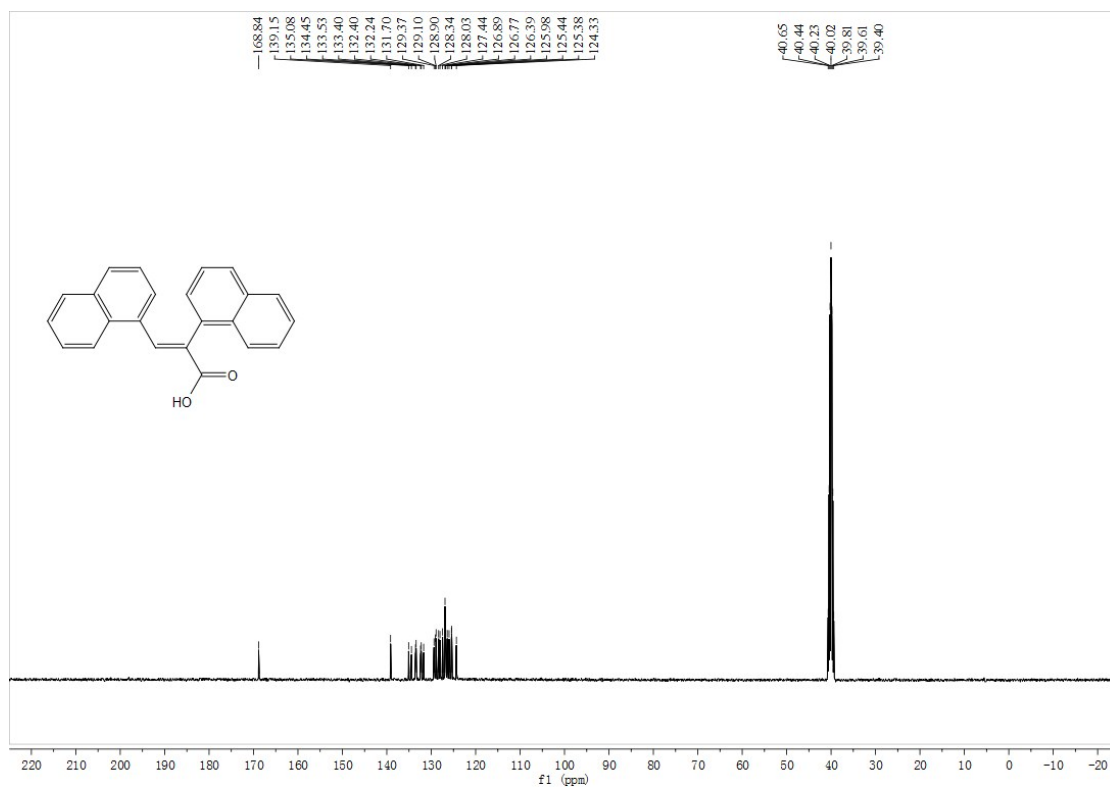


<sup>13</sup>C NMR of **2g**

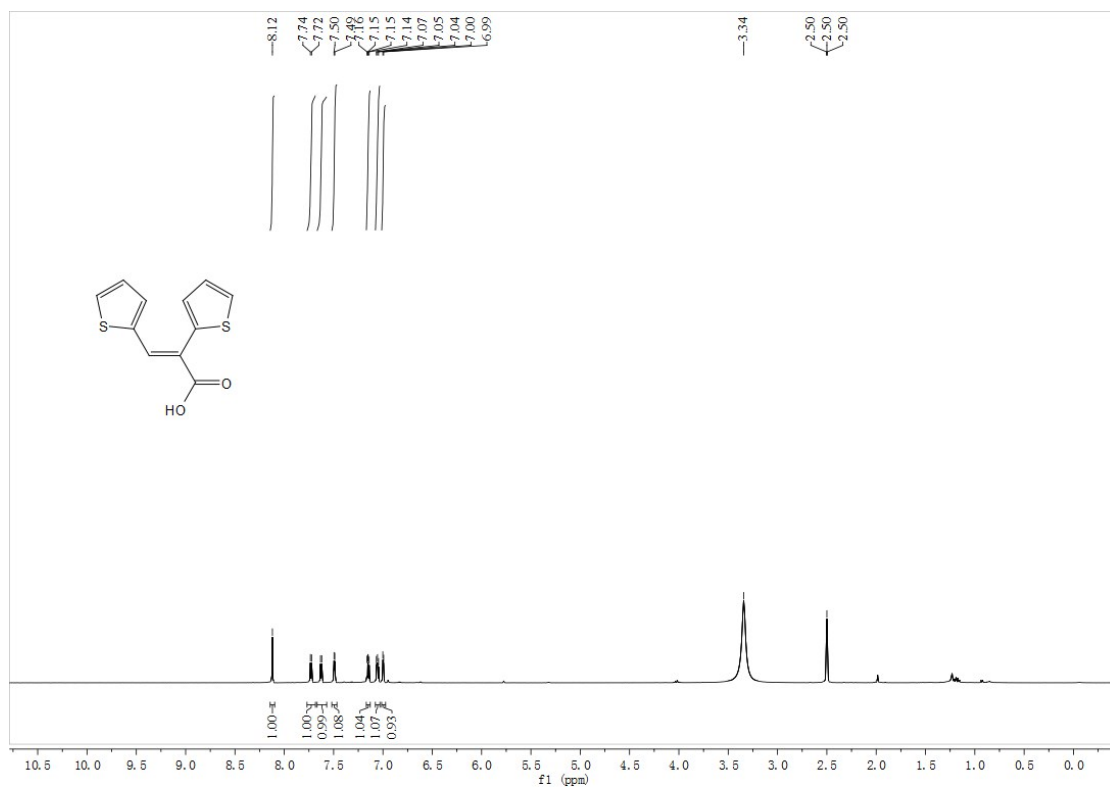




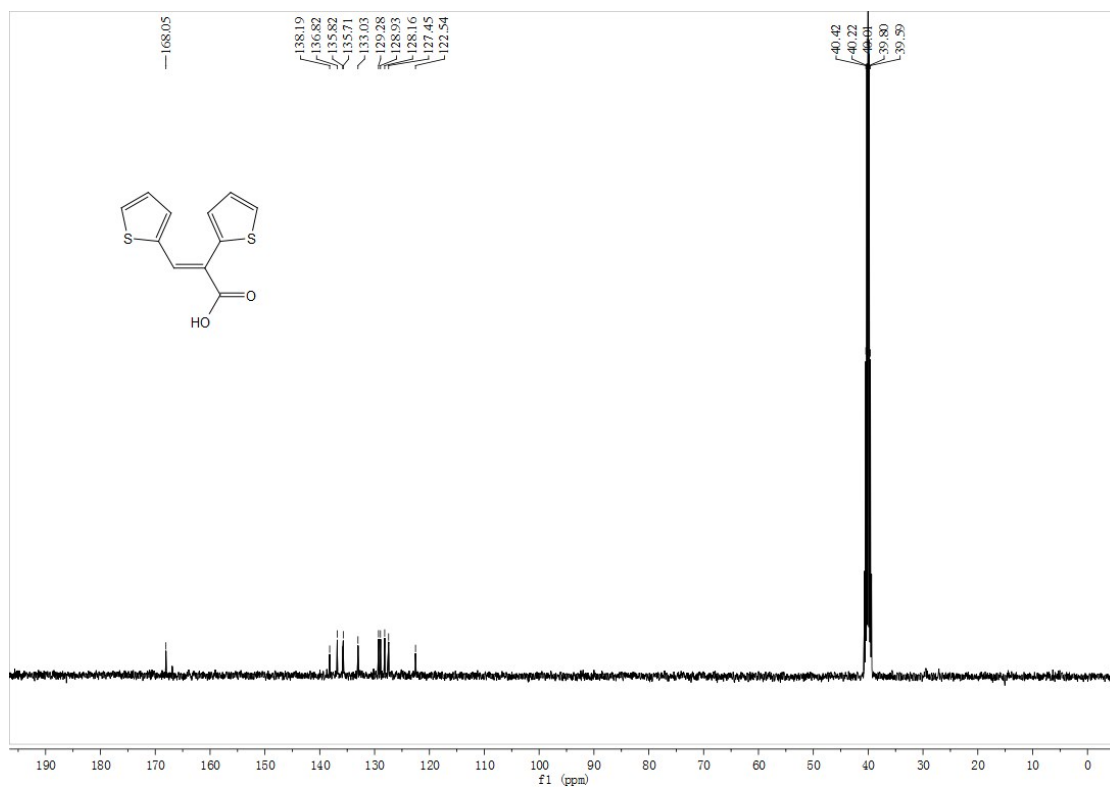
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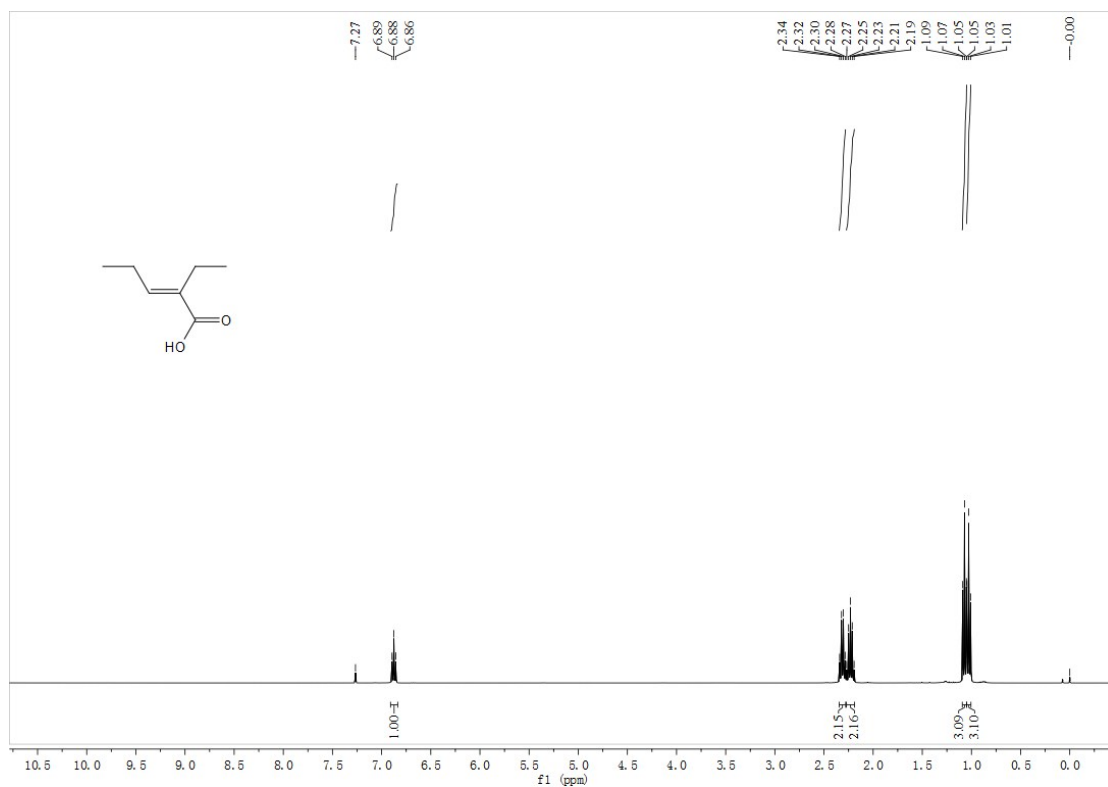
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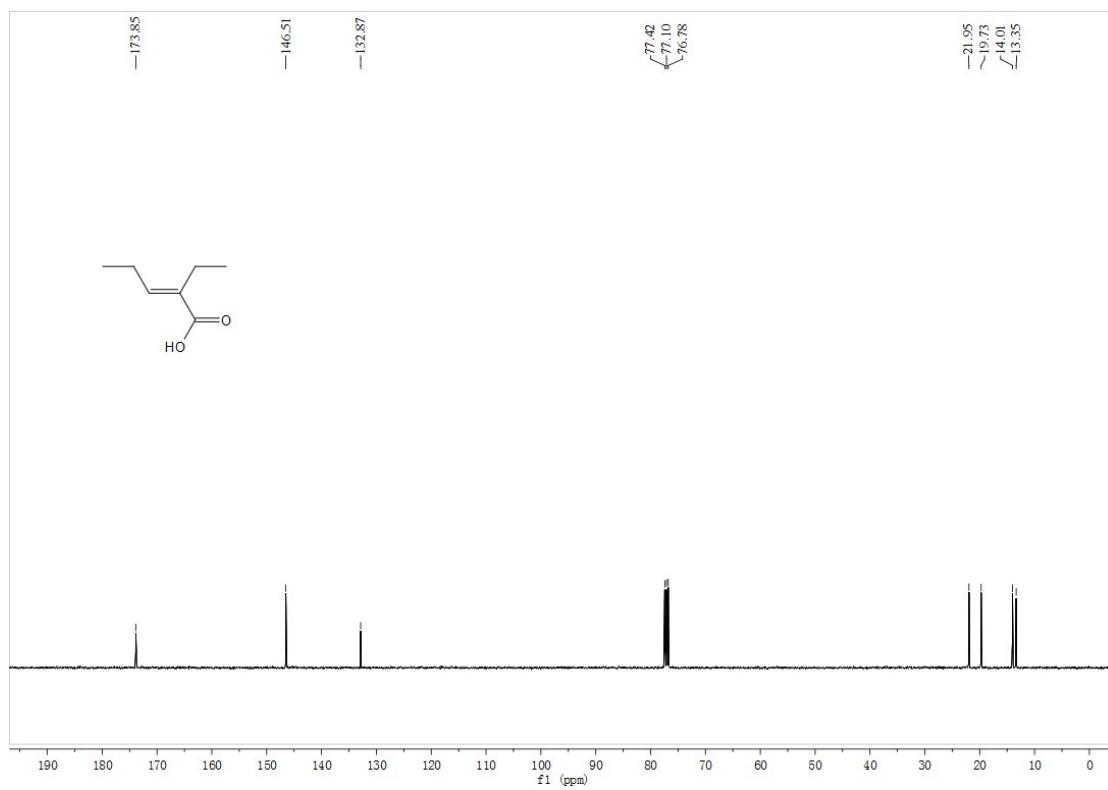
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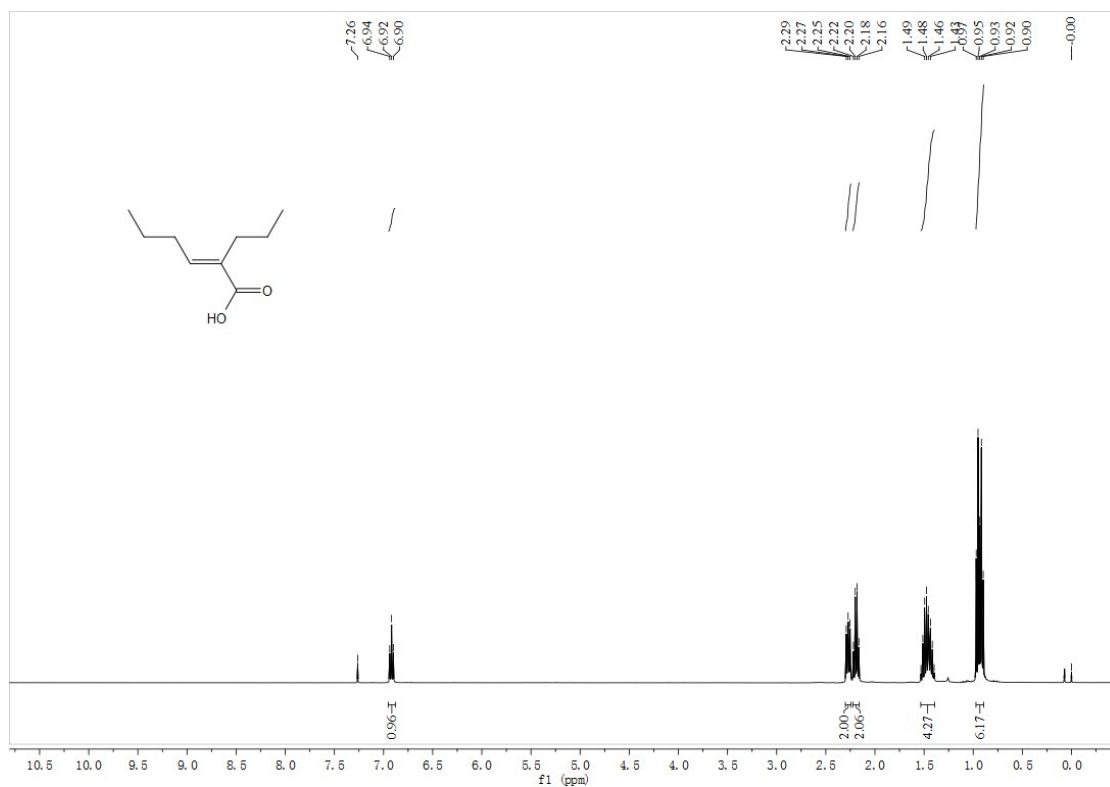
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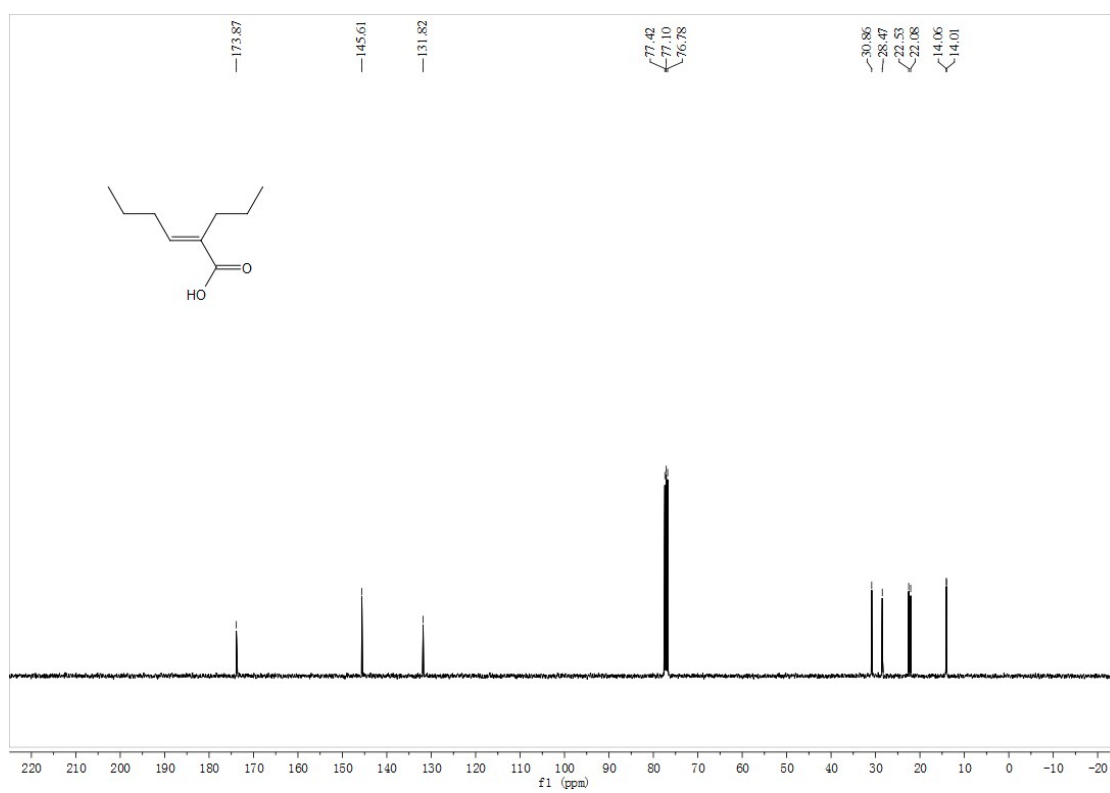
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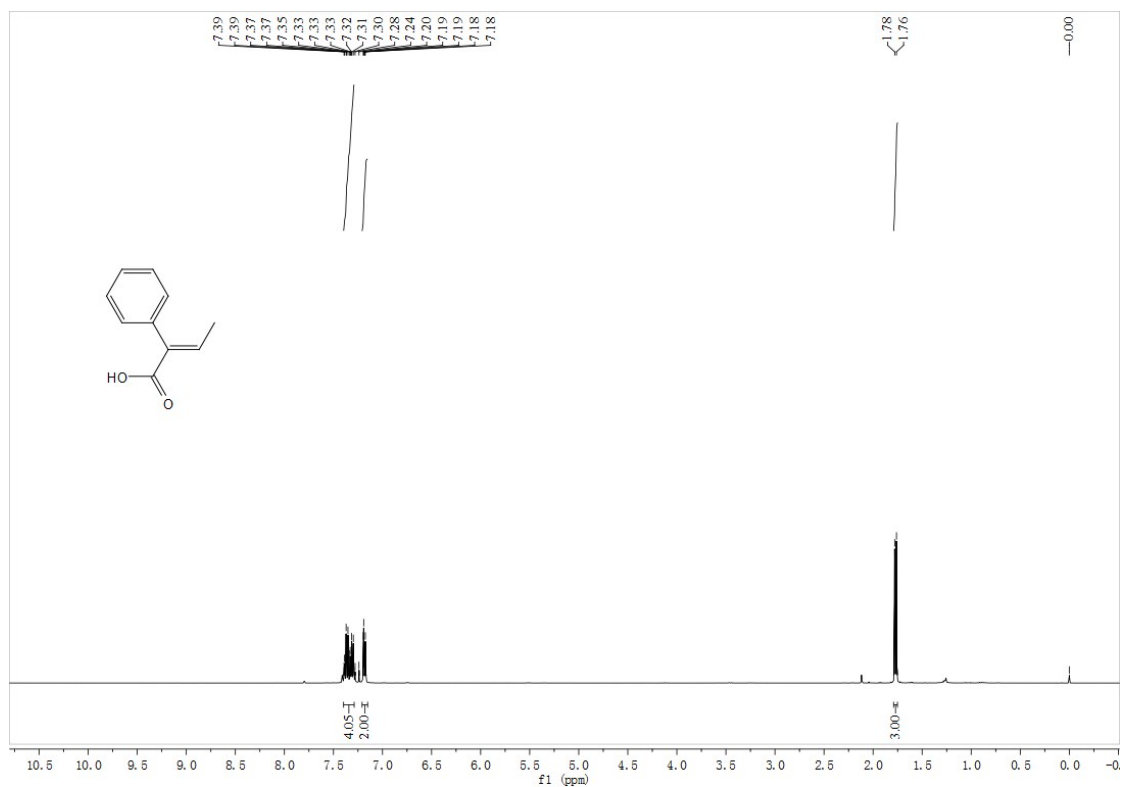
<sup>13</sup>C NMR of 2j



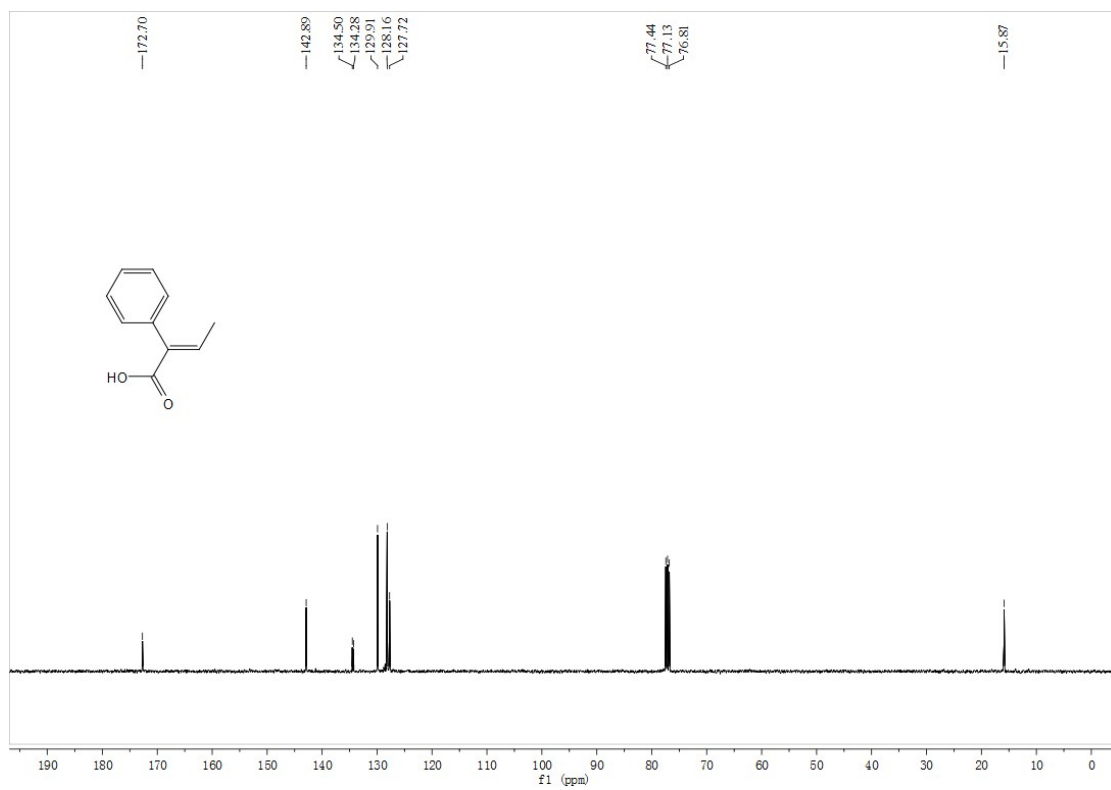
$^1\text{H NMR}$  of **2k**



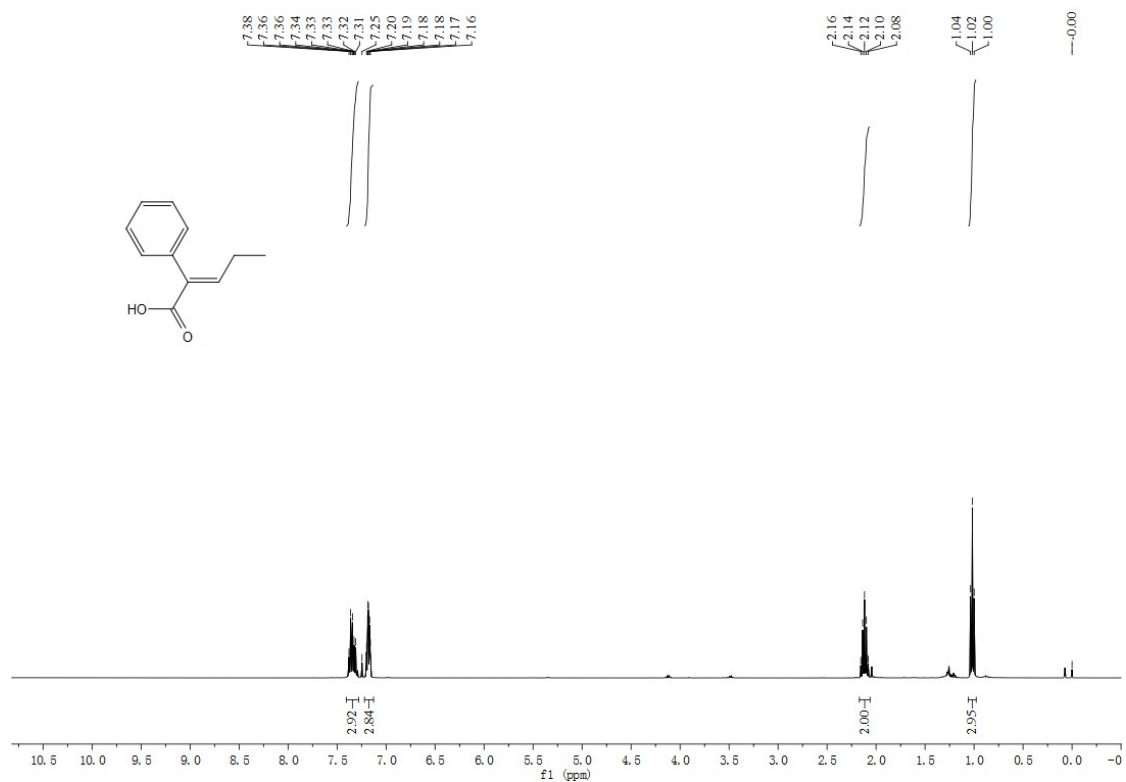
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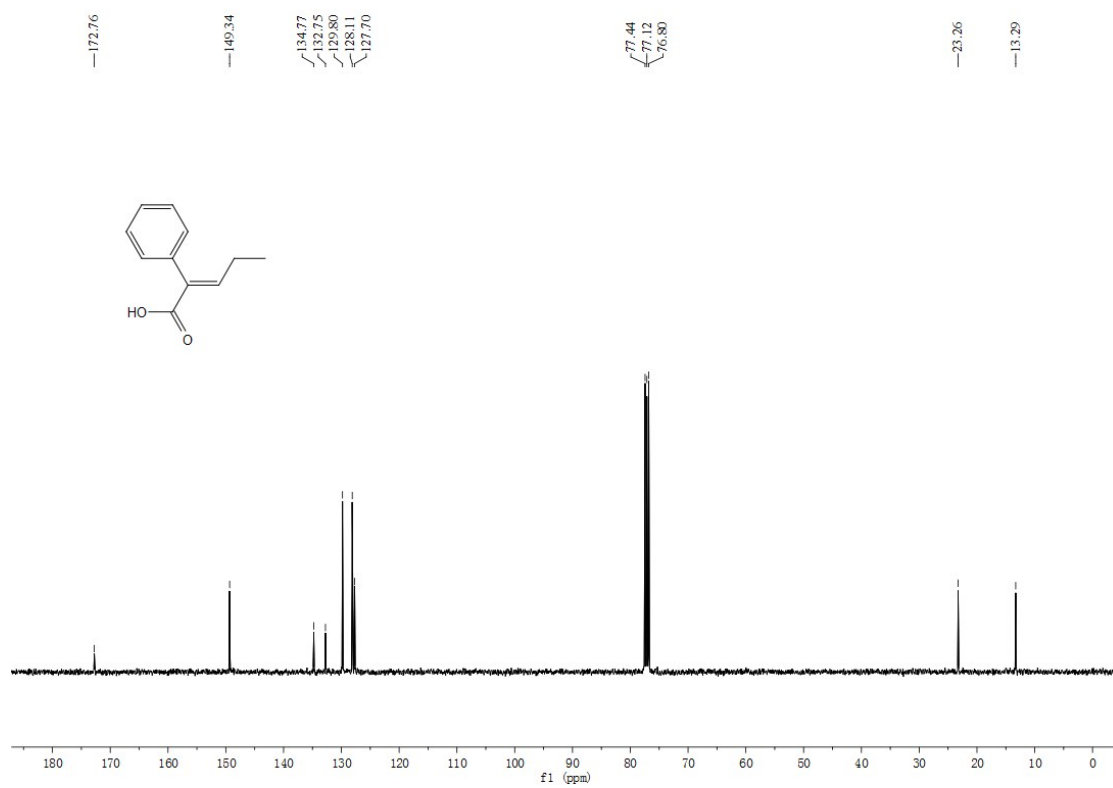
<sup>1</sup>H NMR of 21



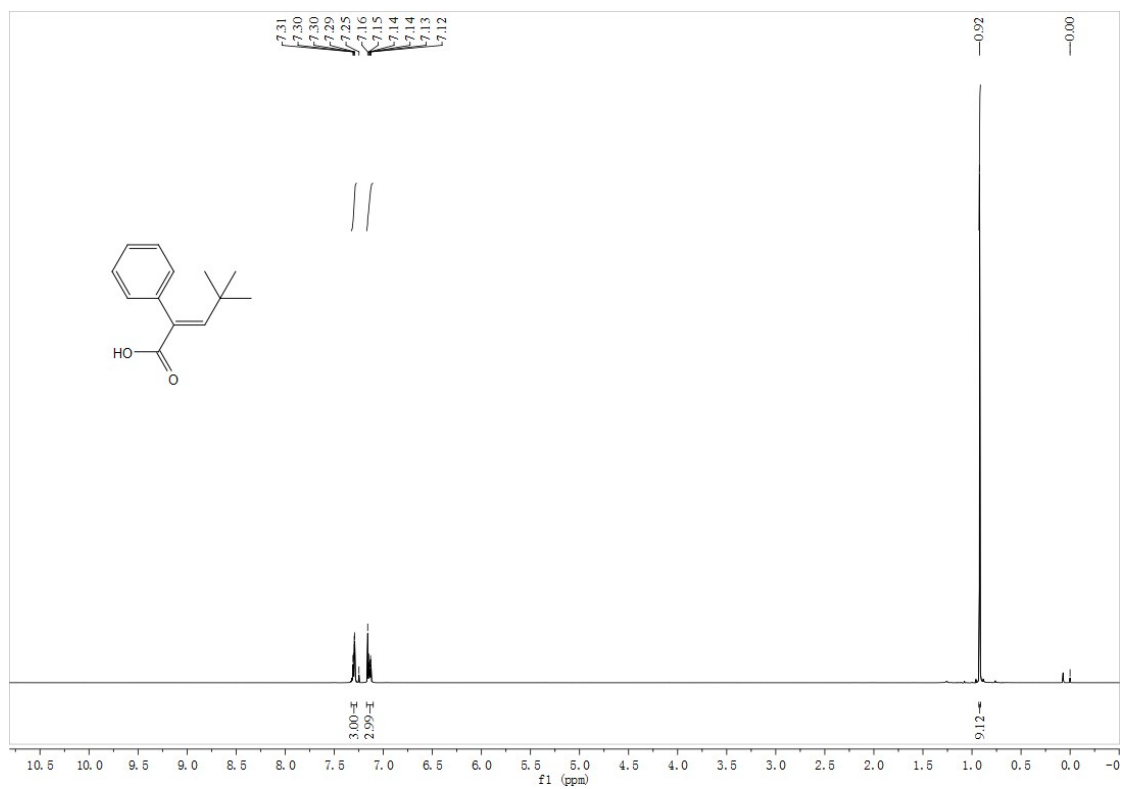
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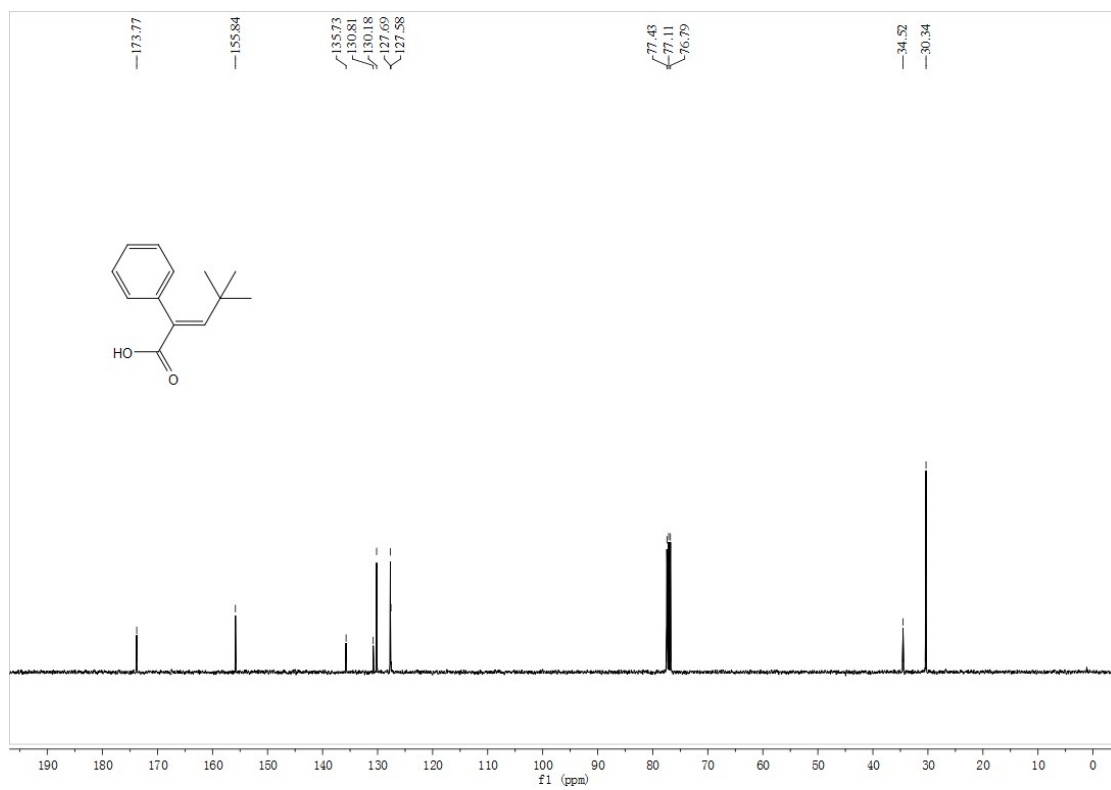
<sup>1</sup>H NMR of 2m



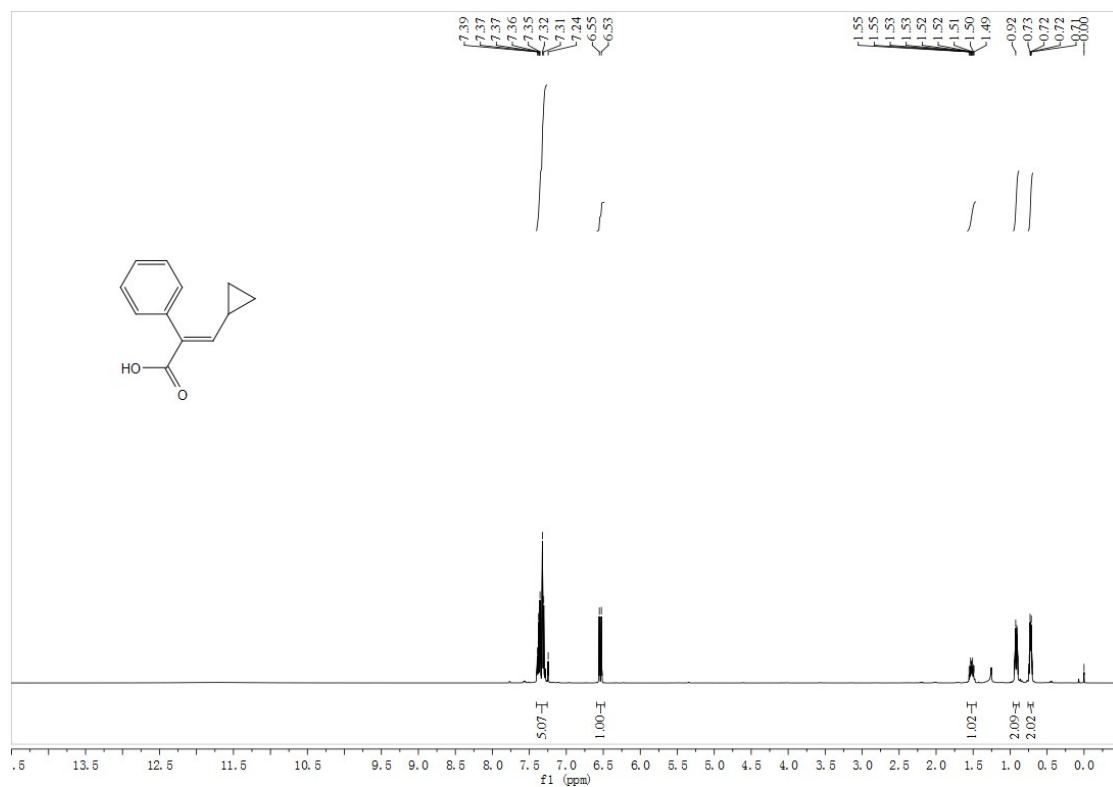
<sup>13</sup>C NMR of 2m



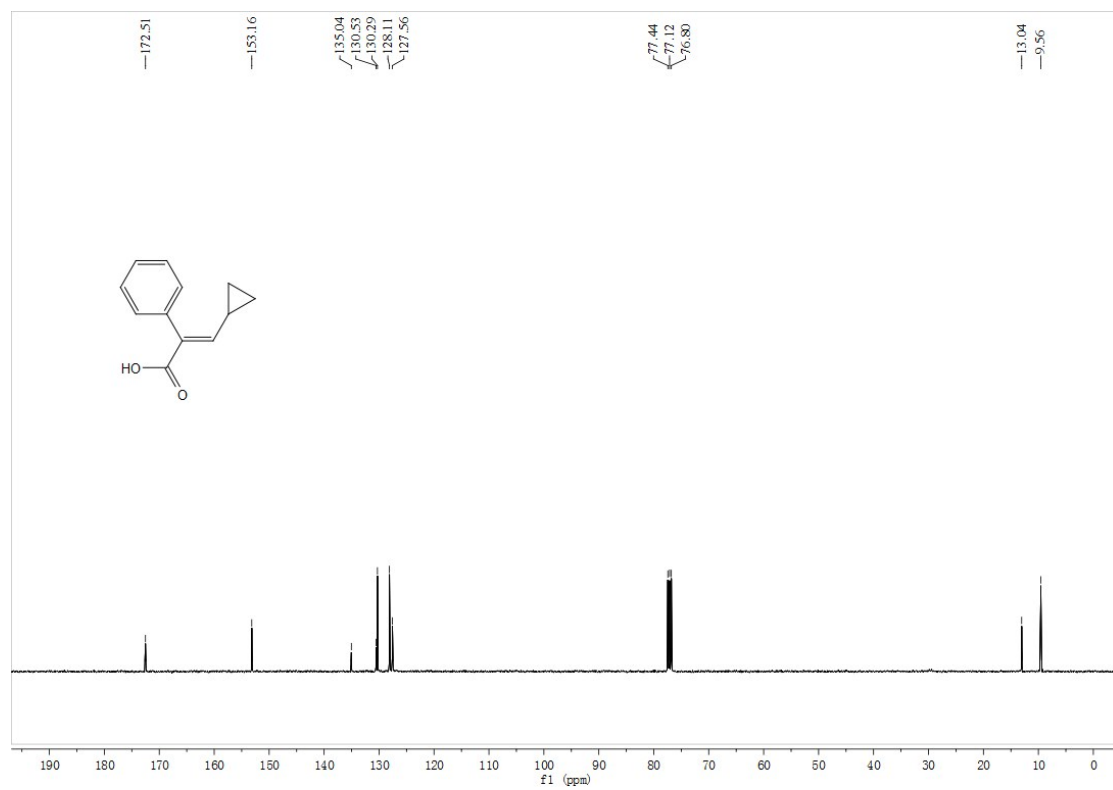
<sup>1</sup>H NMR of 2n



<sup>13</sup>C NMR of 2n

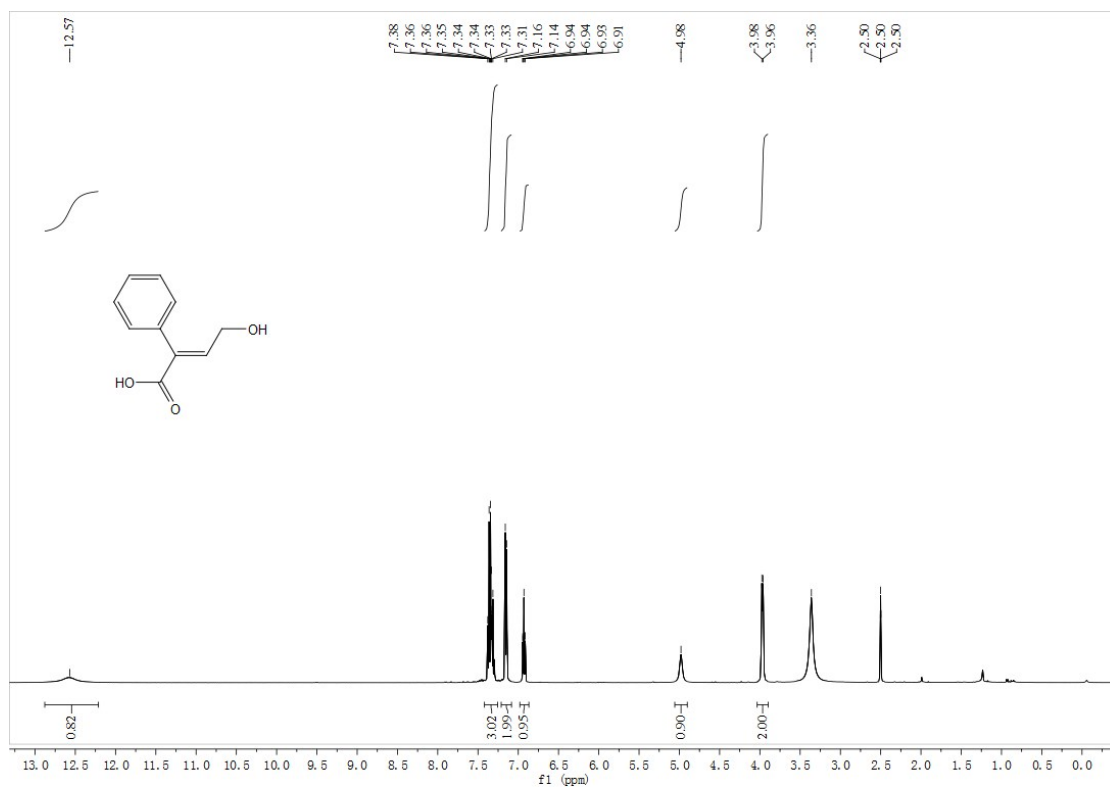


<sup>1</sup>H NMR of **2o**

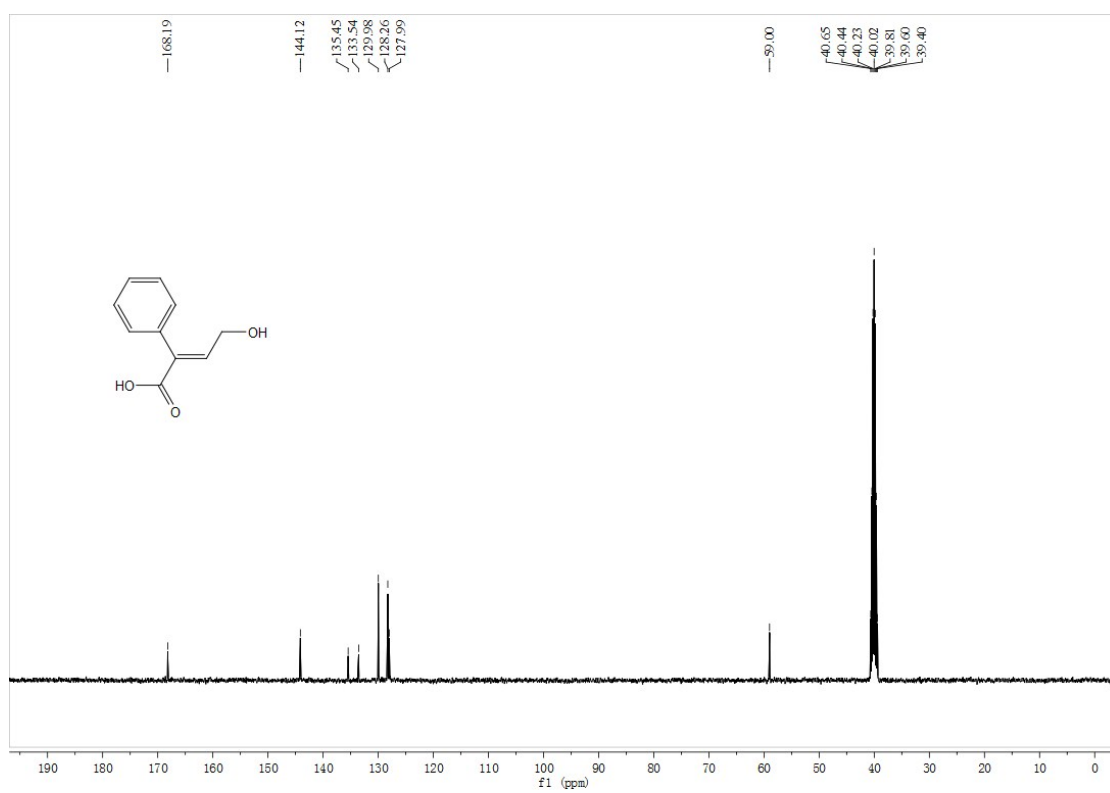


<sup>13</sup>C NMR of **2o**

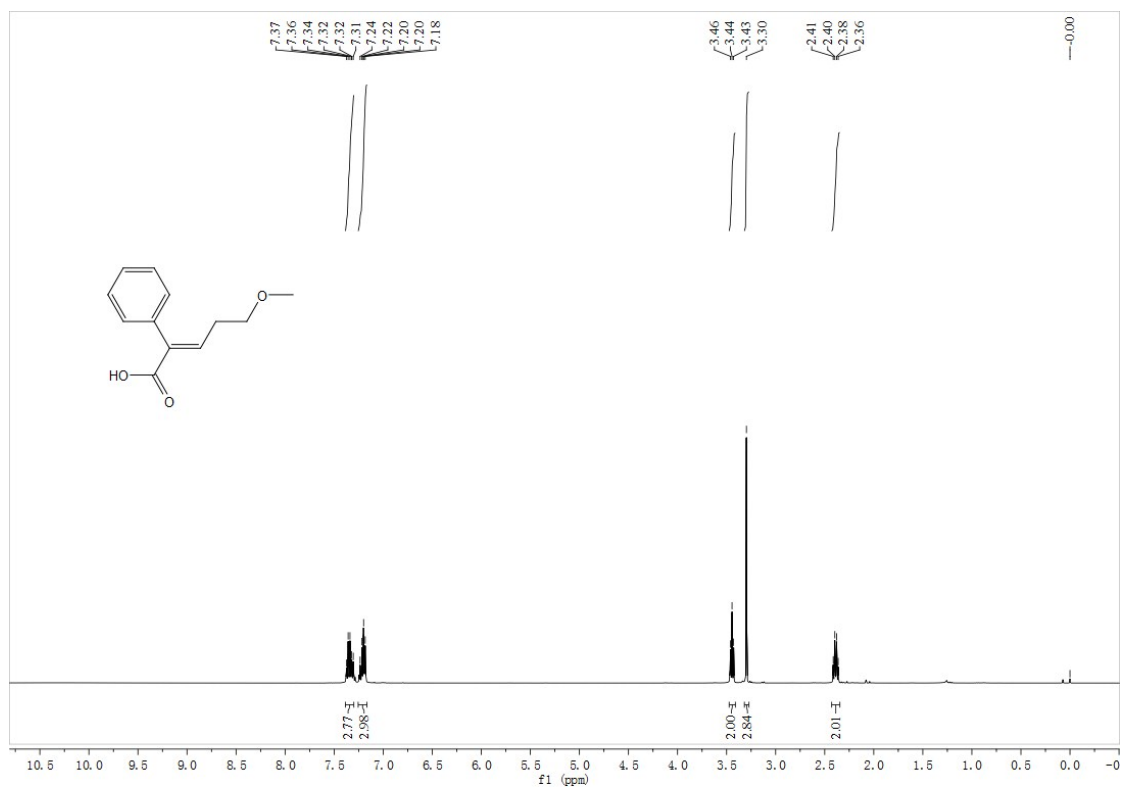




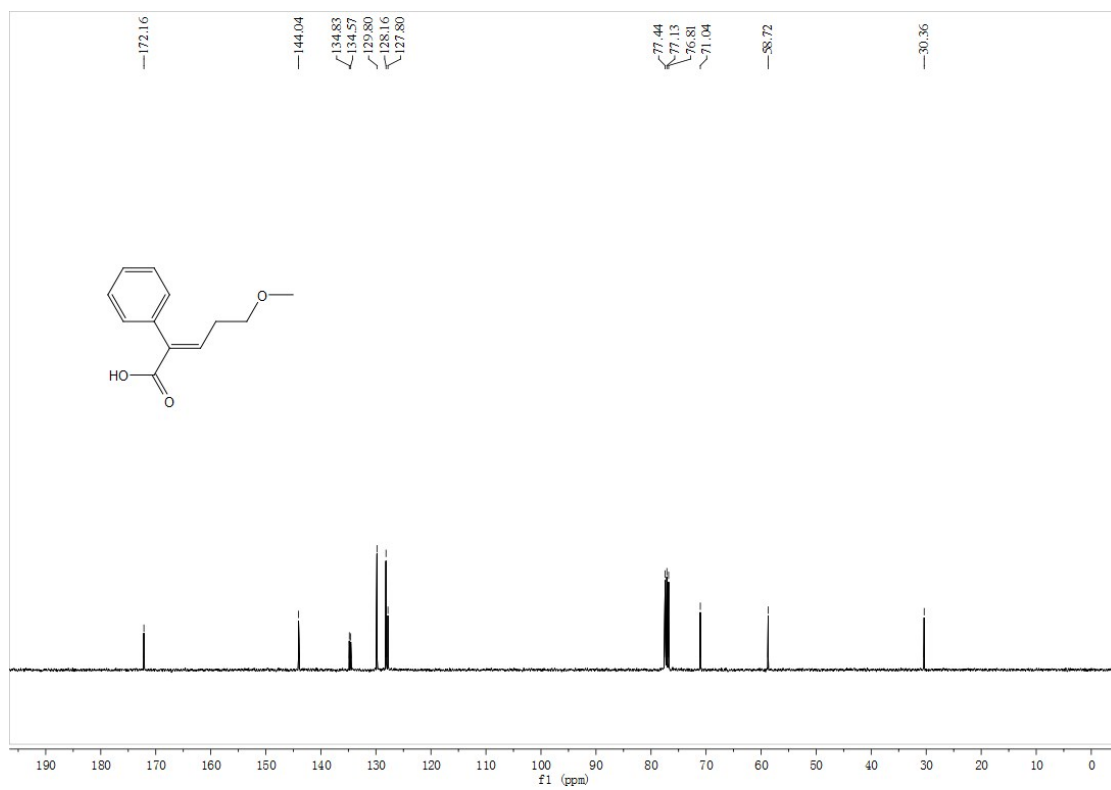
<sup>1</sup>H NMR of 2p



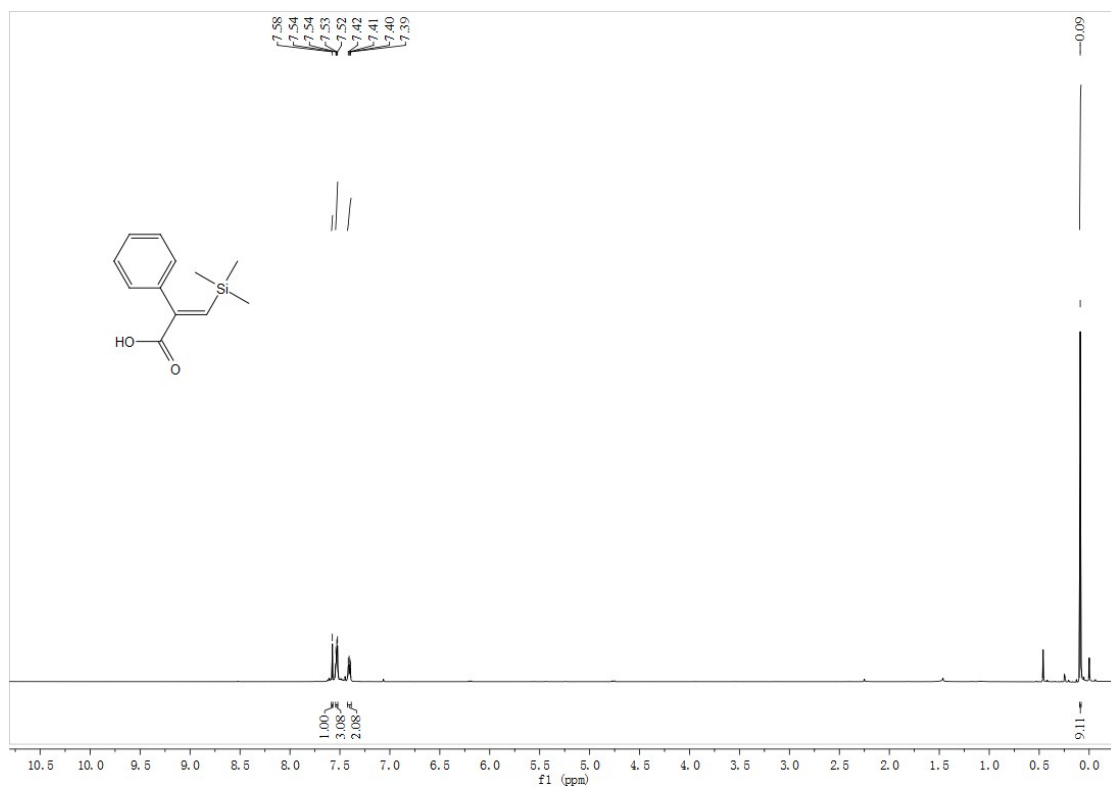
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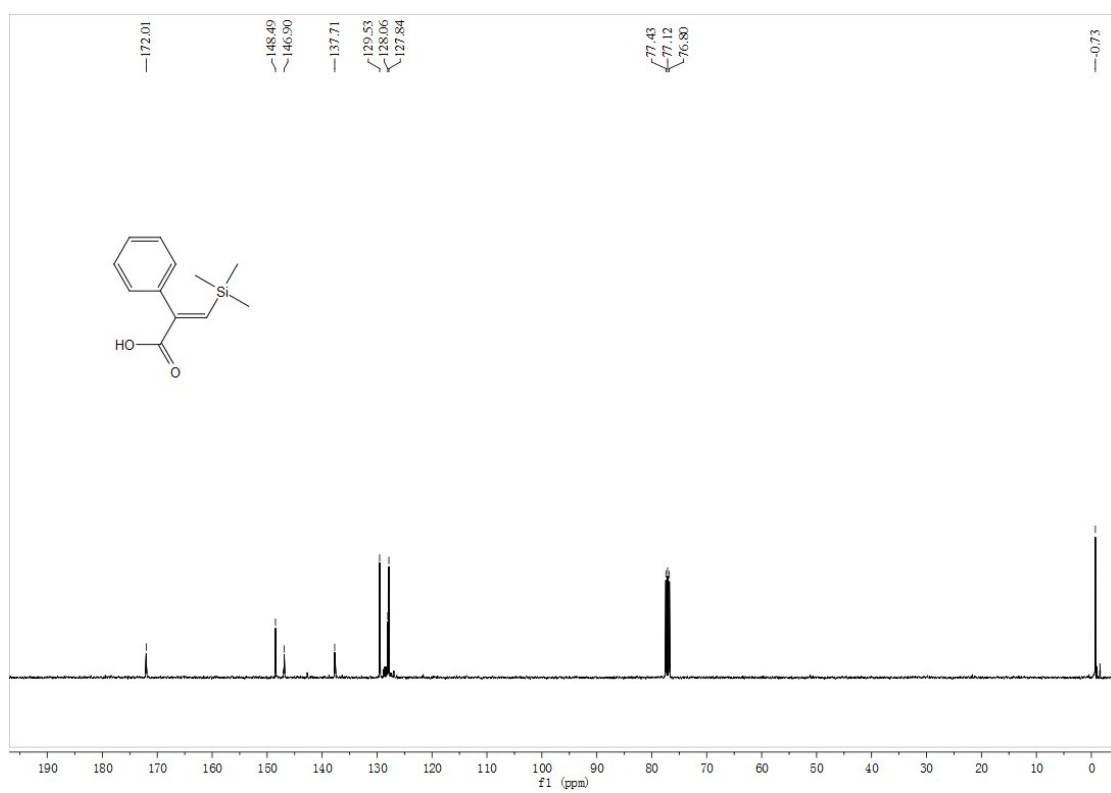
<sup>1</sup>H NMR of 2q



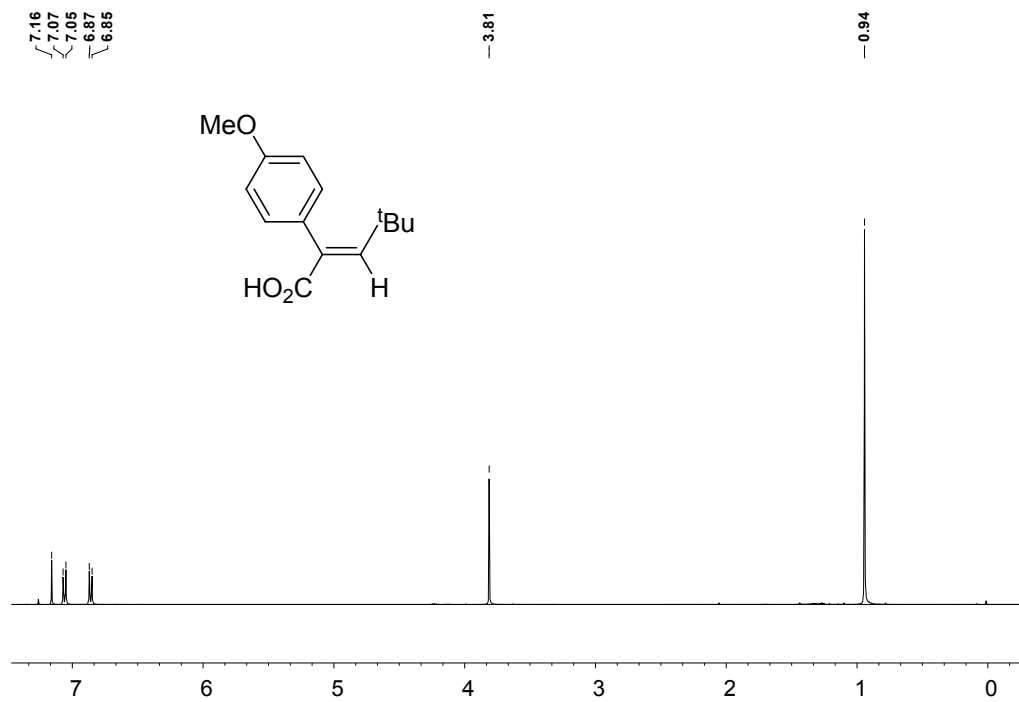
<sup>13</sup>C NMR of 2q



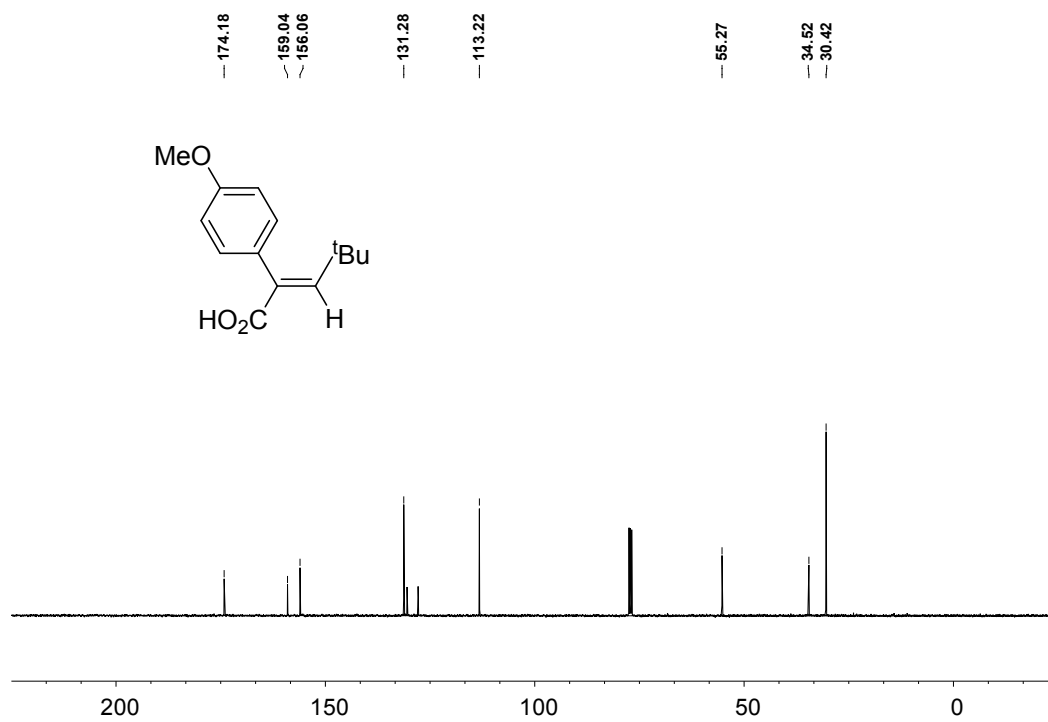
<sup>1</sup>H NMR of **2r**



<sup>13</sup>C NMR of **2r**



<sup>1</sup>H NMR of **2w**



<sup>13</sup>C NMR of **2w**