

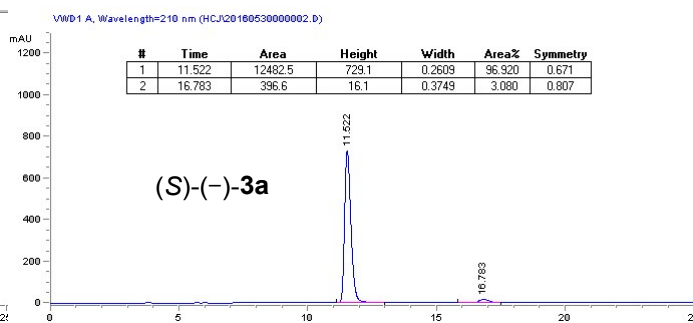
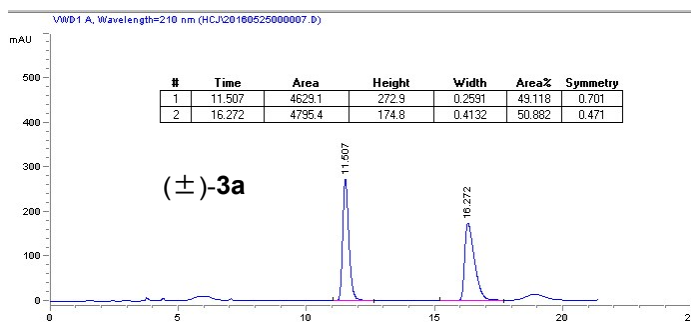
## **Ir-catalyzed asymmetric hydrogenation of $\beta$ -keto esters with chiral ferrocenyl P,N,N-ligands**

Xiu-Shuai Chen, Chuan-Jin Hou,\* Chao Qin, Hongzhu Liu, Yan-Jun Liu, De-Zhi Huang and Xiang-Ping Hu\*

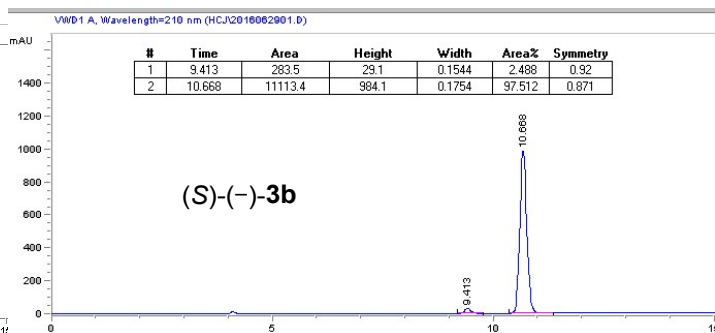
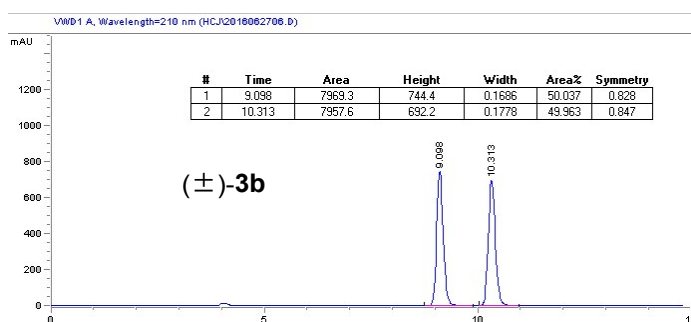
*School of Light Industry and Chemical Engineering, Dalian Polytechnic University, Dalian 116034, China. E-mail: houcj@dpu.edu.cn*

*Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, China. E-mail: xiangping@dicp.ac.cn*

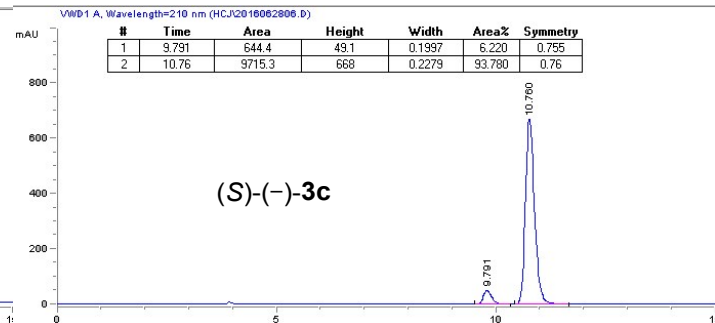
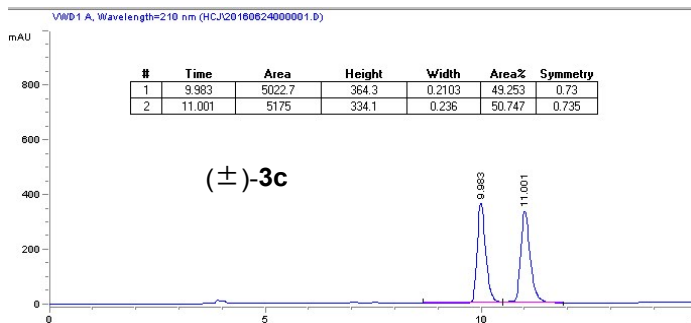
### (S)-methyl 3-hydroxy-3-phenylpropanoate 3a



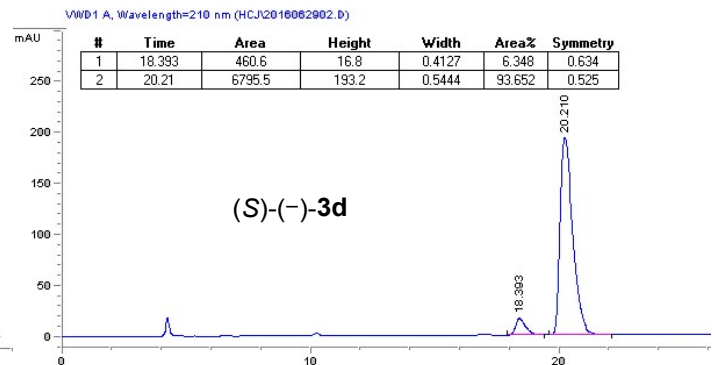
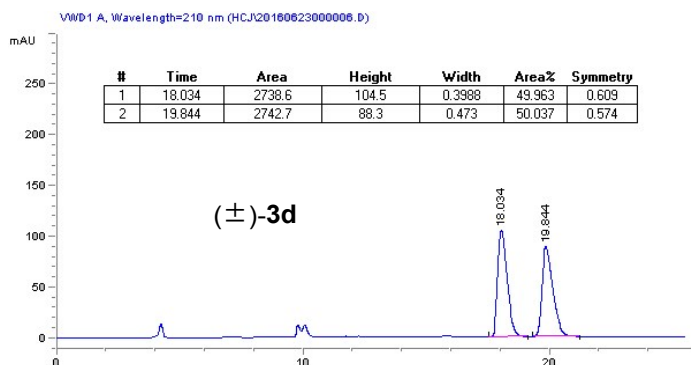
### (S)-methyl 3-(2-chlorophenyl)-3-hydroxypropanoate 3b



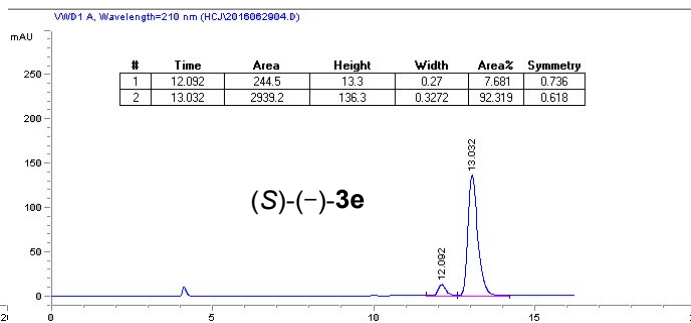
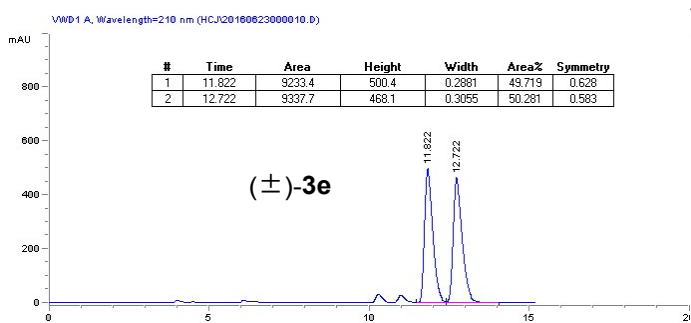
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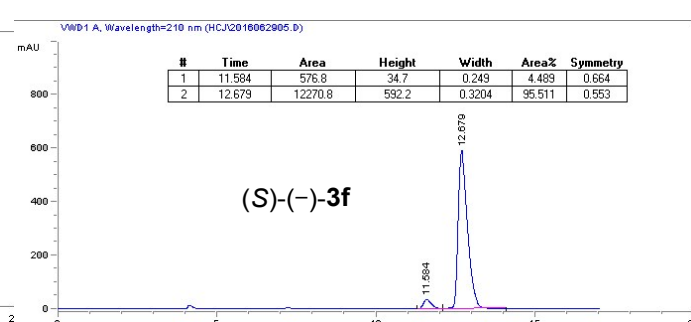
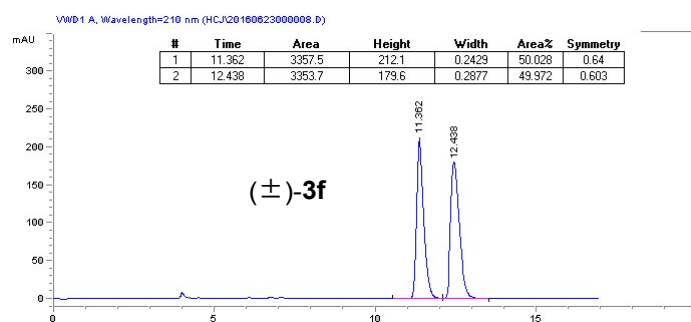
### (S)-methyl 3-(4-chlorophenyl)-3-hydroxypropanoate 3d



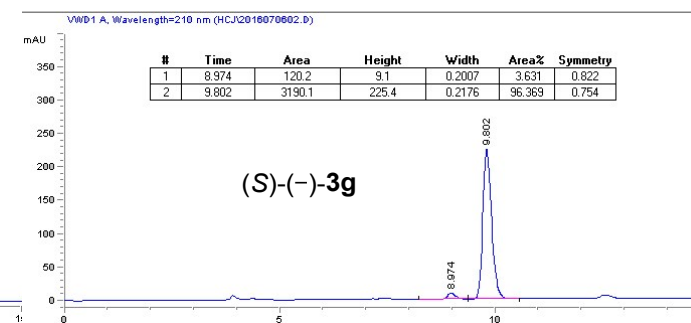
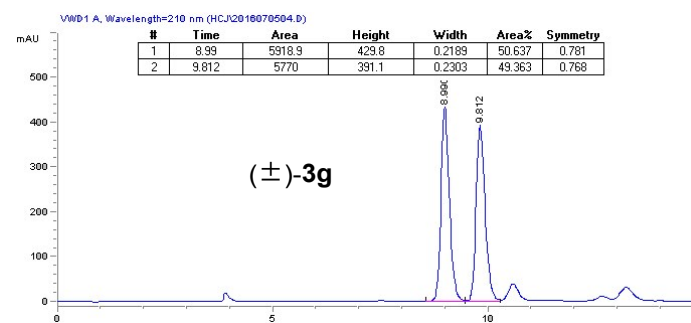
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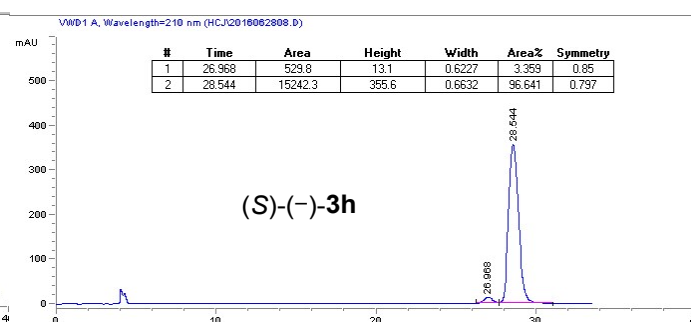
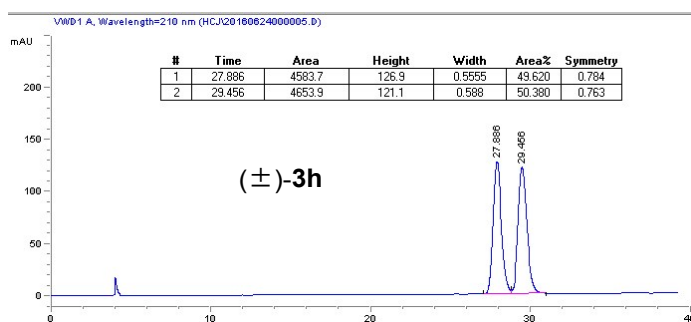
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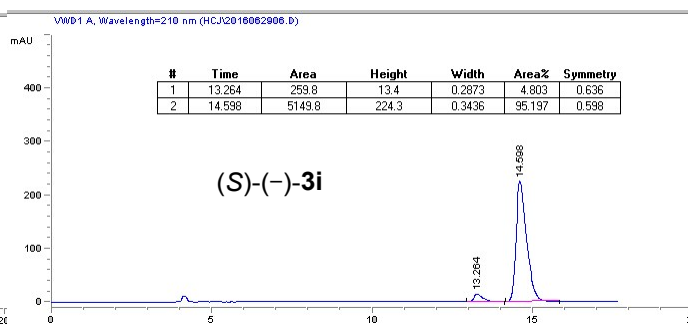
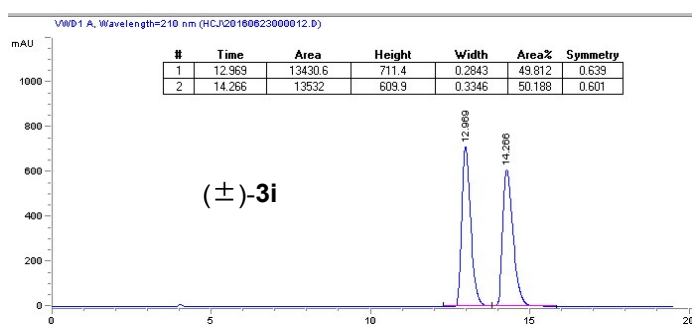
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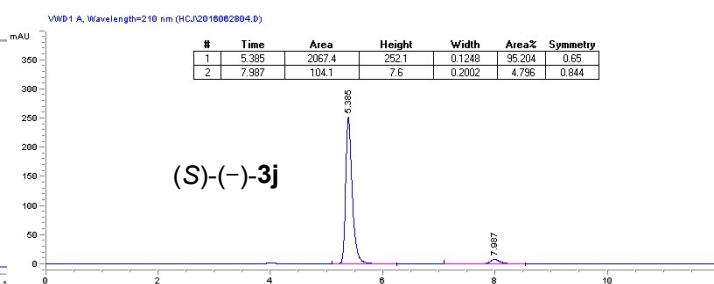
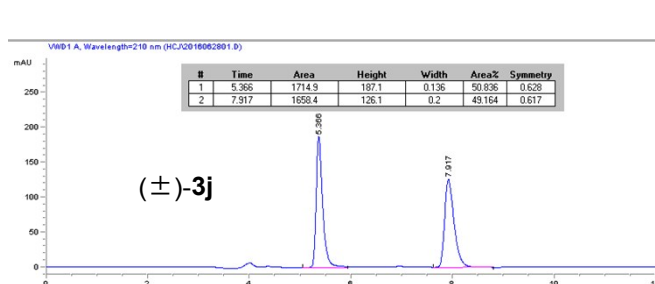
### (S)-methyl 3-(4-methoxyphenyl)-3-hydroxypropanoate 3h



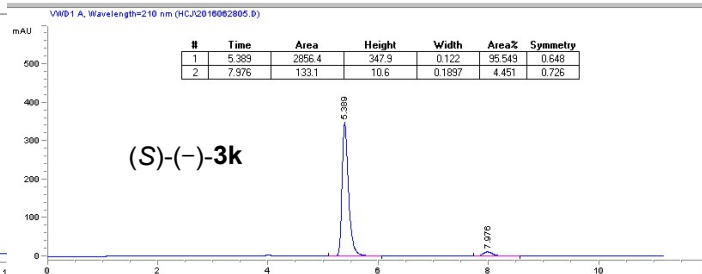
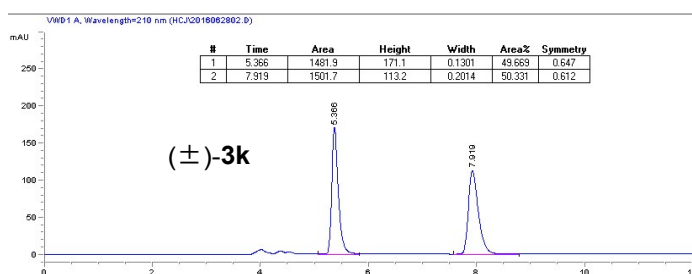
## (S)-methyl 3-hydroxy-3-(naphthalen-2-yl)propanoate 3i



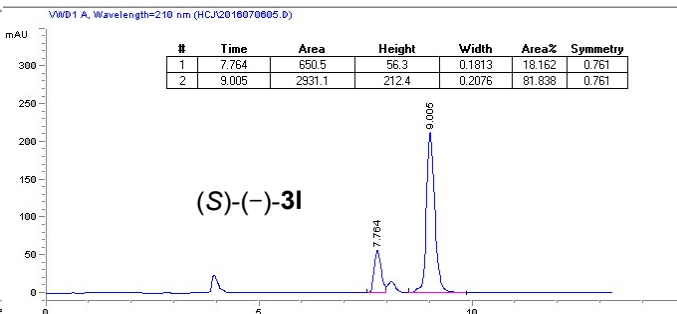
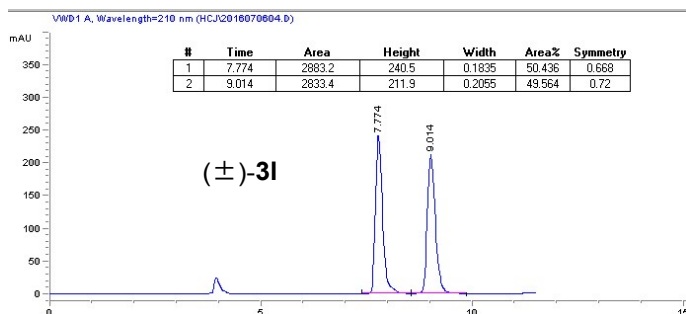
## (S)-methyl 3-(furan-2-yl)-3-hydroxypropanoate 3j



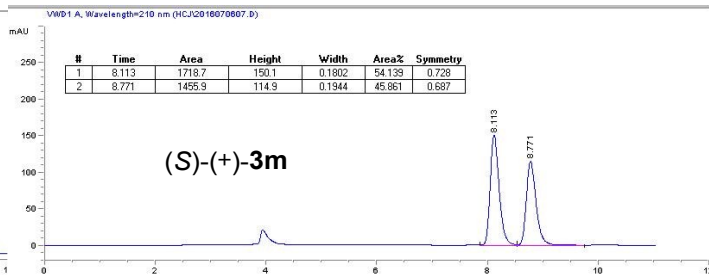
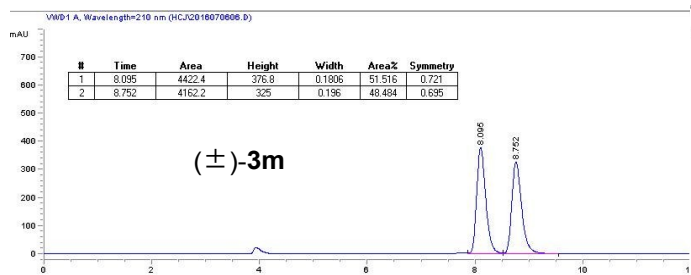
## (S)-methyl 3-hydroxy-3-(thiophen-2-yl)propanoate 3k



## (S)-methyl 3-hydroxy-4-methylpentanoate 3l



# (S)-methyl 3-hydroxybutanoate 3m

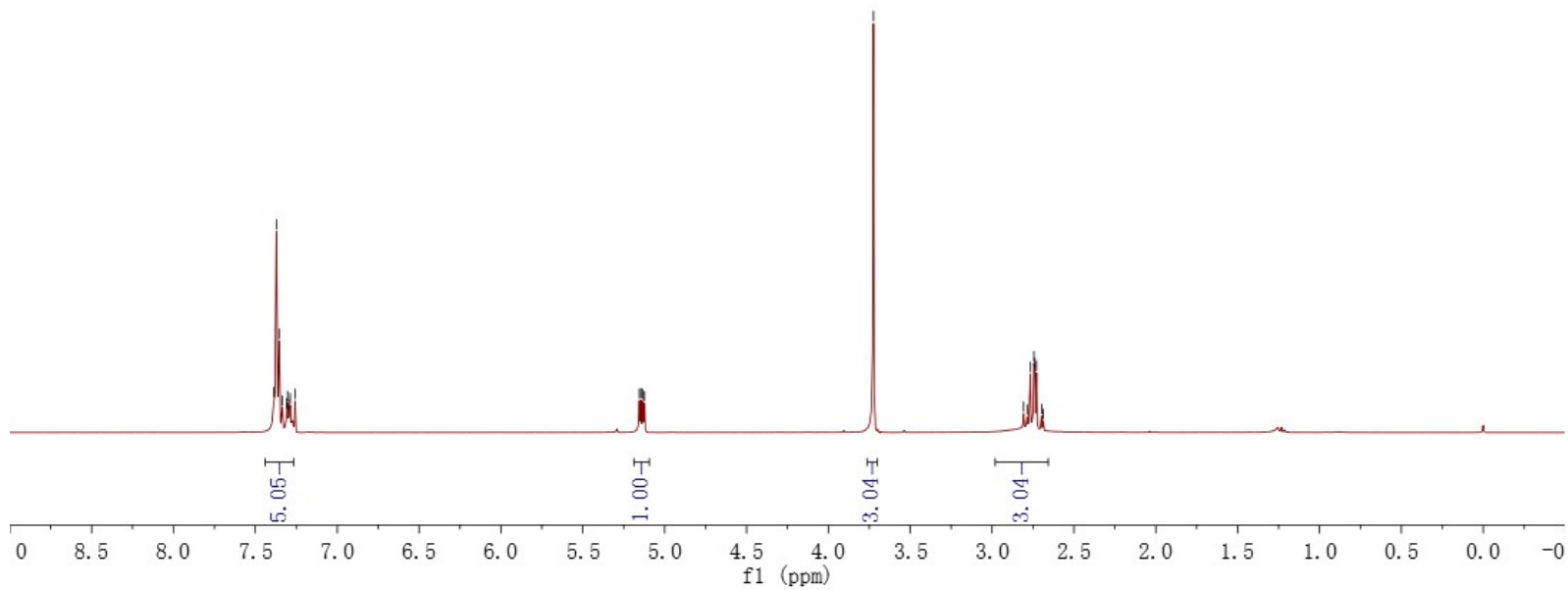
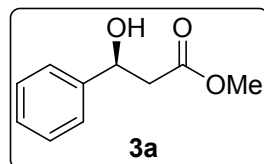


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7.2574

5.1549  
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5.1229

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HCJ-2387  
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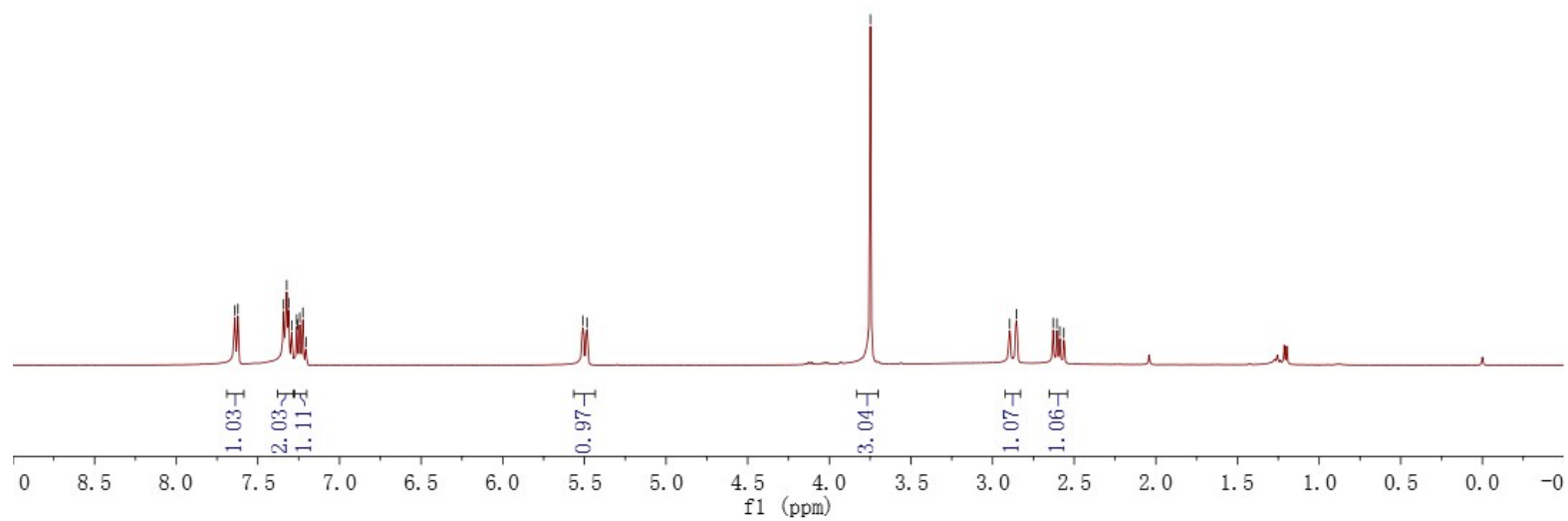
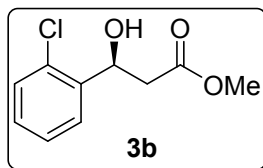
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5.5088  
5.4848

3.7484

2.8953  
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HCJ-2409  
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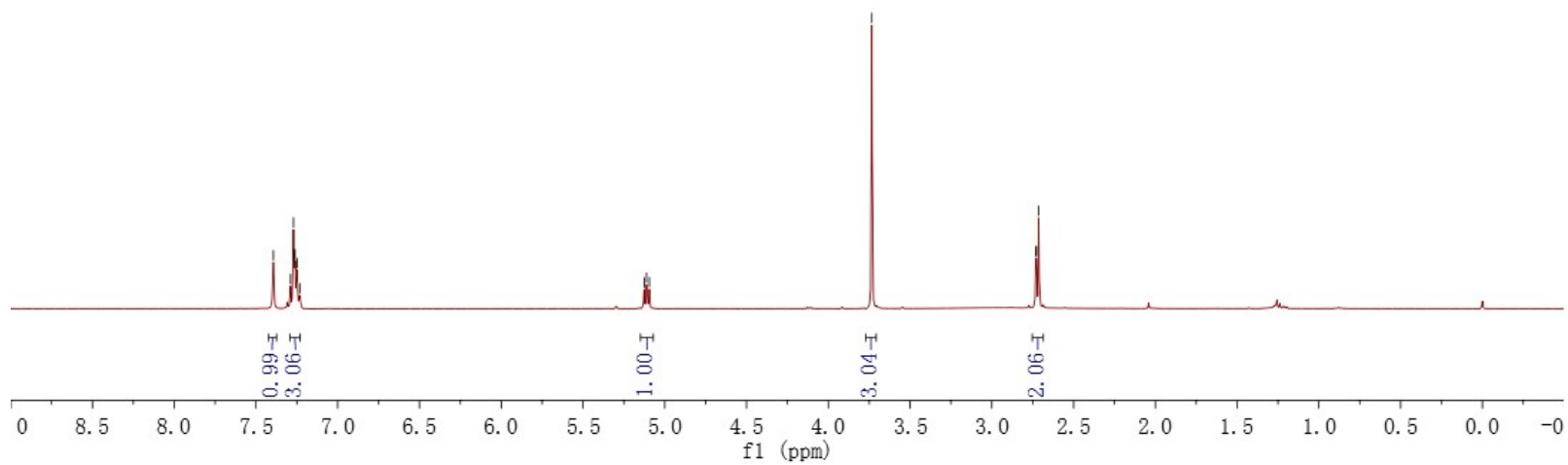
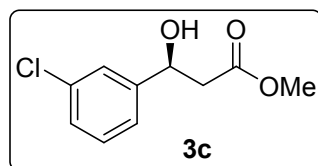
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7.2325

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3.7341

2.7313  
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HCJ-2388  
PROTON CDC13 {D:\NMR400\02T2} nmr 49





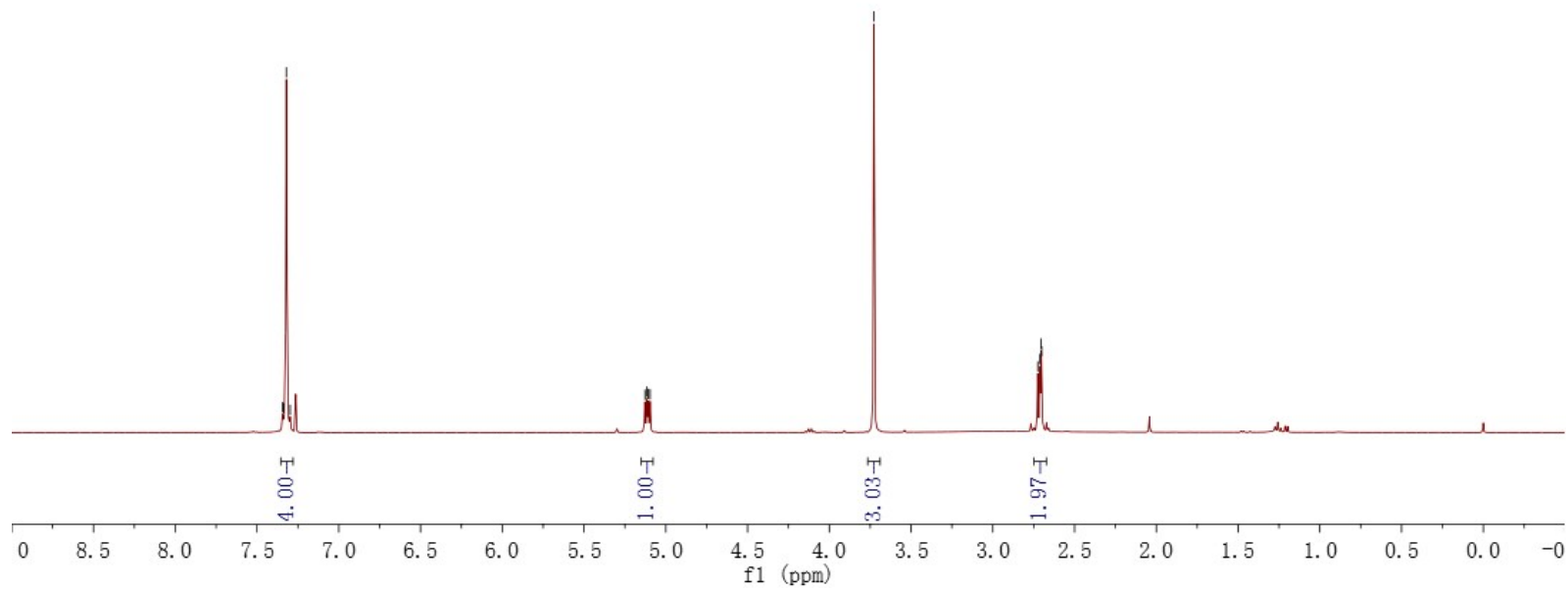
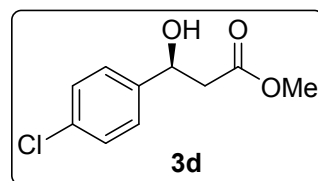
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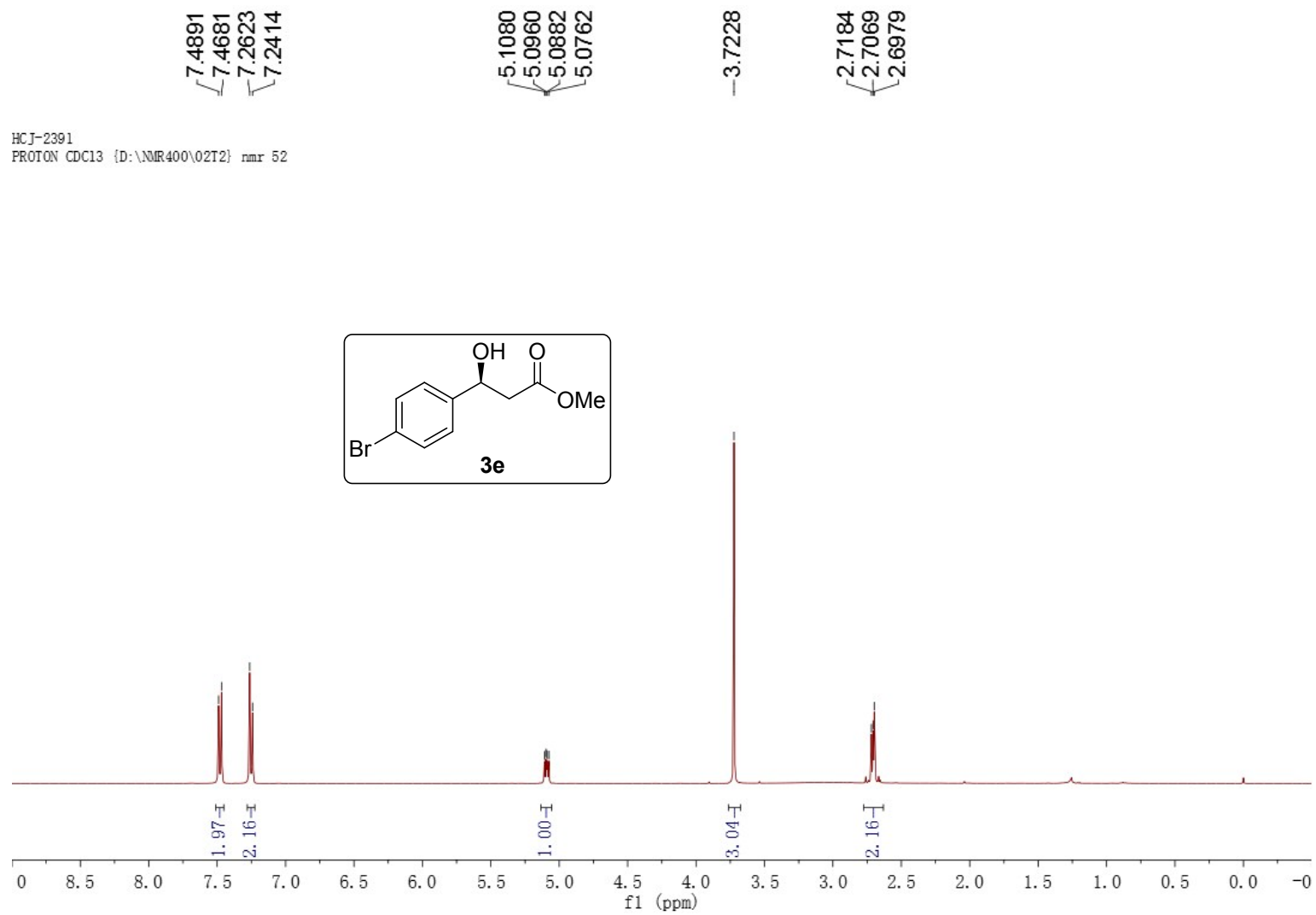
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HCJ-2411  
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HCJ-2391  
PROTON CDC13 {D:\NMR400\02T2} nmr 52



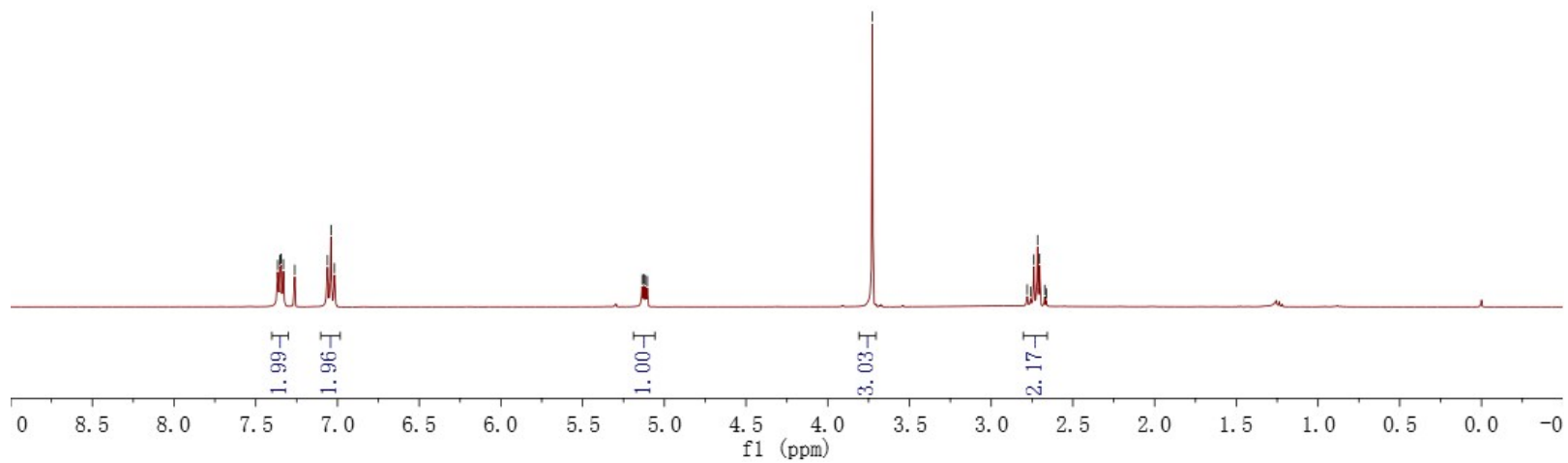
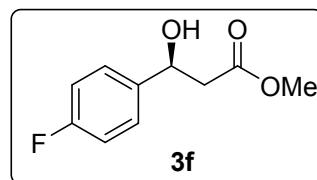
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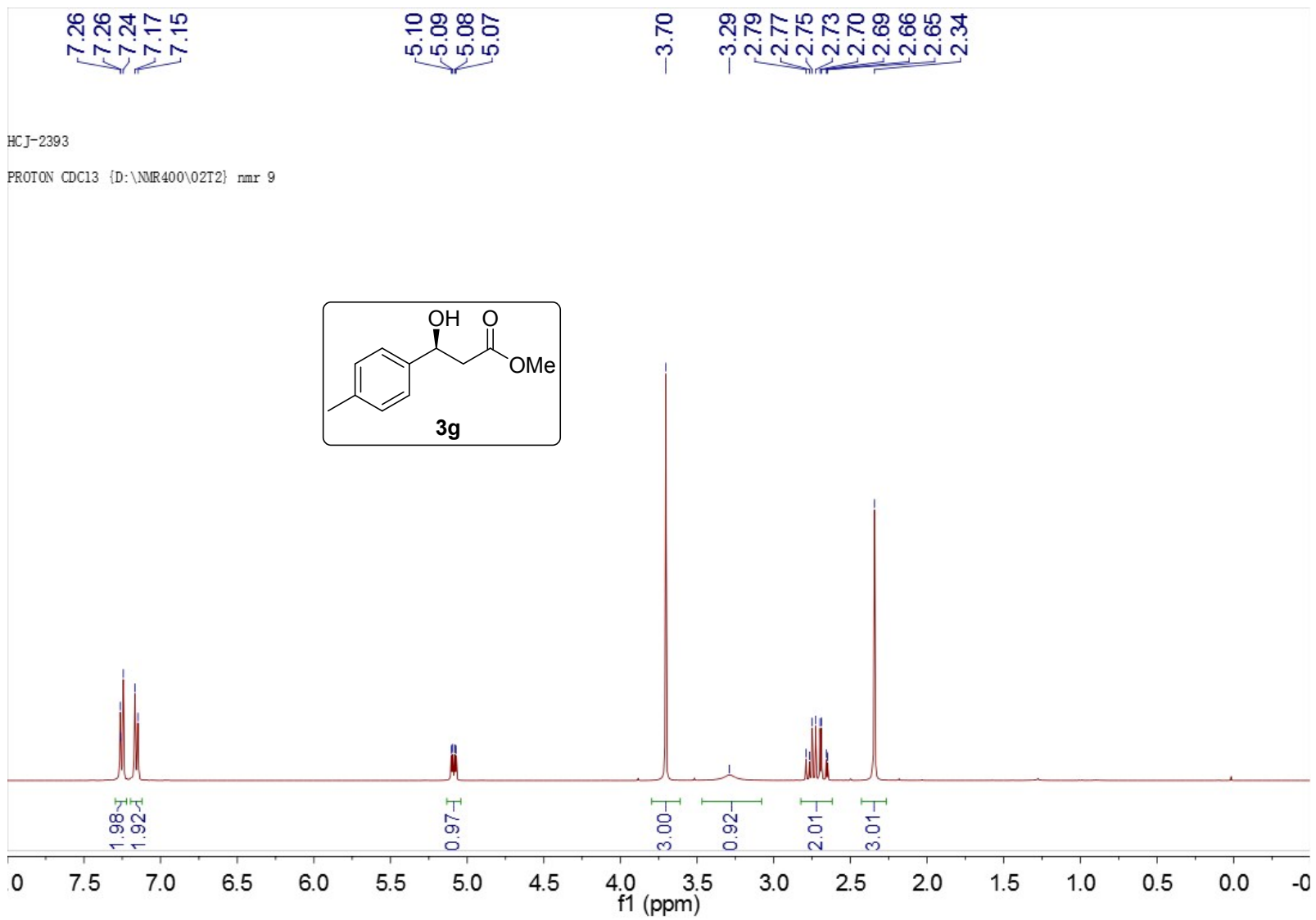
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—3.7269

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HCJ-2390  
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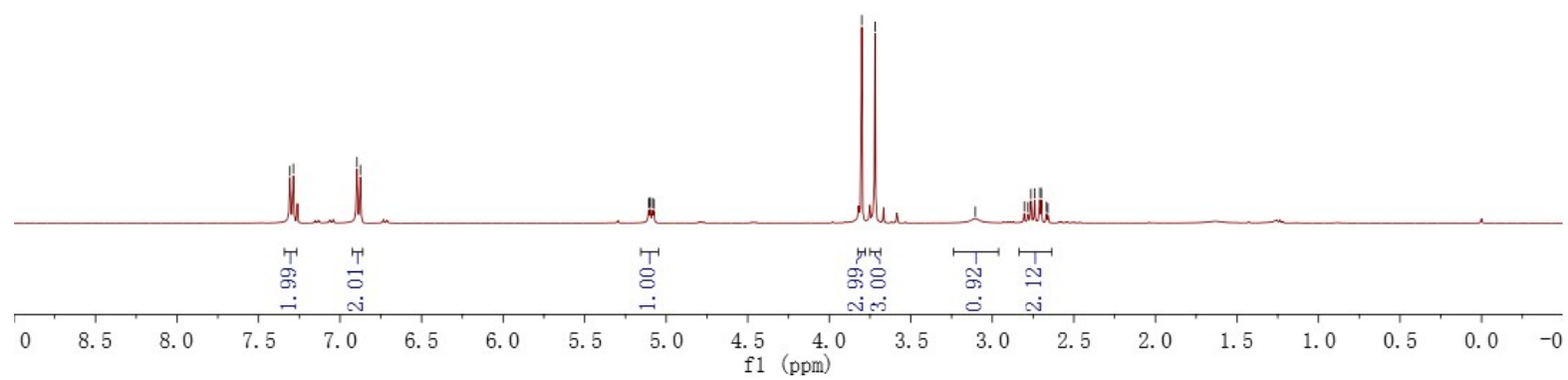
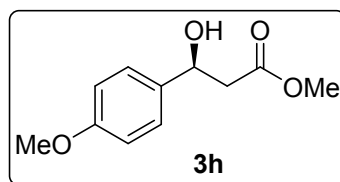


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3.1040  
2.8038  
2.7809  
2.7632  
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HCJ-2392  
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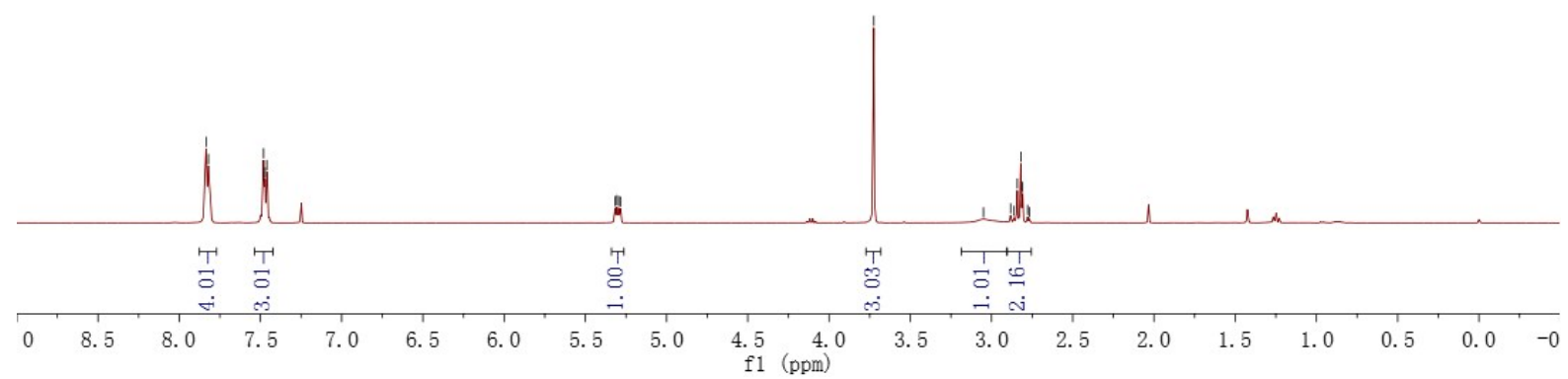
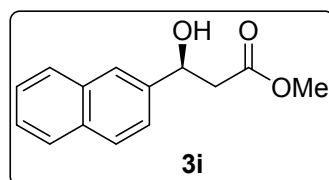


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2.8608  
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HCJ-2416  
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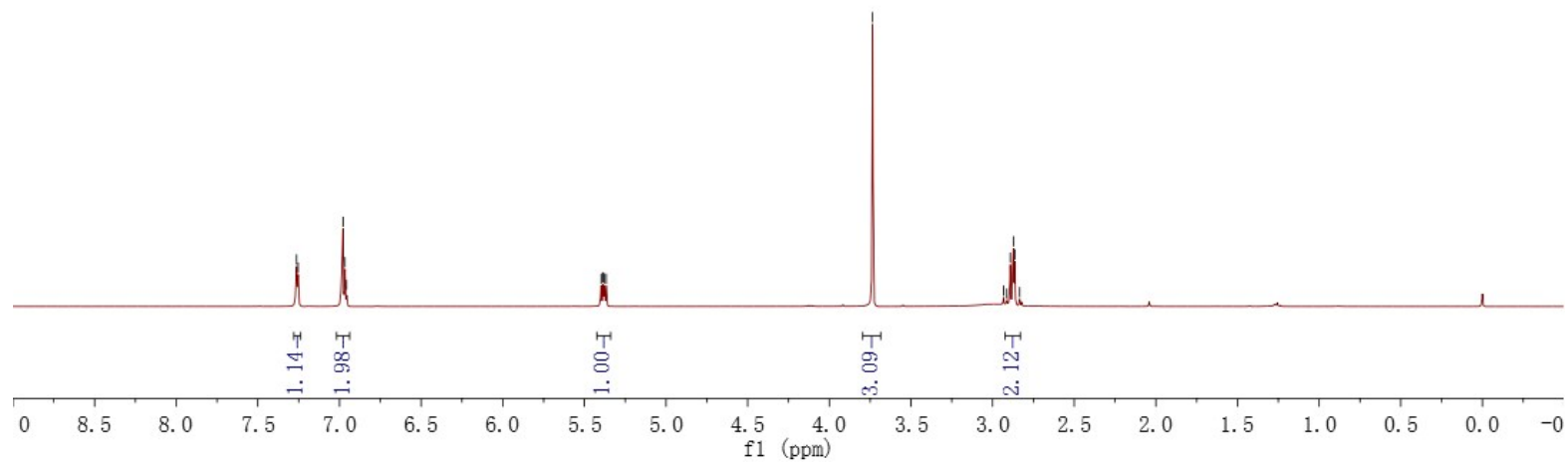
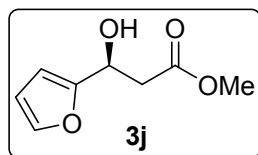


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5.3978  
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3.7350  
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HCJ-2417  
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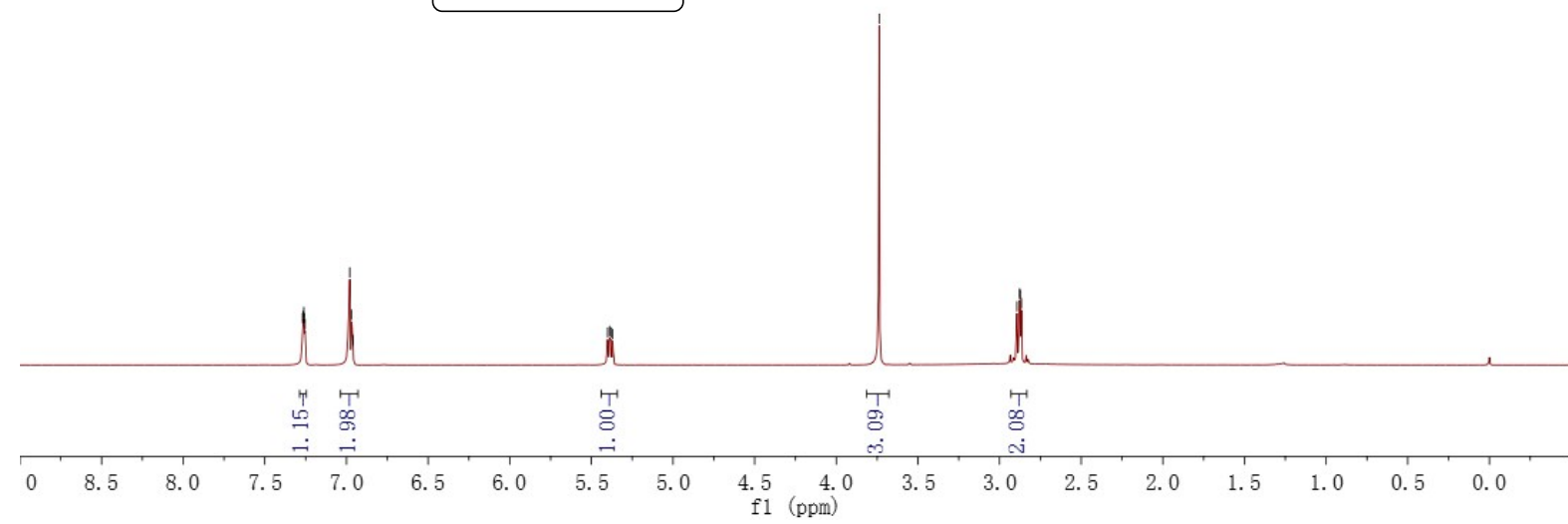
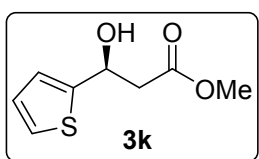
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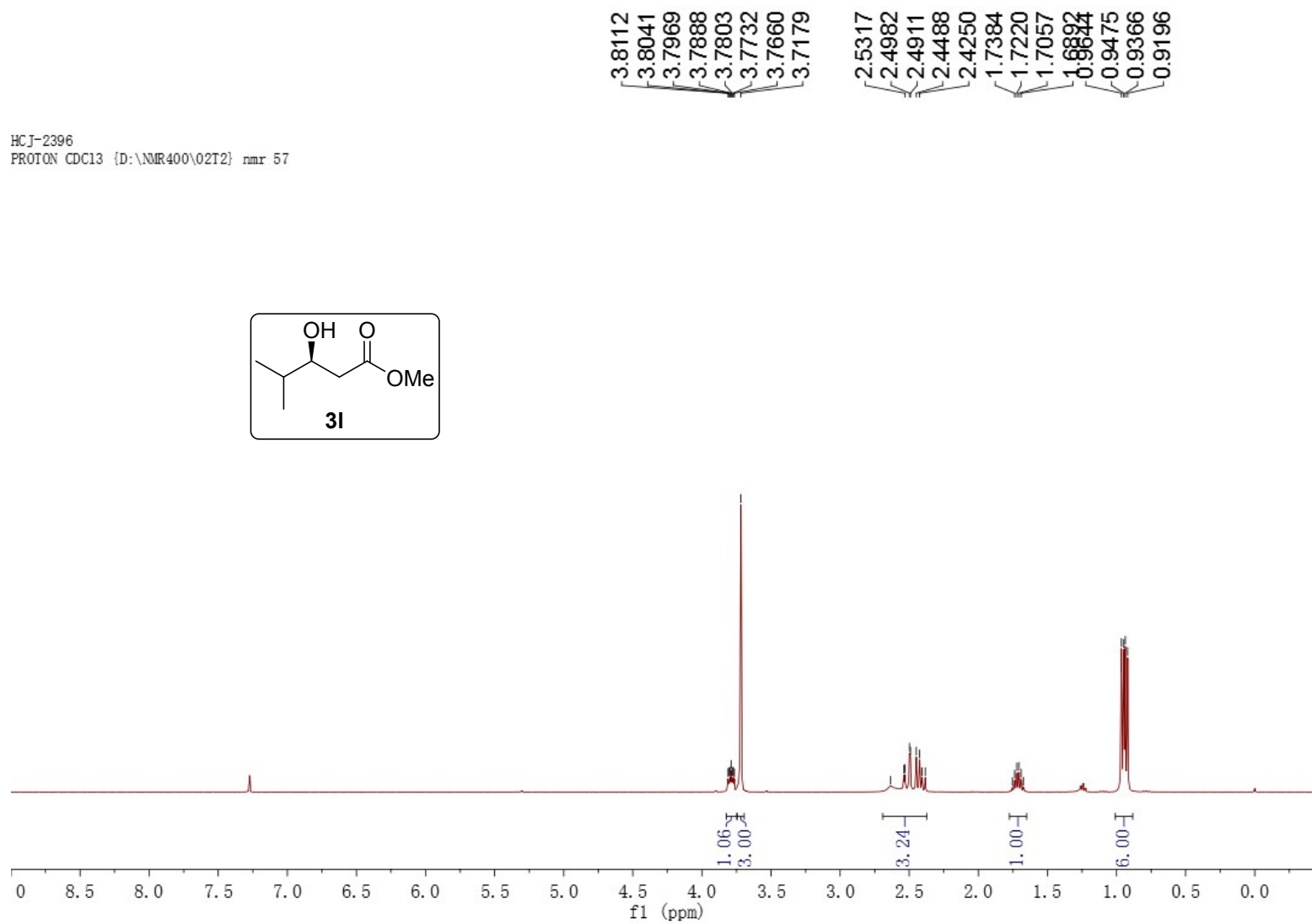
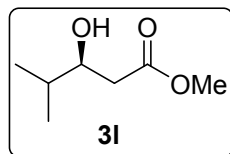
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HCJ-20170216

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4.19  
4.19  
4.18  
4.18  
4.17  
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-2.47  
-2.45  
-2.43  
2.40  
1.24  
1.23

