

Supporting Information

**Enantioselective Synthesis of Cyclic Quaternary α -Amino Acid
Derivatives by Chiral Phosphoric Acid Catalysis**

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Zhejiang University, Hangzhou 310027, China

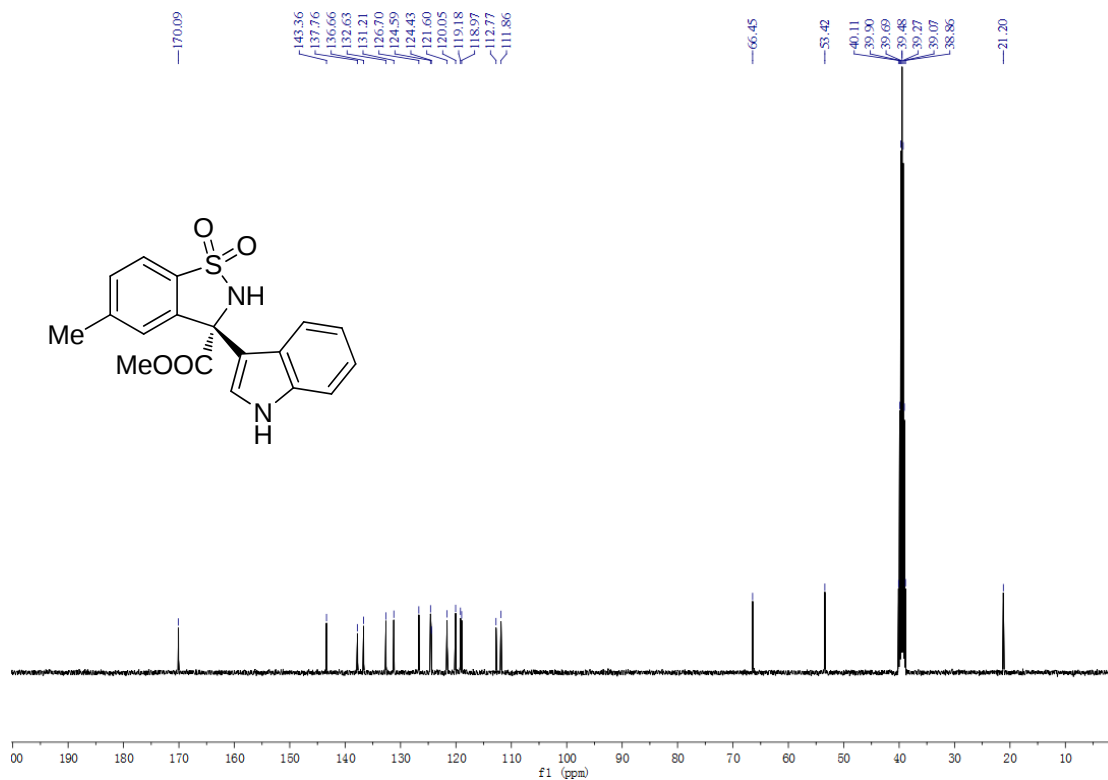
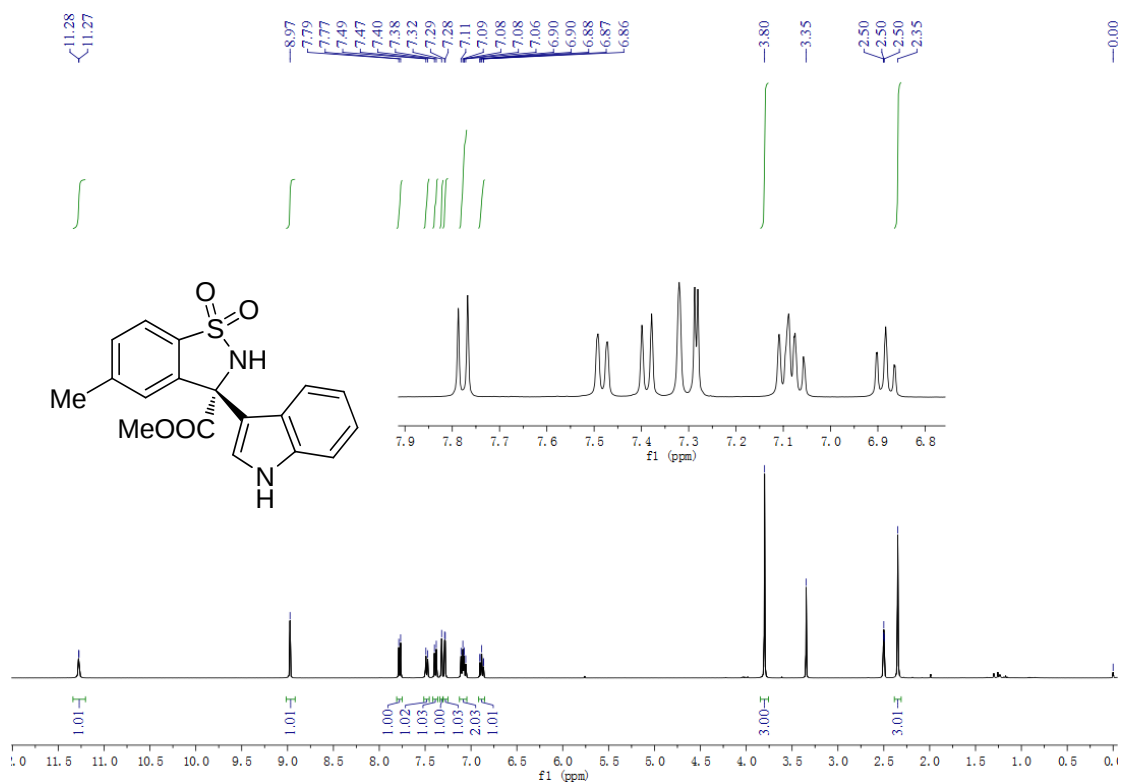
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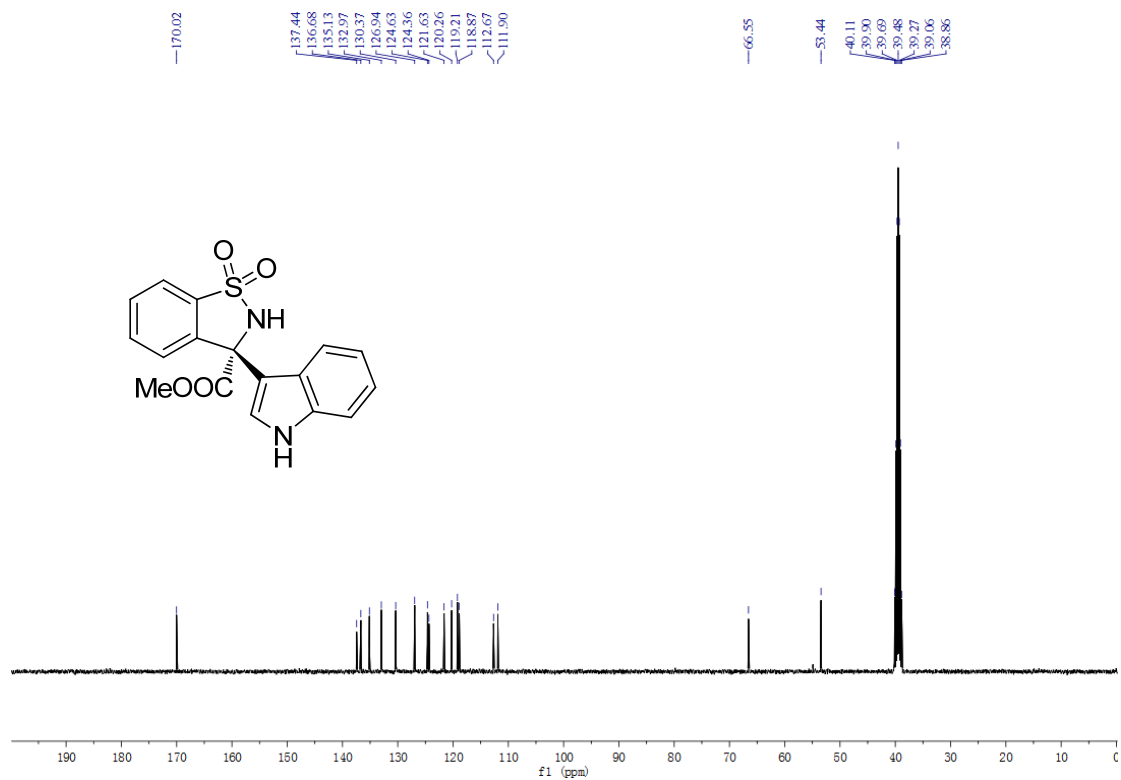
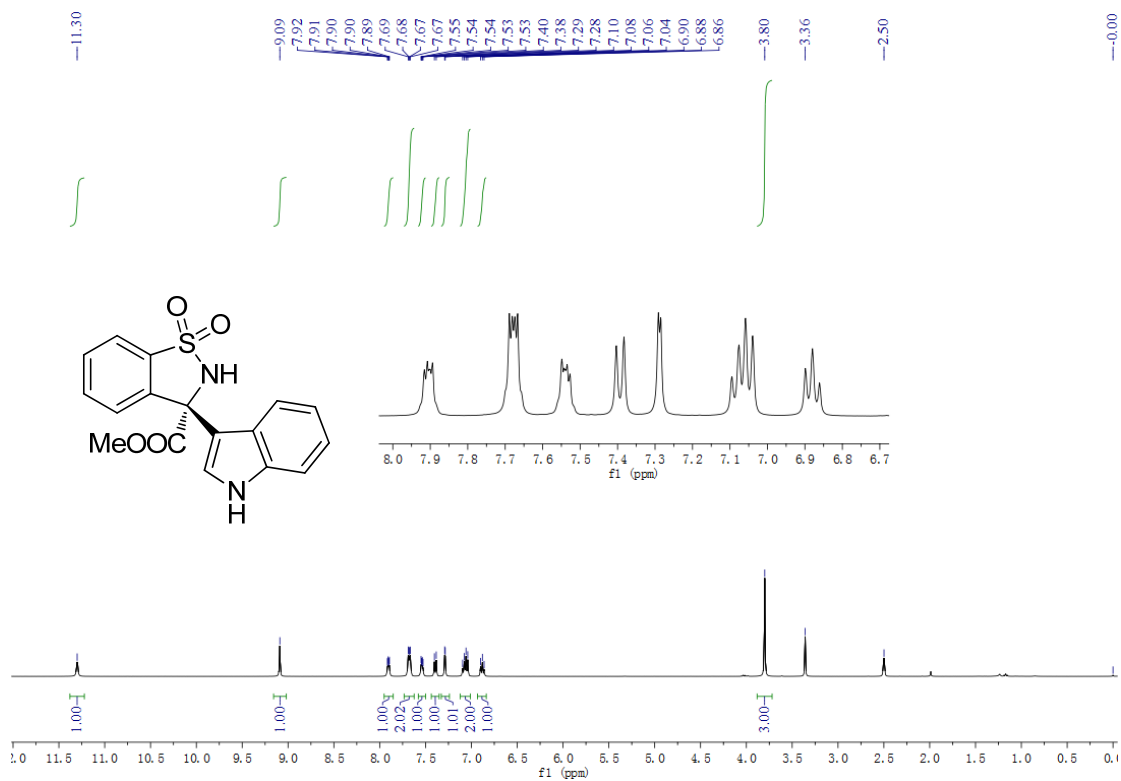
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Copies of ^1H NMR and ^{13}C NMR spectra

(S)-3-methoxycarbonyl-3-(3-indolyl)-5-methyl-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3a**)



(S)-3-methoxycarbonyl-3-(3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3b**)

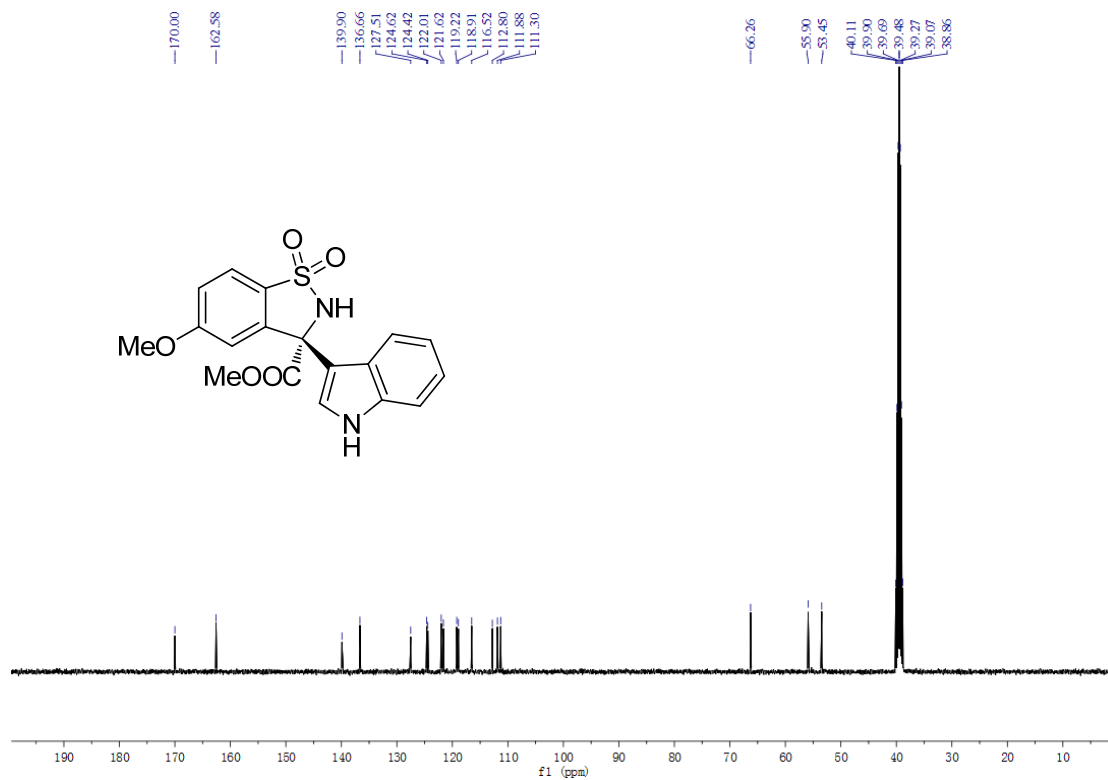


Chemical structure of (S)-1-methoxy-2-(1-methyl-1H-indol-3-yl)-2-sulfamoylbenzene is shown. The ¹H NMR spectrum (CDCl₃) displays peaks corresponding to the structure, with integration values indicated below the peaks.

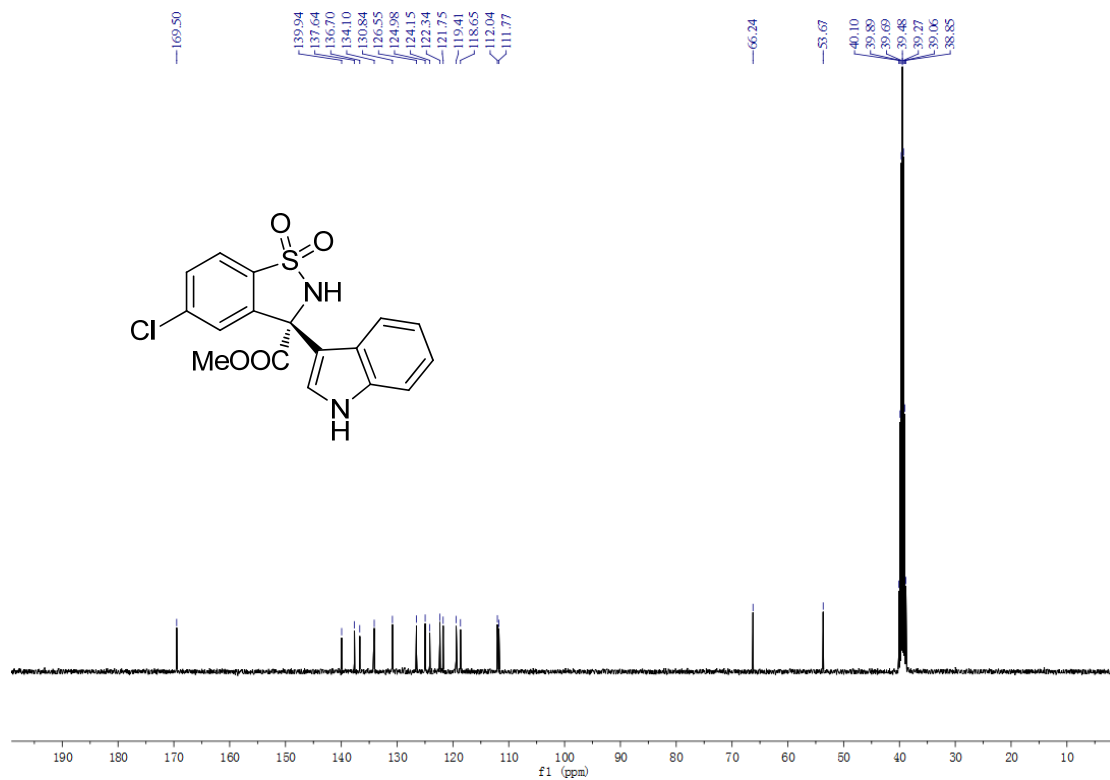
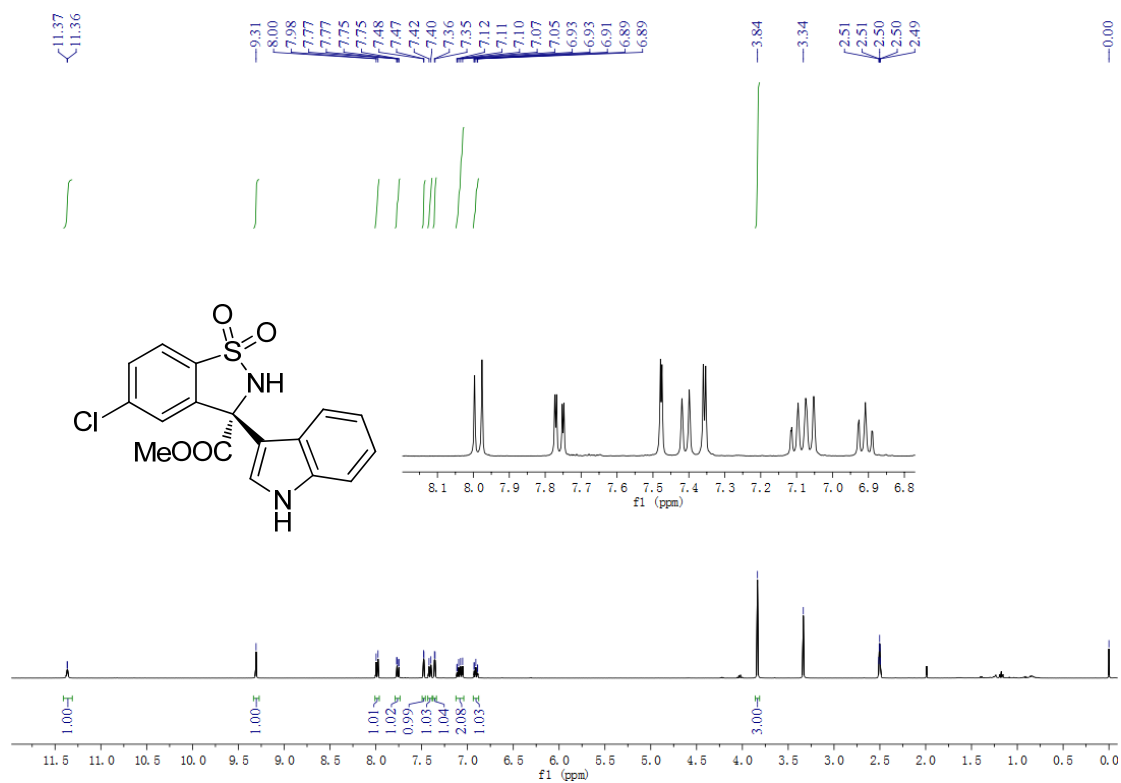
Chemical structure: COc1ccc(cc1C(=O)OC[C@H]2C=CNc3ccccc23)S(=O)(=O)N

¹H NMR spectrum (CDCl₃) showing peaks and integration values:

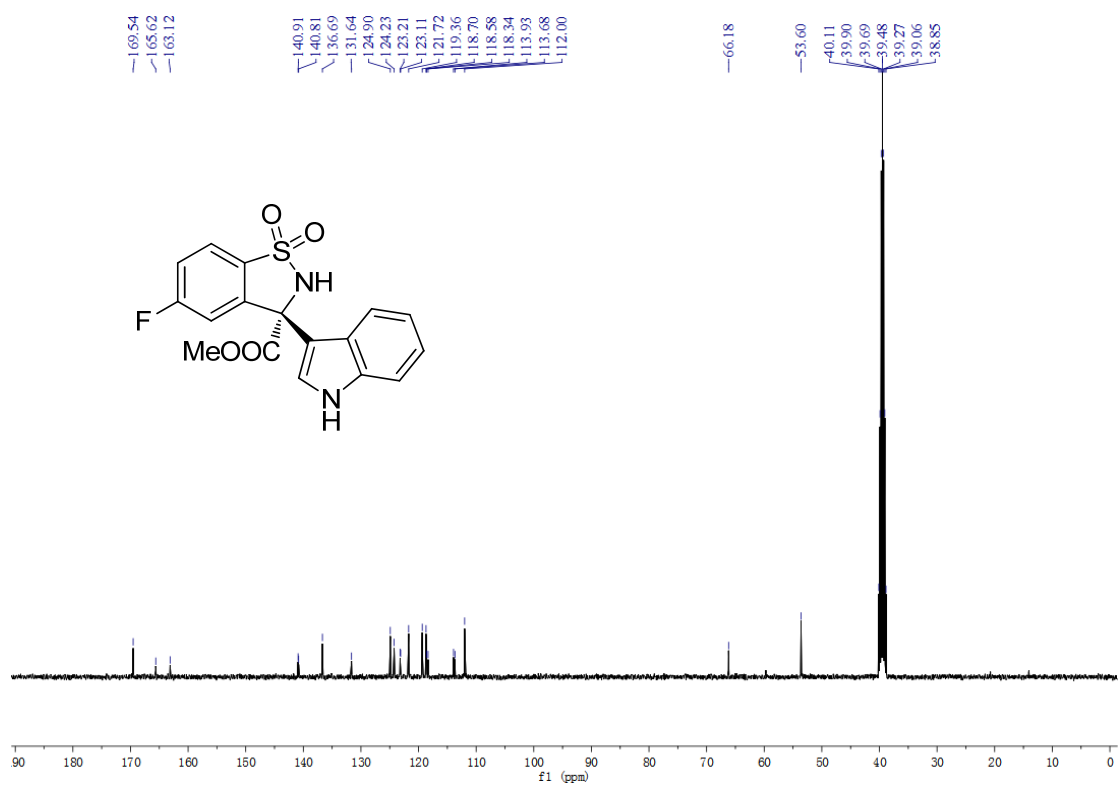
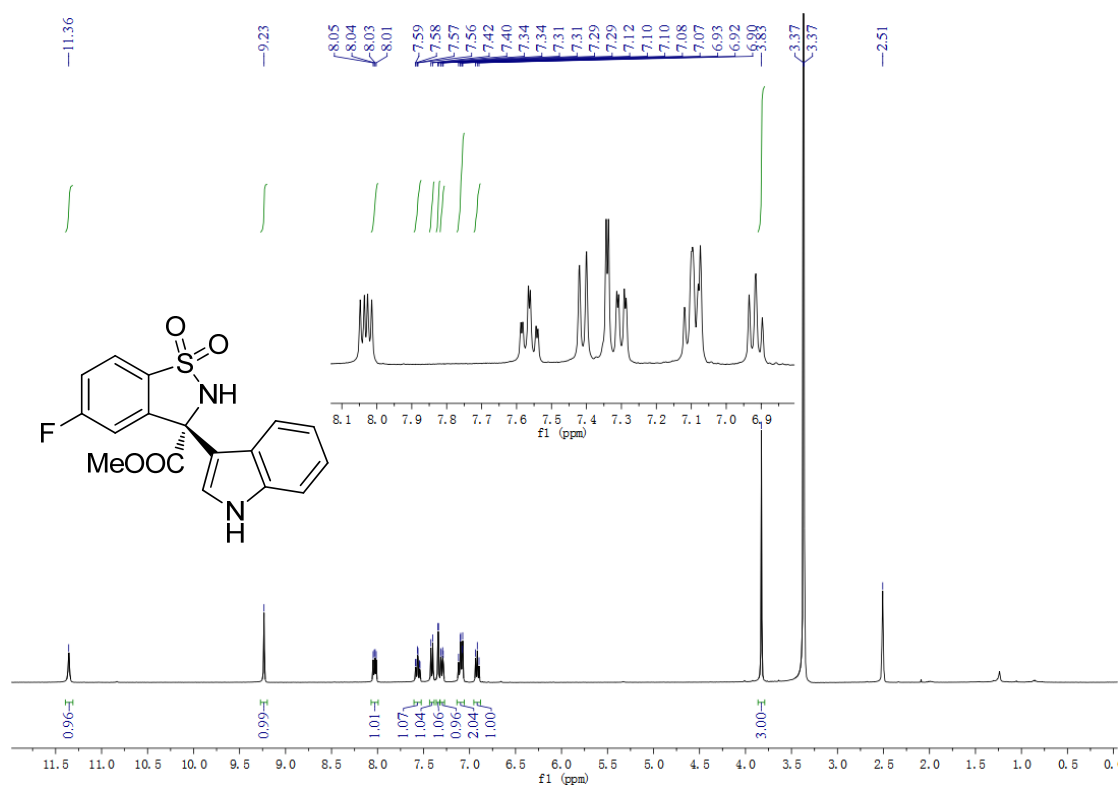
- 8.25 ppm (1.00)
- 7.78 ppm (1.02)
- 7.75 ppm (1.01)
- 7.39 ppm (1.01)
- 7.31 ppm (4.13)
- 7.26 ppm (1.00)
- 7.19 ppm (1.01)
- 7.18 ppm (1.01)
- 7.17 ppm (1.00)
- 7.15 ppm (1.00)
- 7.09 ppm (0.95)
- 6.92 ppm (0.95)
- 6.86 ppm (0.95)
- 3.88 ppm (3.00)
- 3.84 ppm (3.05)
- 1.59 ppm (0.95)
- 0.00 ppm (0.95)



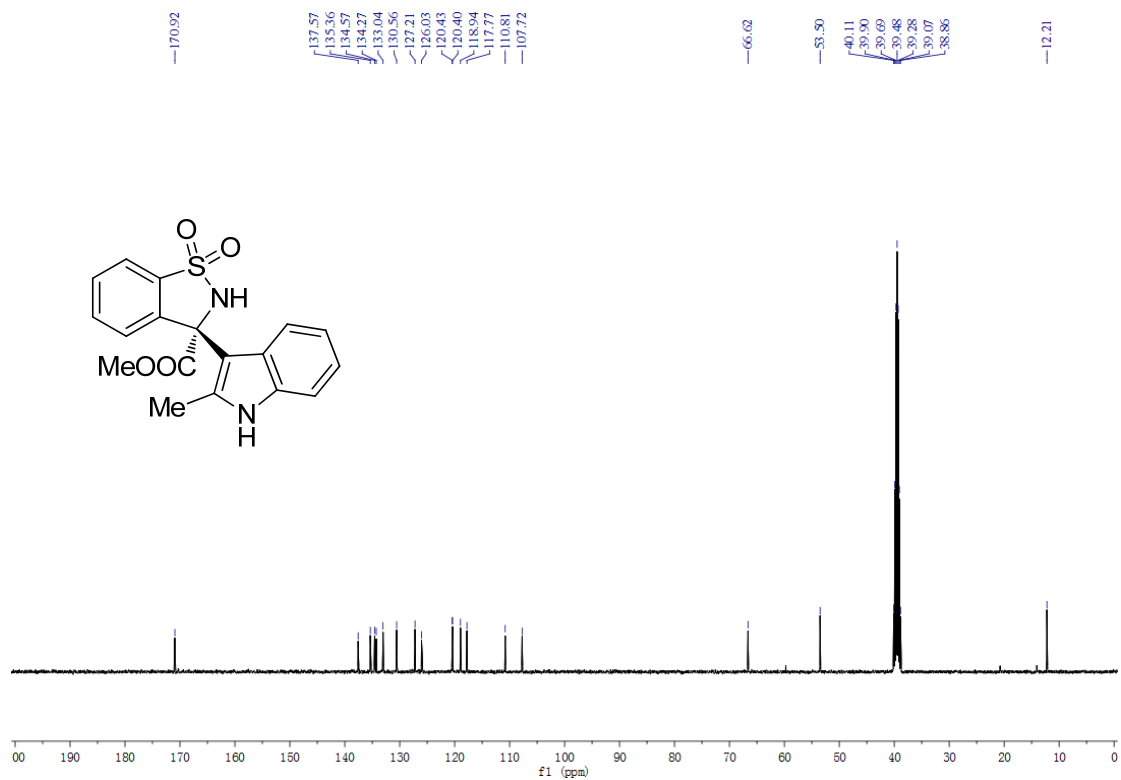
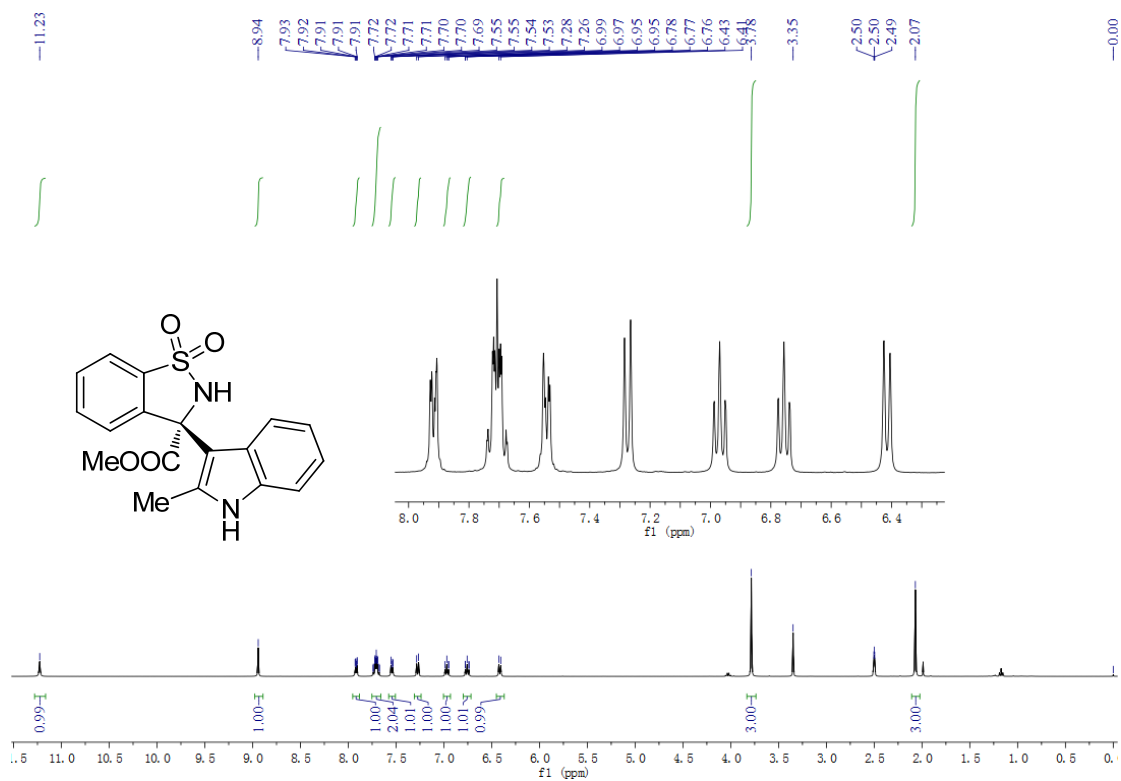
(S)-3-methoxycarbonyl-3-(3-indolyl)-5-chloro-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3d**)



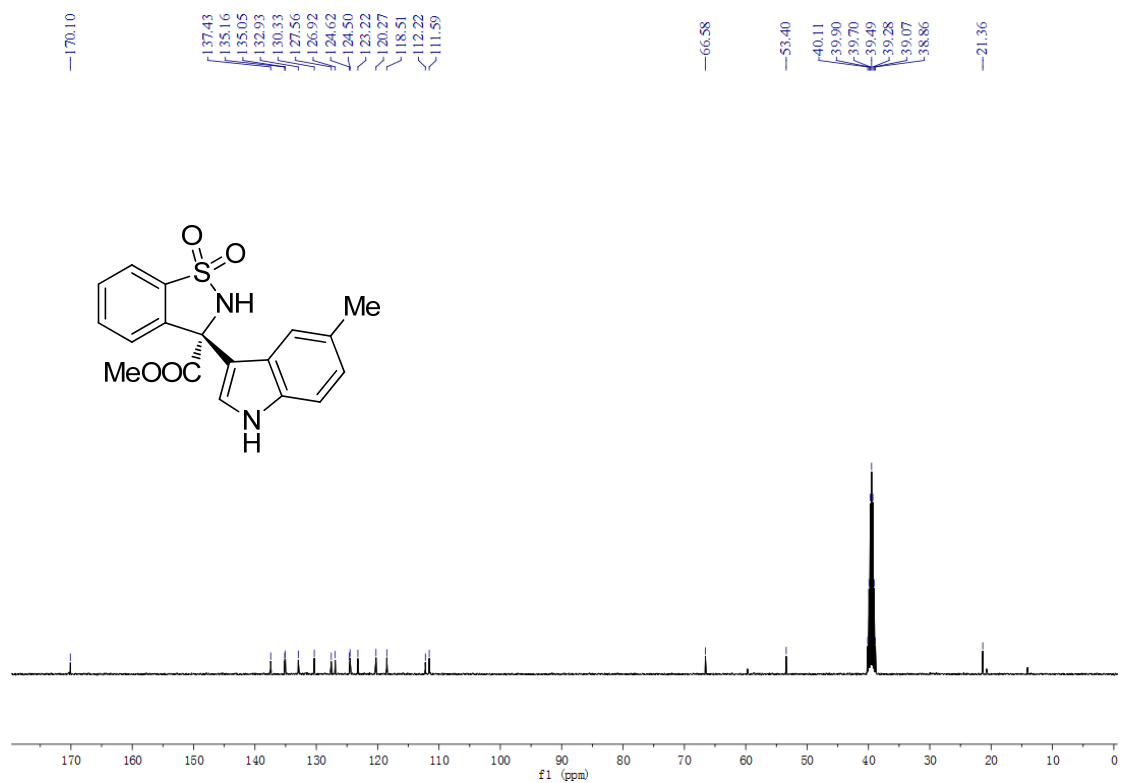
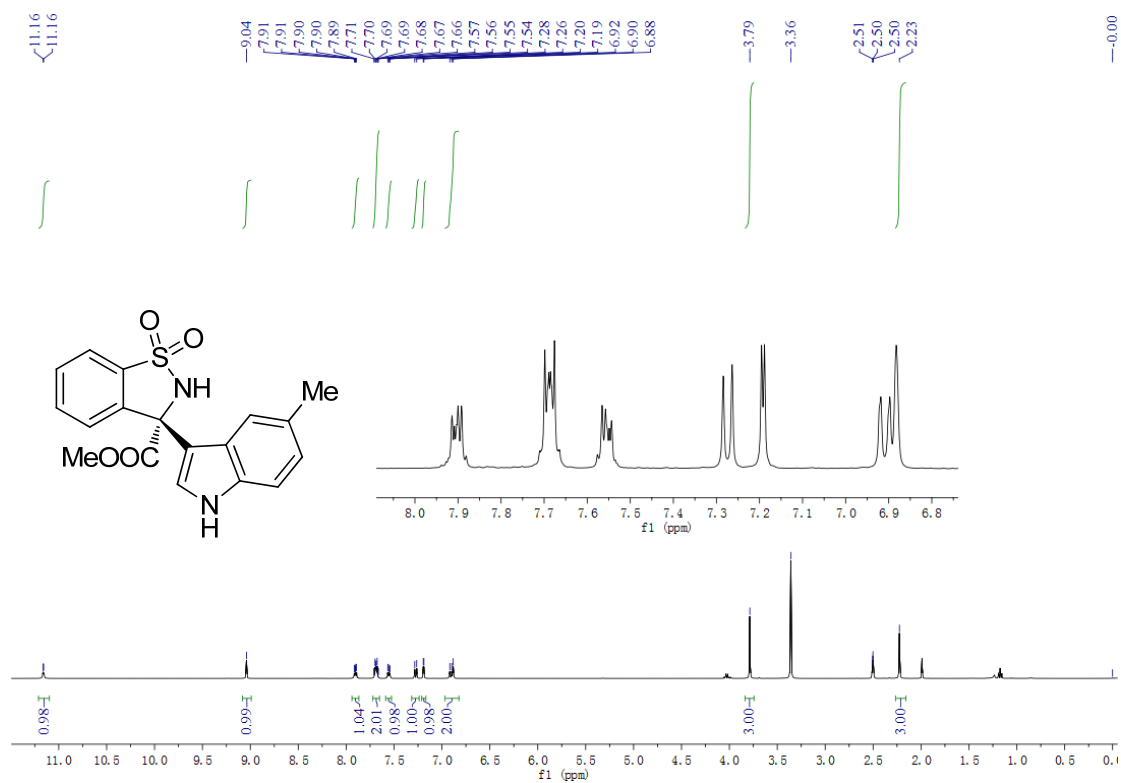
(S)-3-methoxycarbonyl-3-(3-indolyl)-5-fluoro-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3e**)



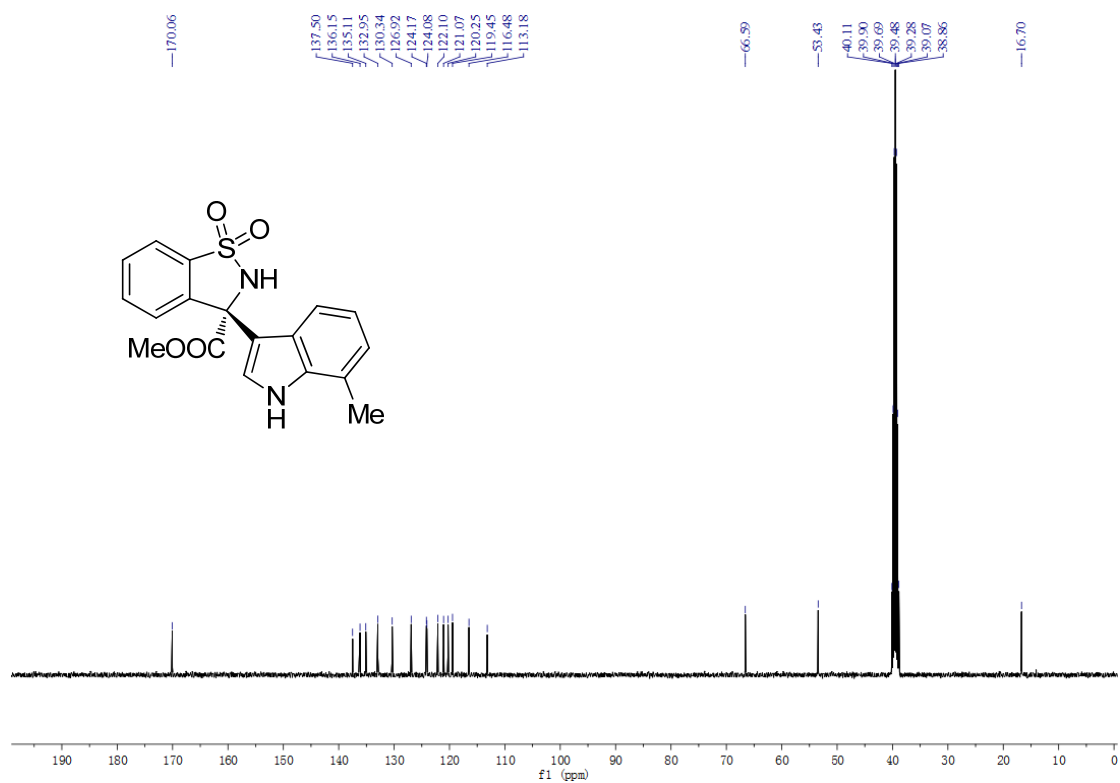
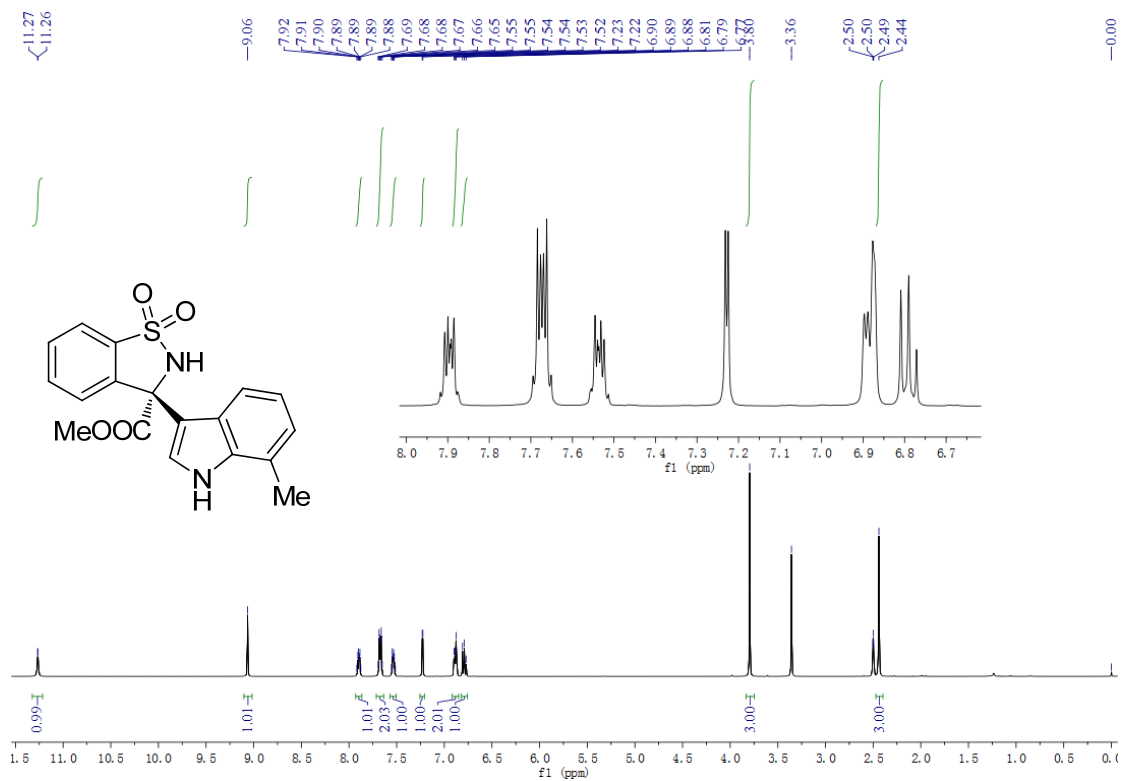
(S)-3-methoxycarbonyl-3-(2-methyl-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3f**)



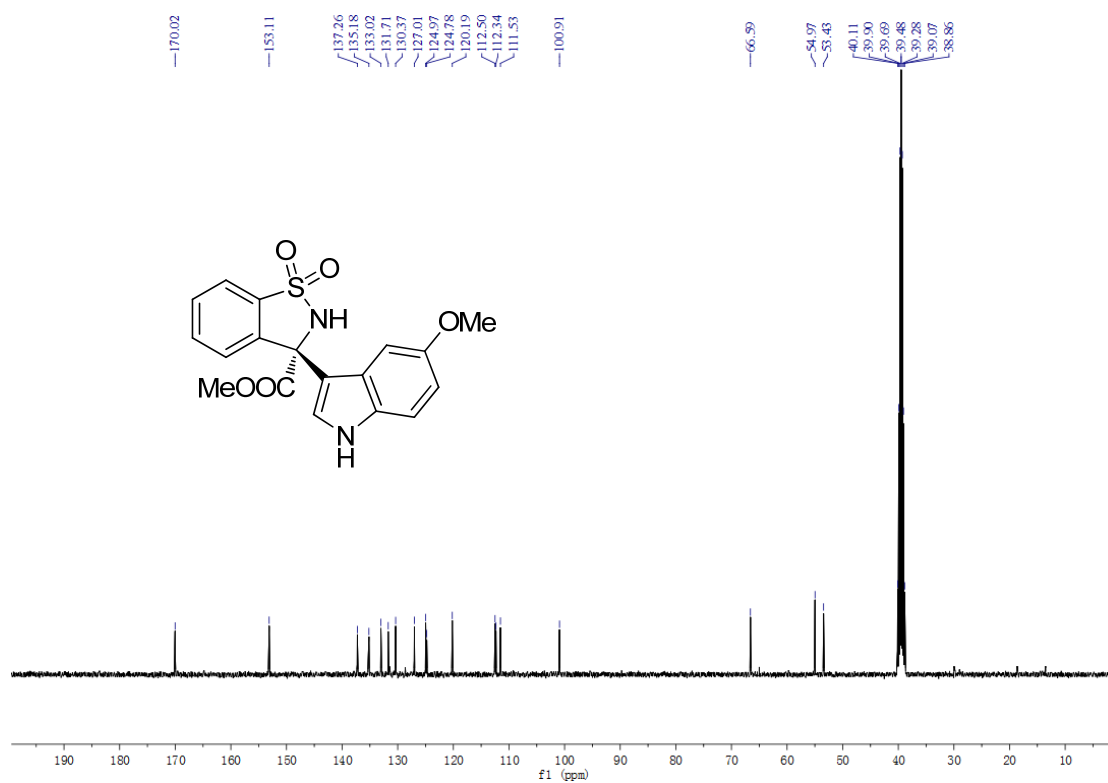
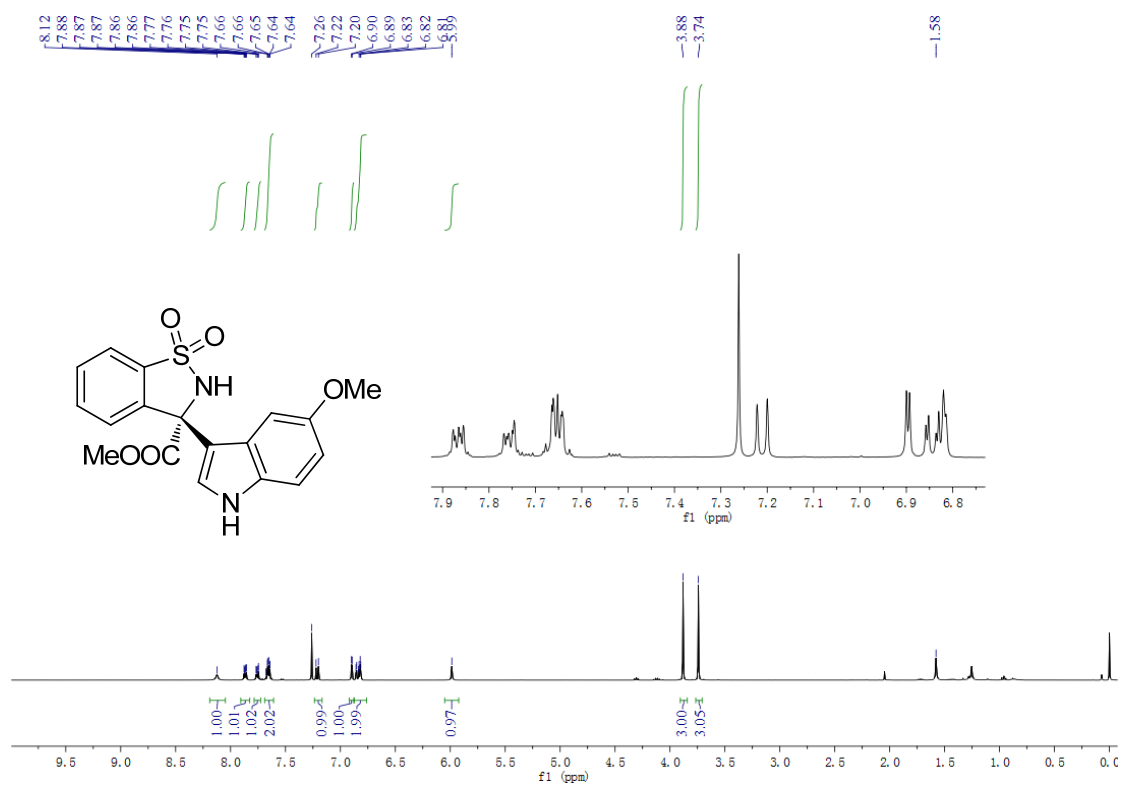
(S)-3-methoxycarbonyl-3-(5-methyl-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3g**)



(S)-3-methoxycarbonyl-3-(7-methyl-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3h**)



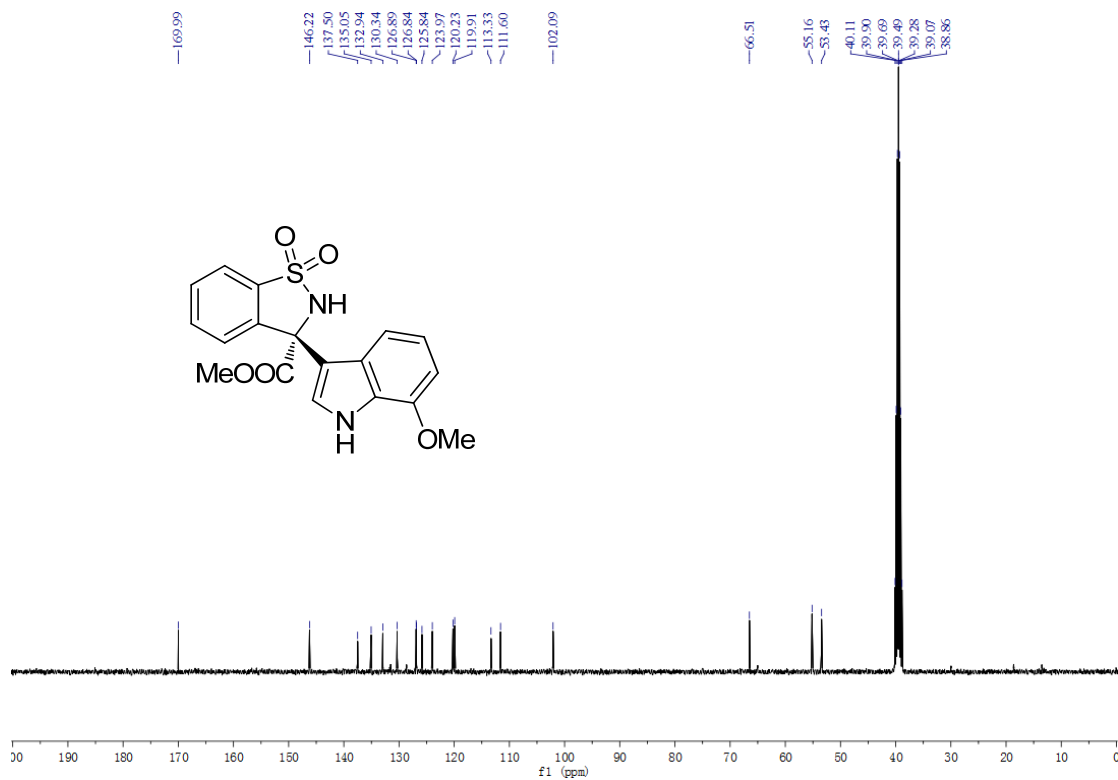
(S)-3-methoxycarbonyl-3-(5-methoxy-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3i**)



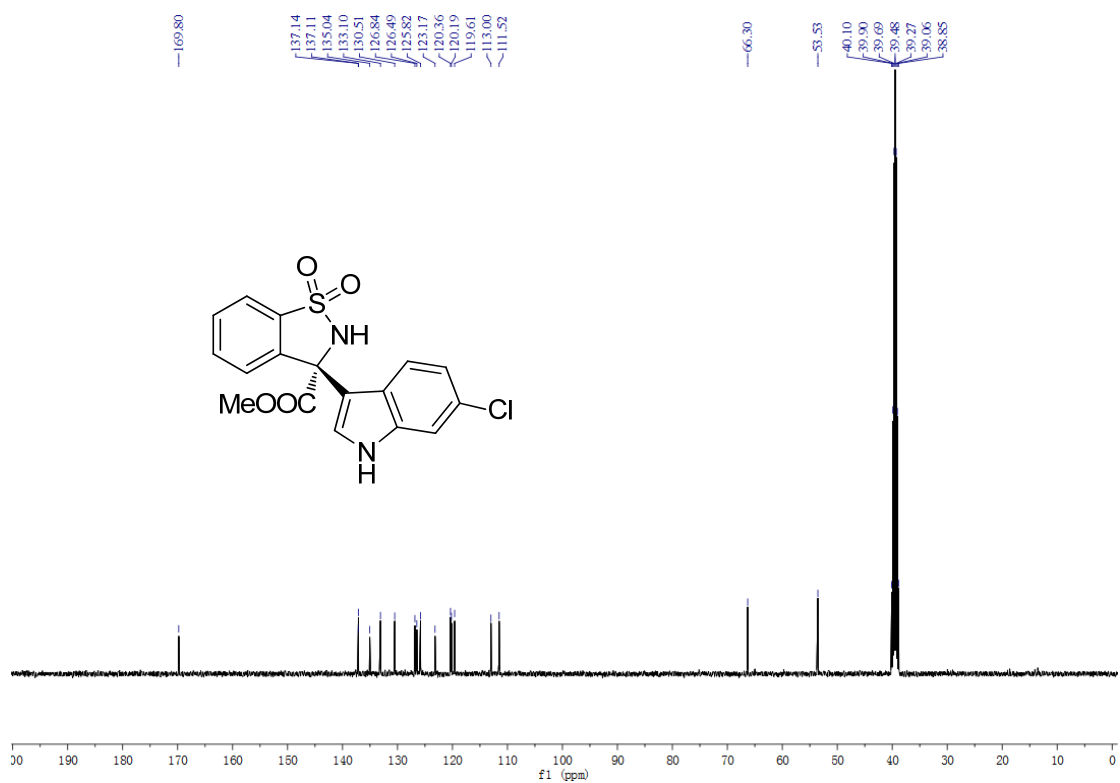
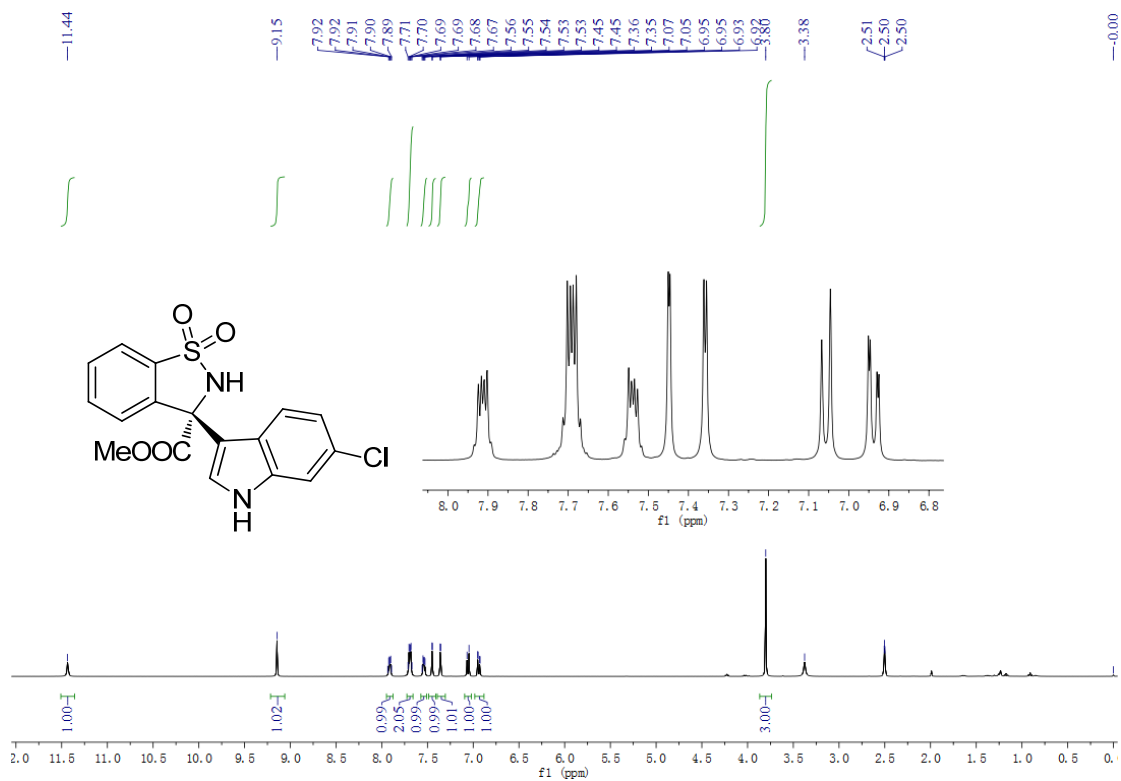
COc1ccc2c(c1)c(c[nH]2)[C@H](C(=O)OC)C3Cc1ccccc1S3(=O)=O

¹H NMR spectrum (CDCl₃) of (S)-2-methoxy-3-((methanesulfonyl)amino)indole. The spectrum shows peaks in the aromatic region (6.6-7.9 ppm) and a methoxy singlet (3.9 ppm). Integration values are provided below the peaks.

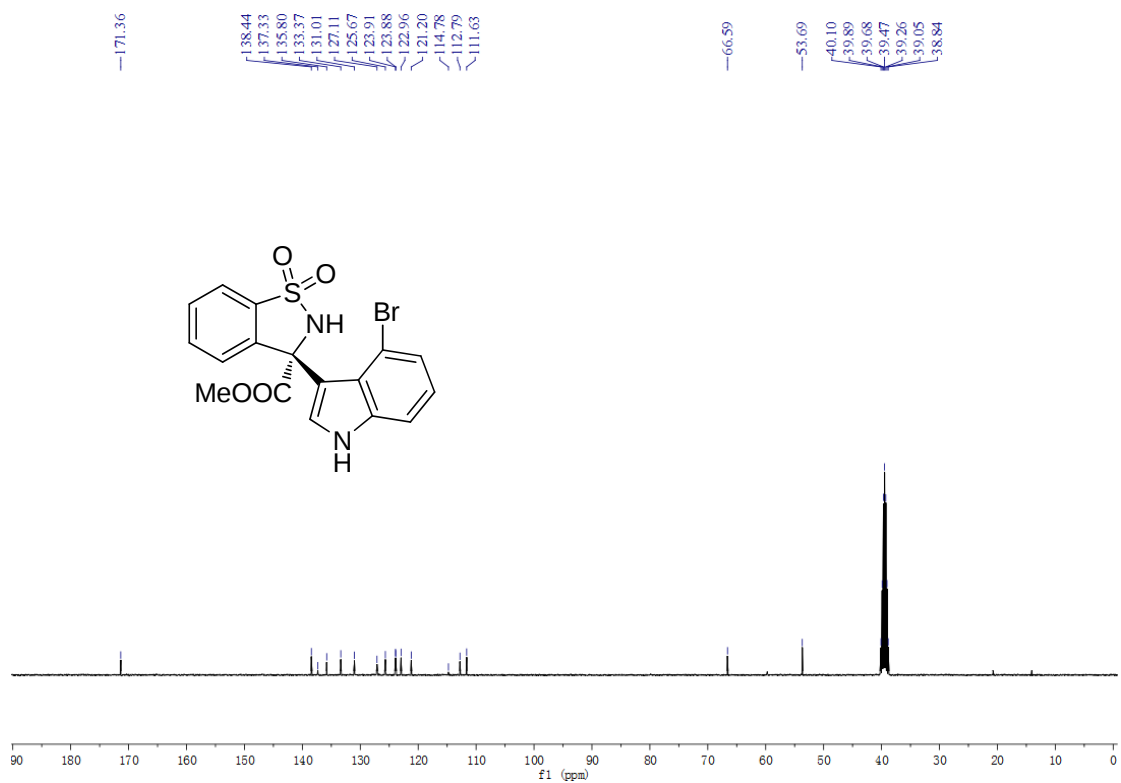
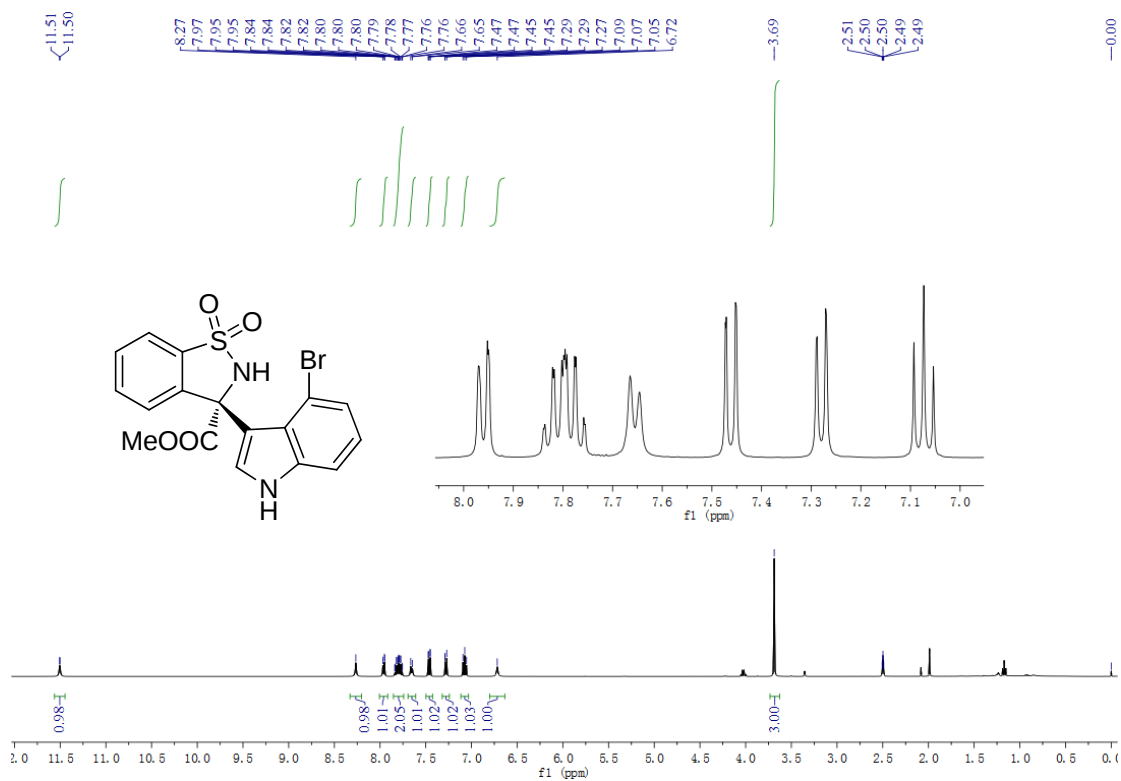
Chemical Shift (ppm)	Integration
7.90	0.94H
7.82	0.98H
7.78	0.98H
7.72	2.00H
7.65	2.02H
7.62	0.94H
7.58	1.00H
7.52	0.92H
3.93	3.00H
3.87	3.00H



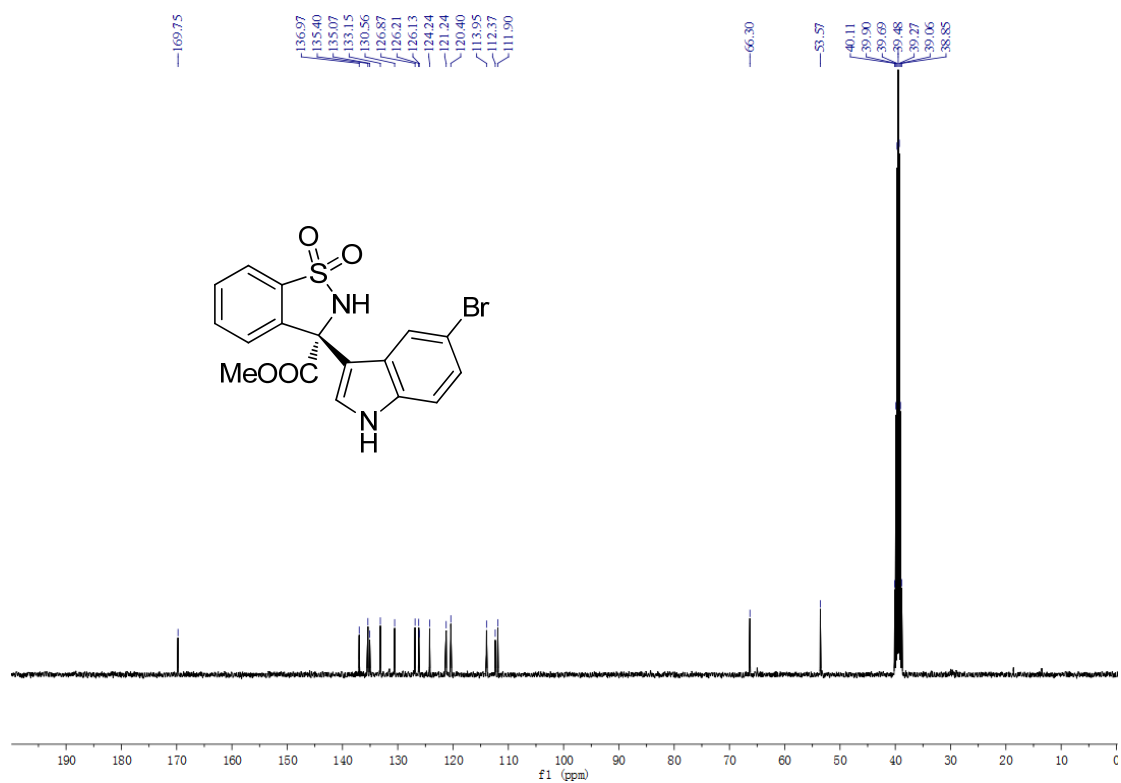
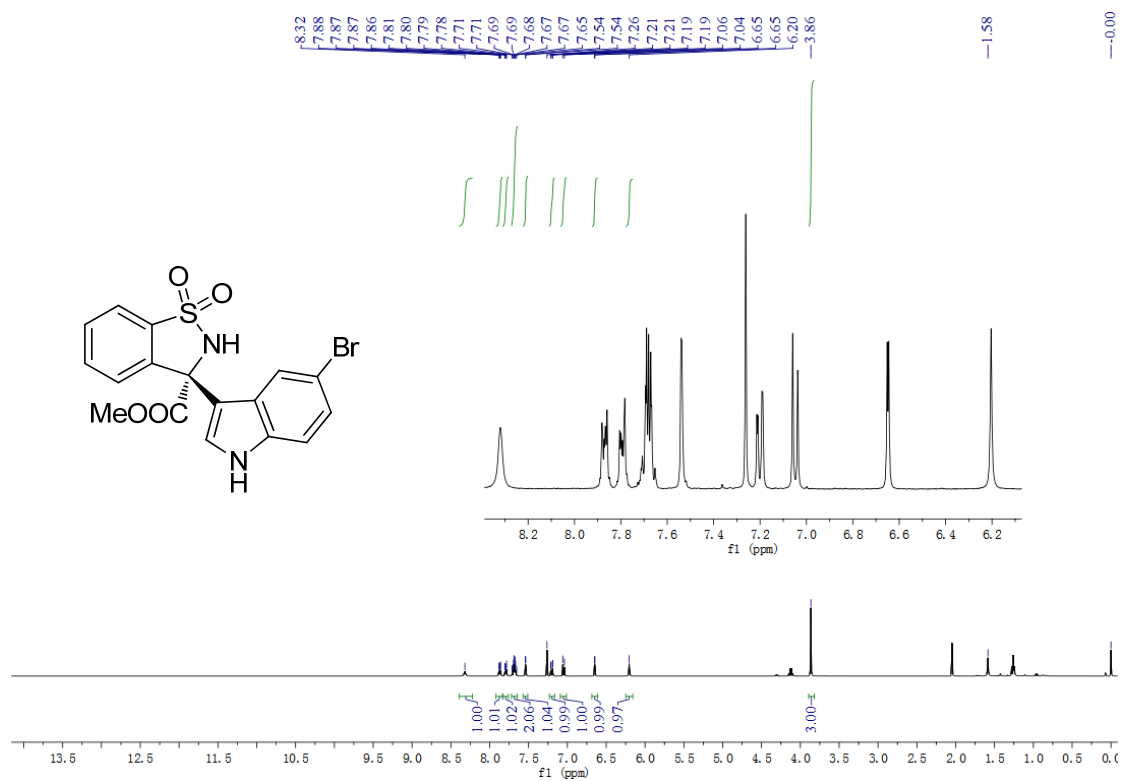
(S)-3-methoxycarbonyl-3-(6-chloro-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3k**)



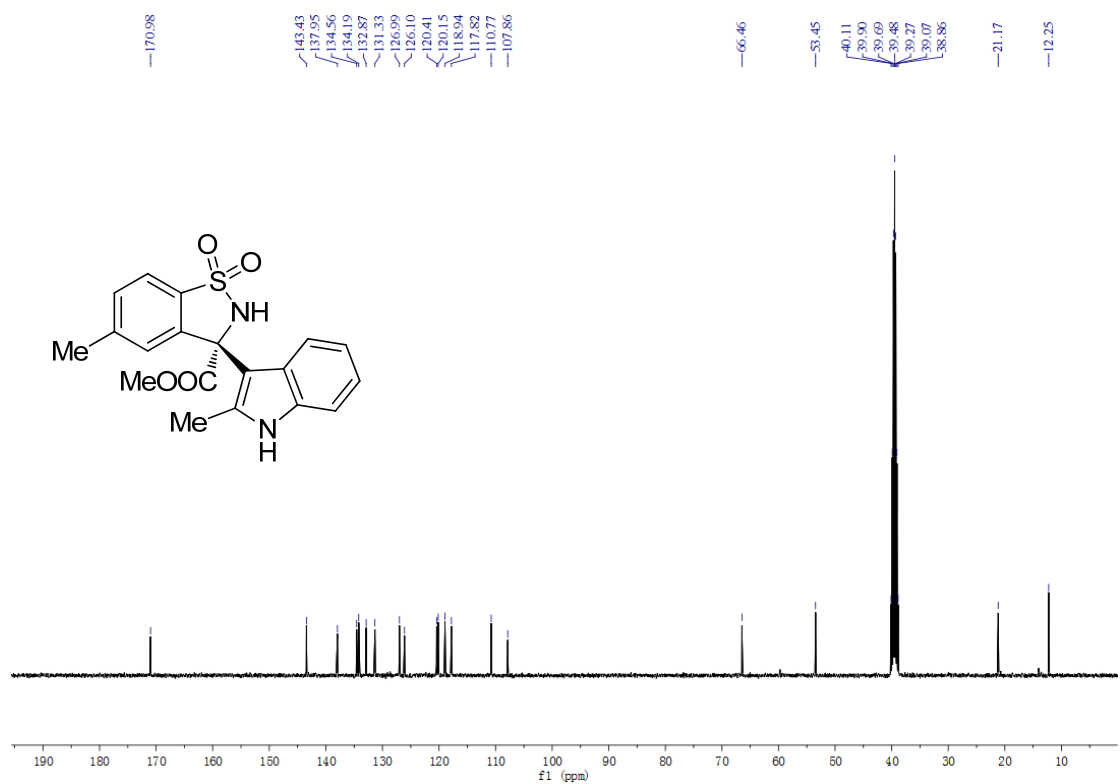
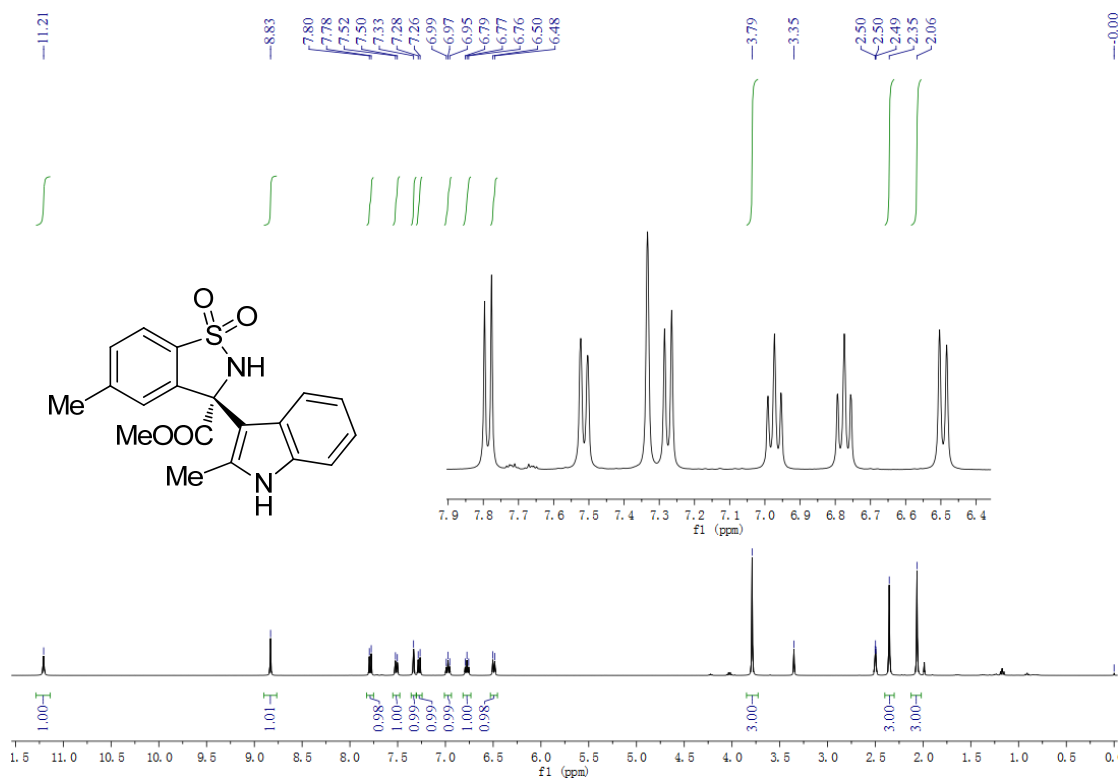
(S)-3-methoxycarbonyl-3-(4-bromo-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3I**)



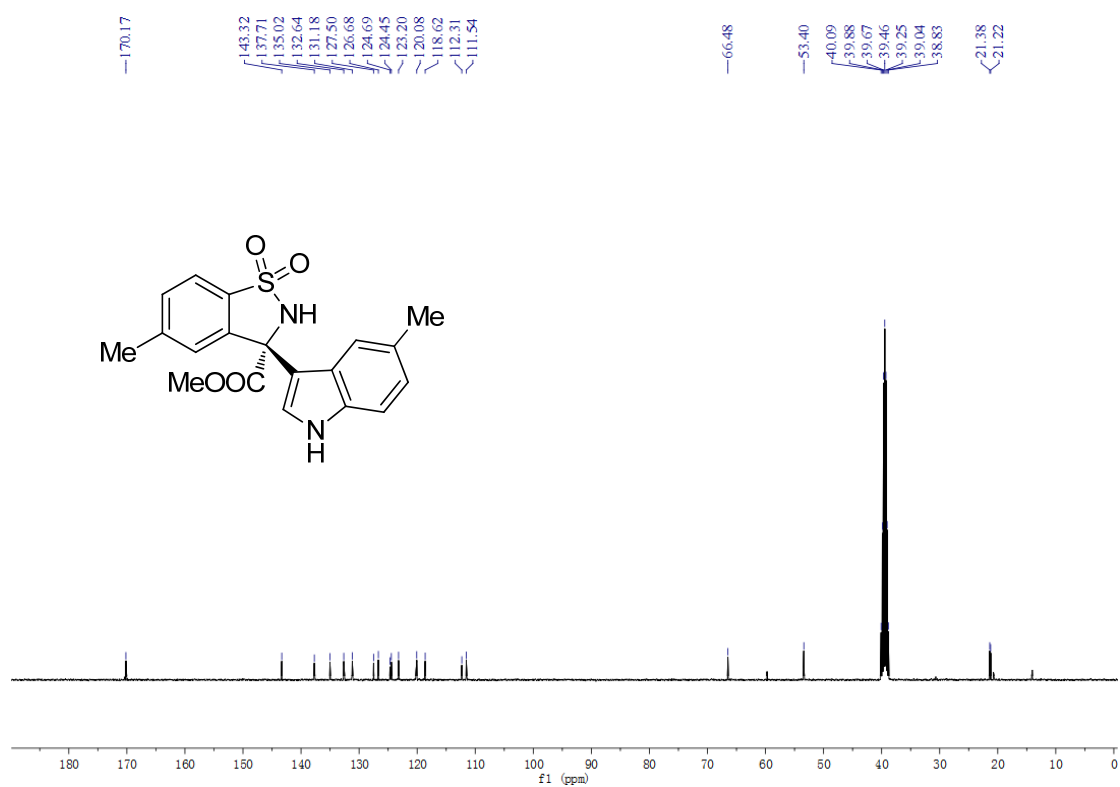
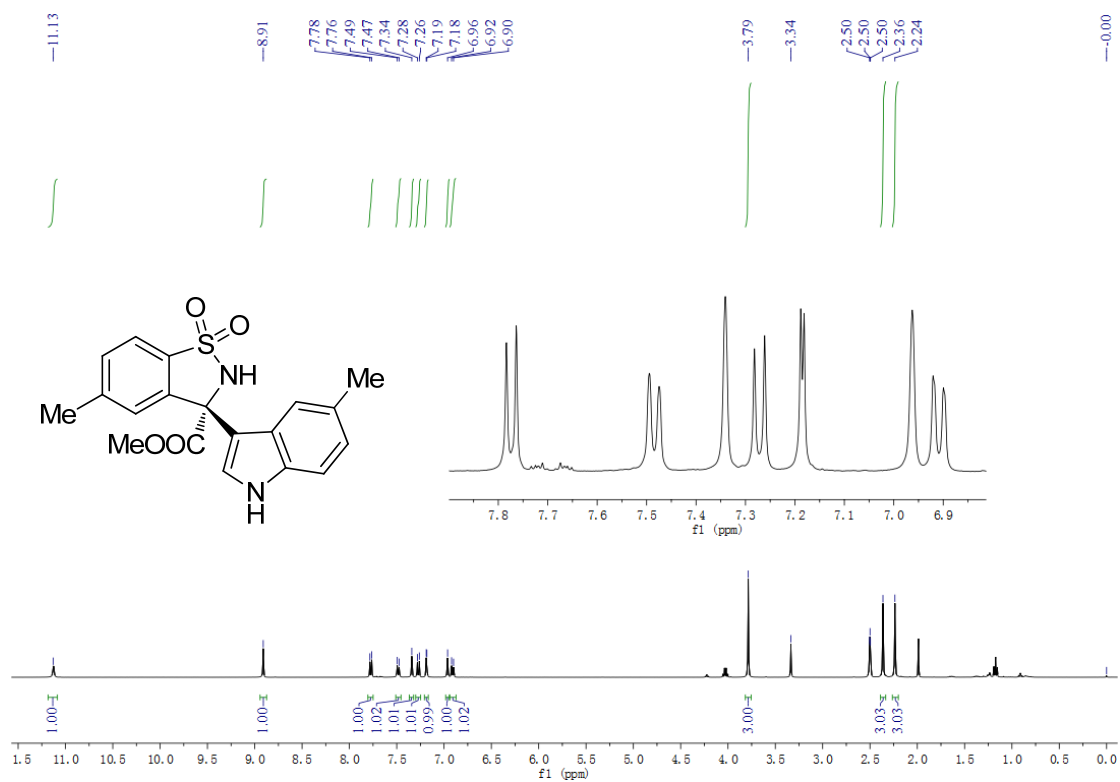
(S)-3-methoxycarbonyl-3-(5-bromo-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3m**)



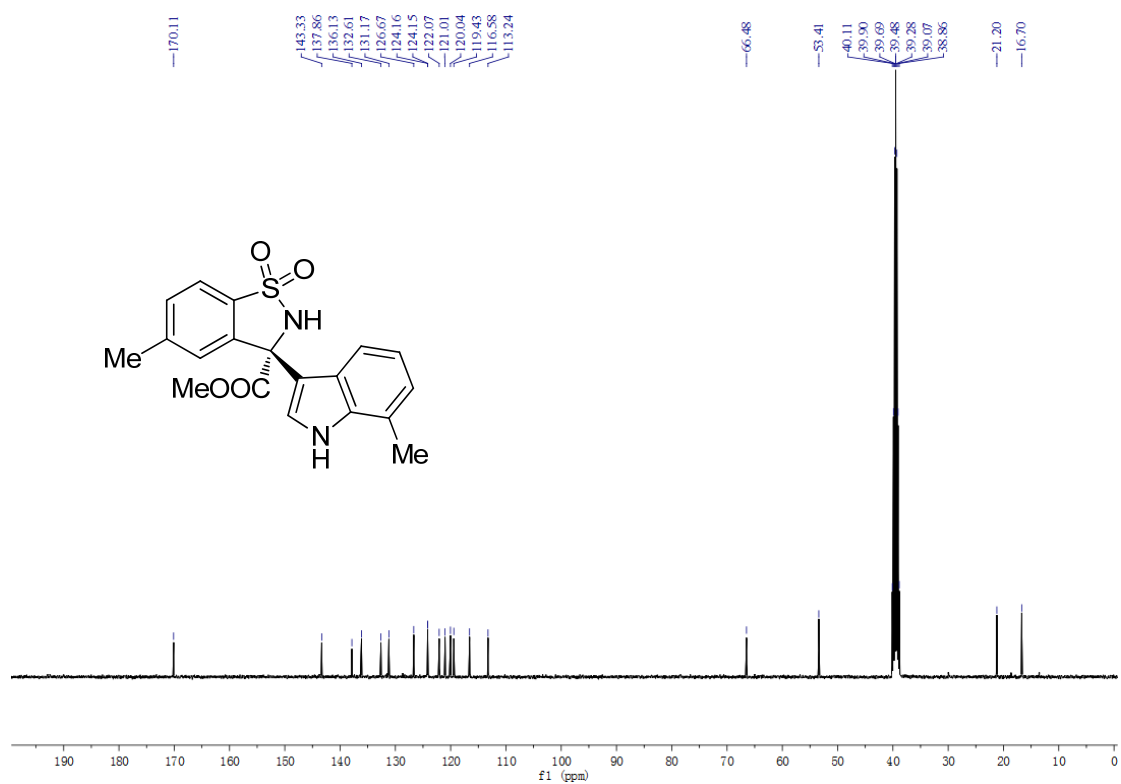
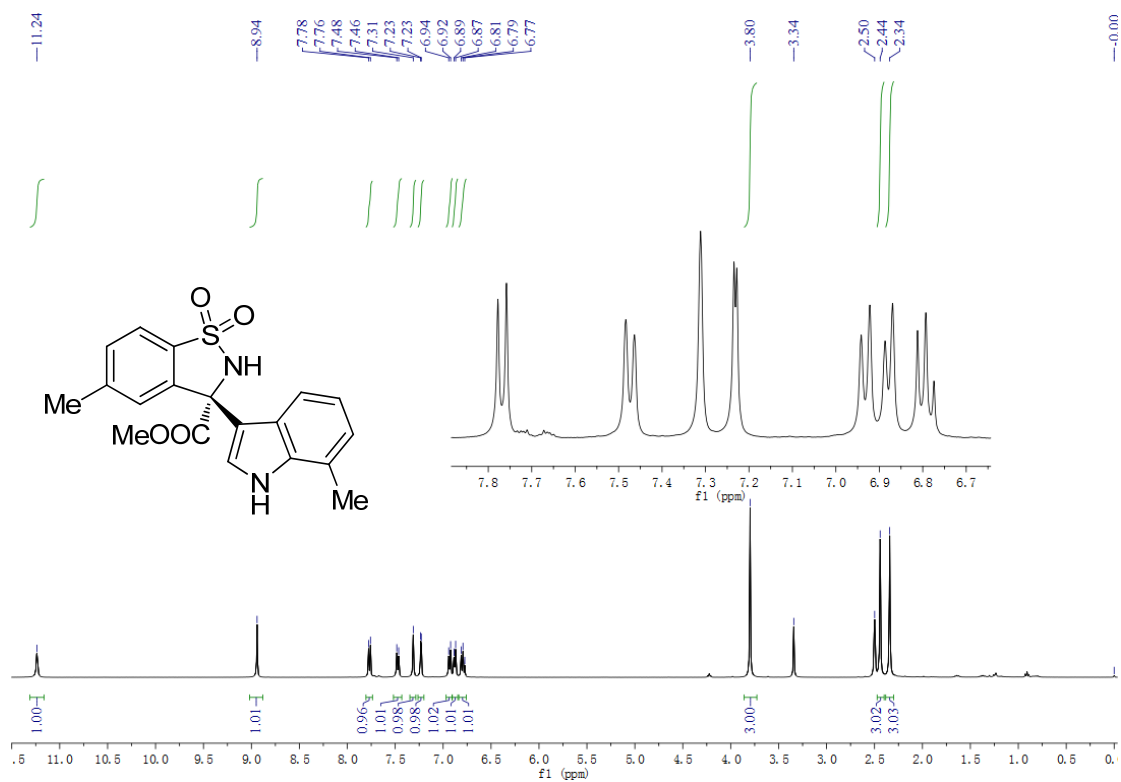
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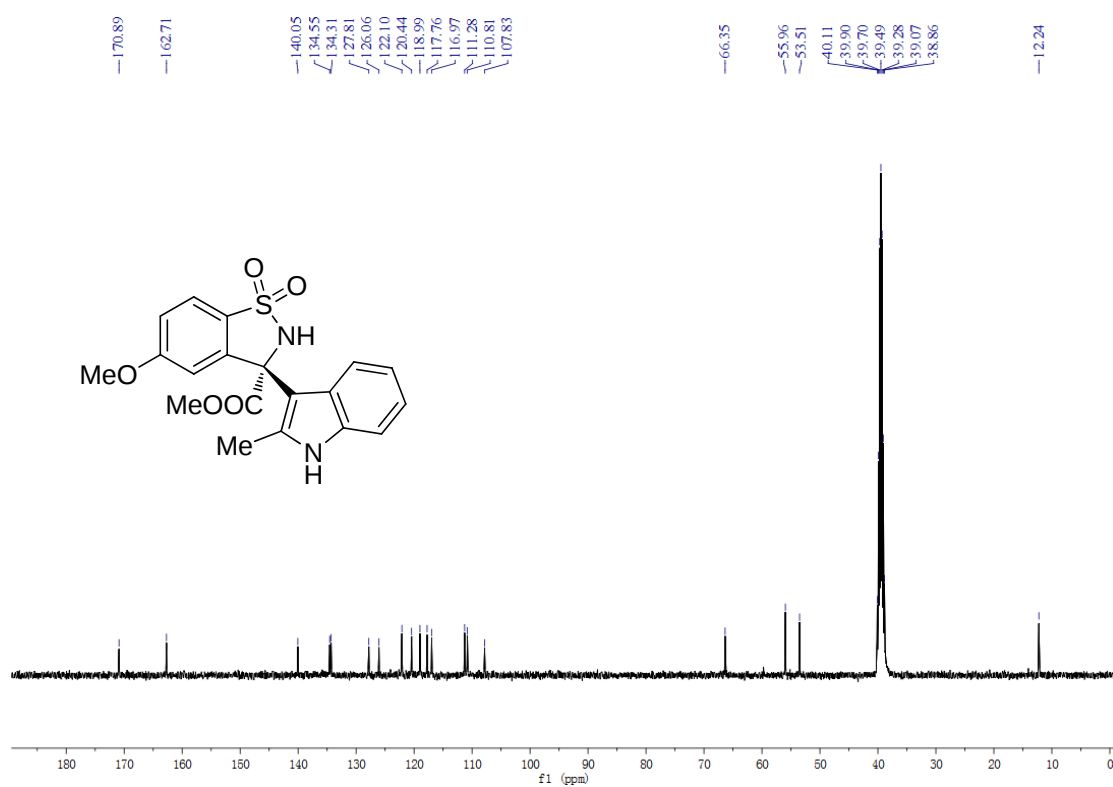
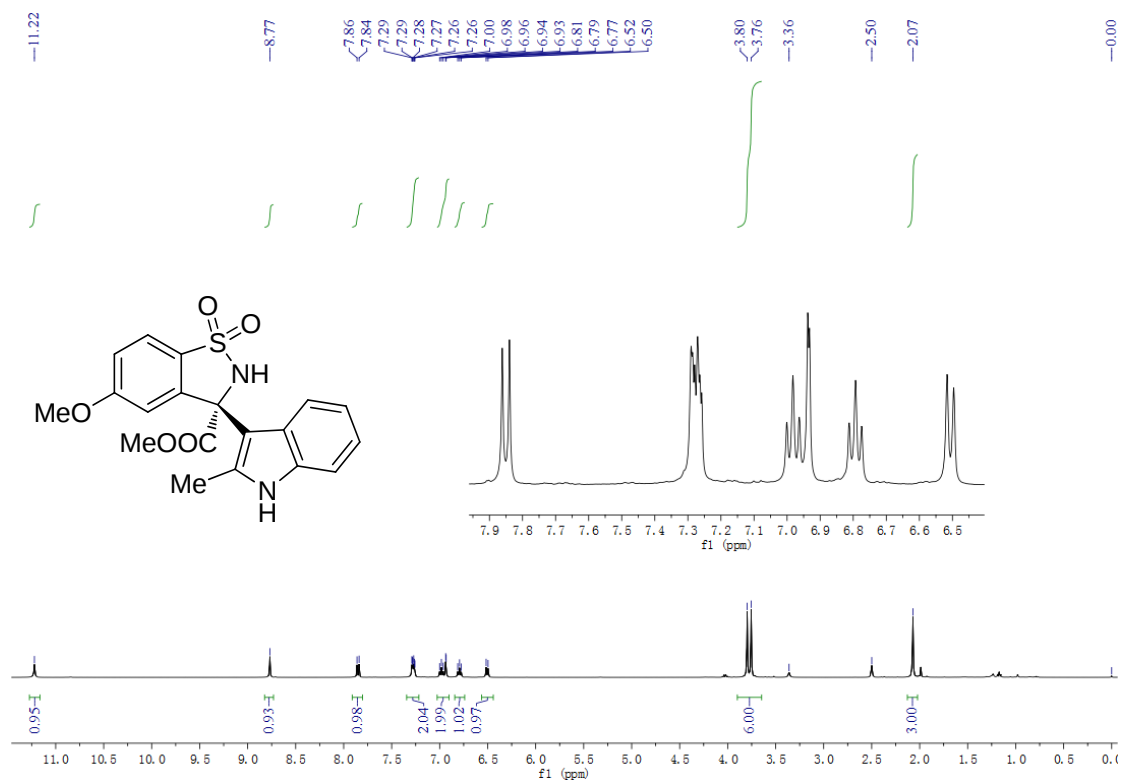
(S)-3-methoxycarbonyl-3-(5-methyl-3-indolyl)-5-methyl-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3o**)



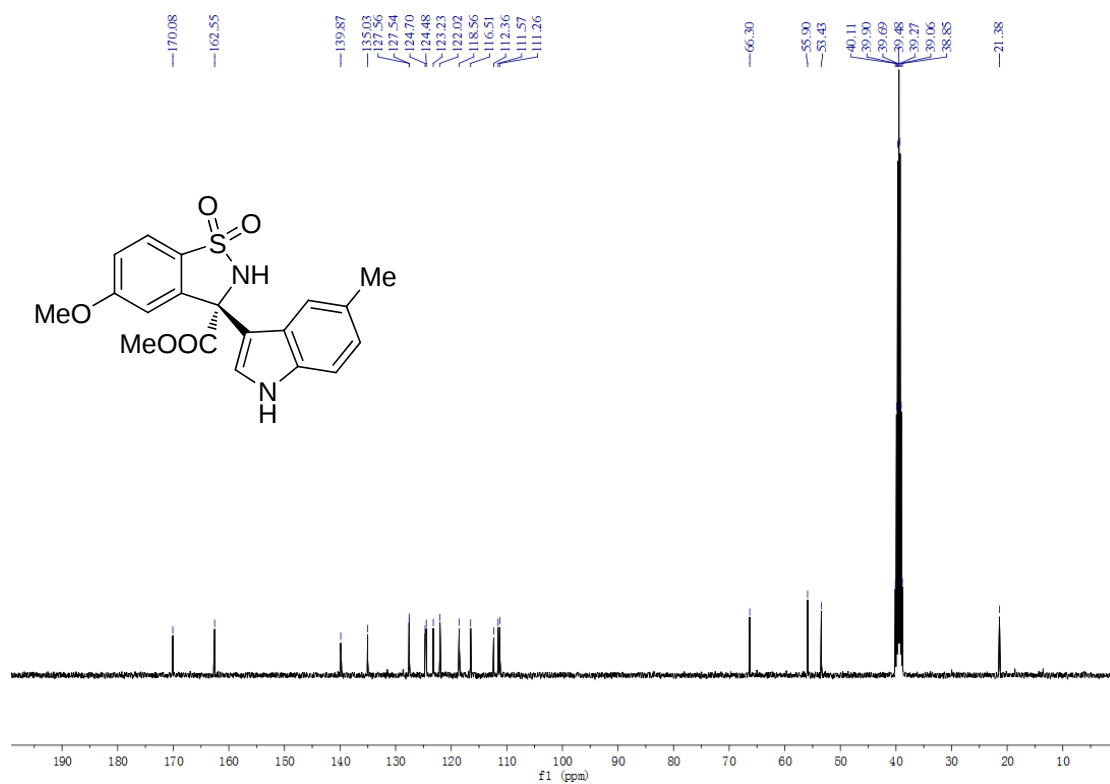
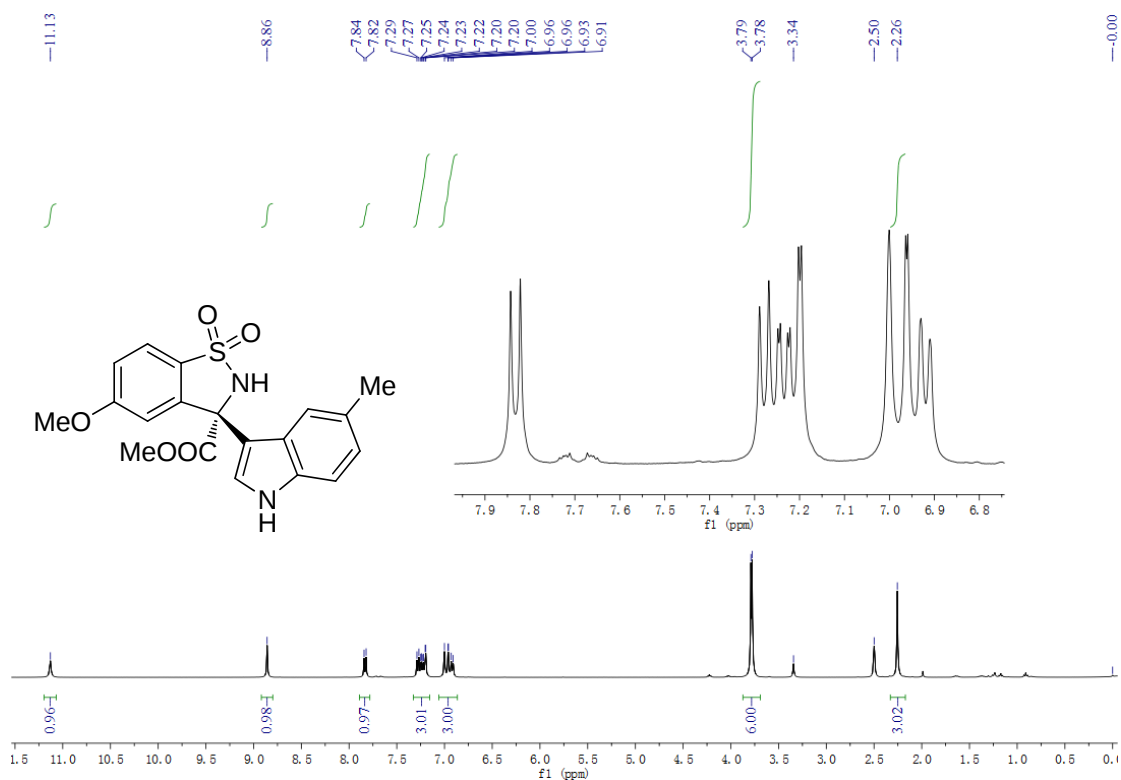
(S)-3-methoxycarbonyl-3-(7-methyl-3-indolyl)-5-methyl-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3p**)



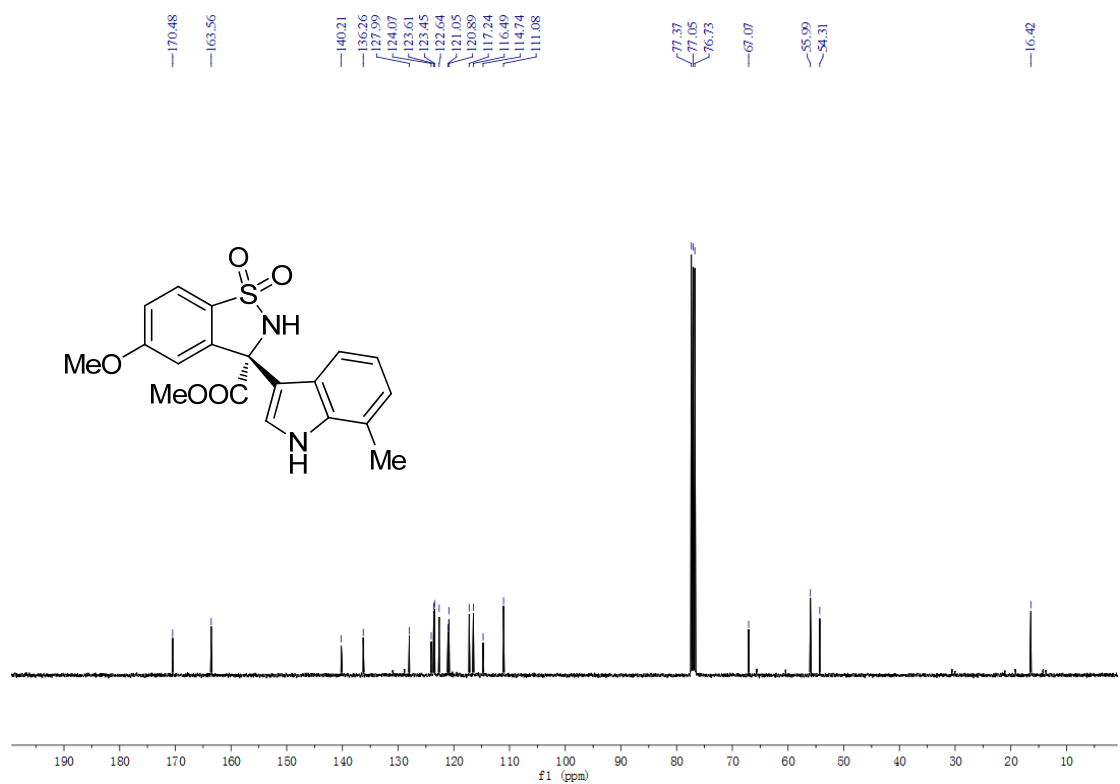
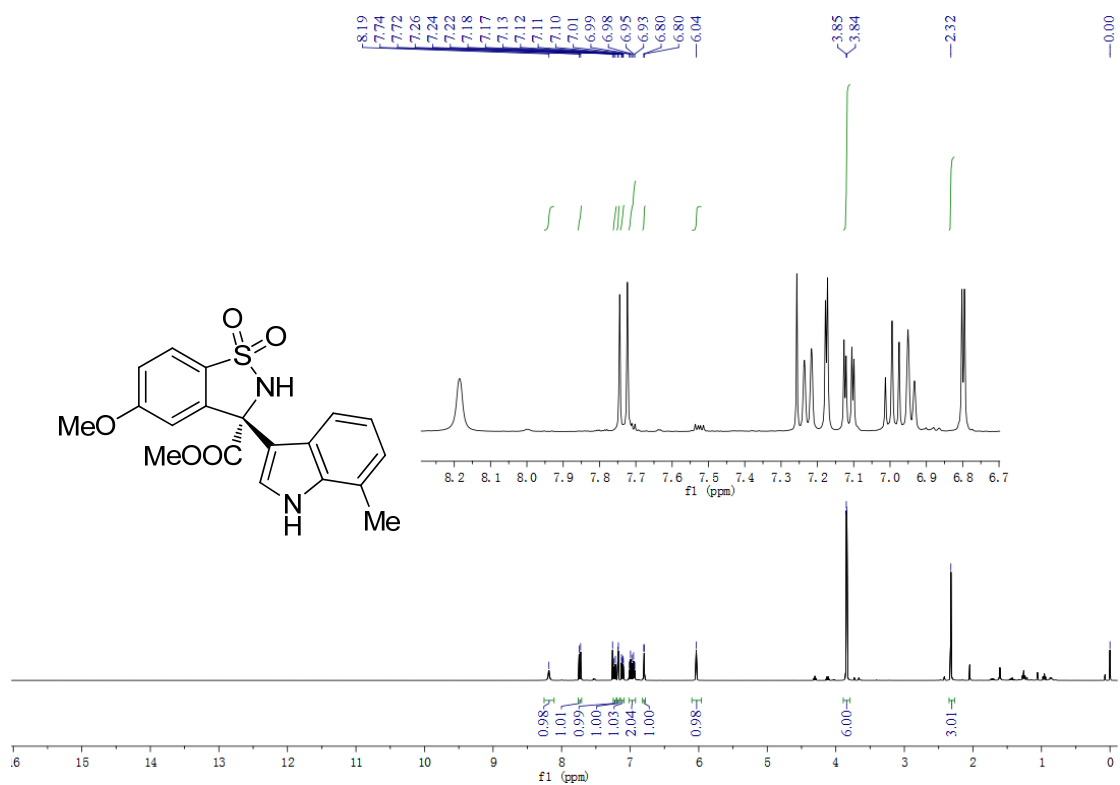
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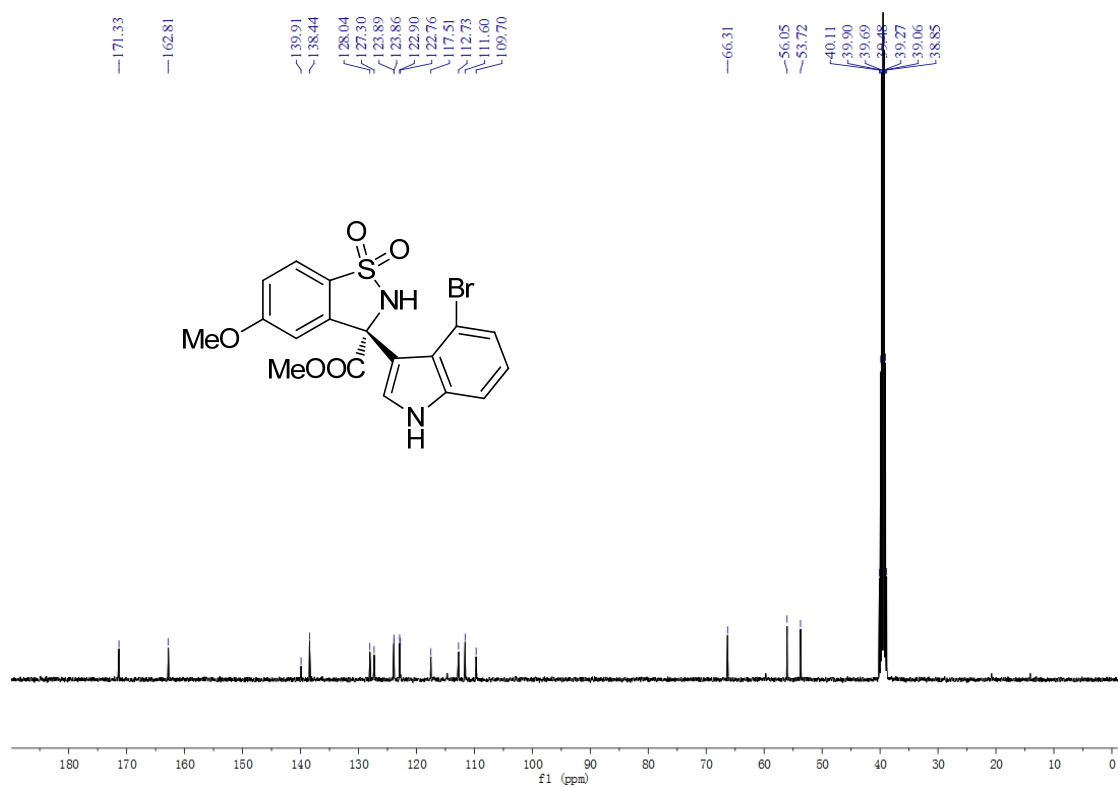
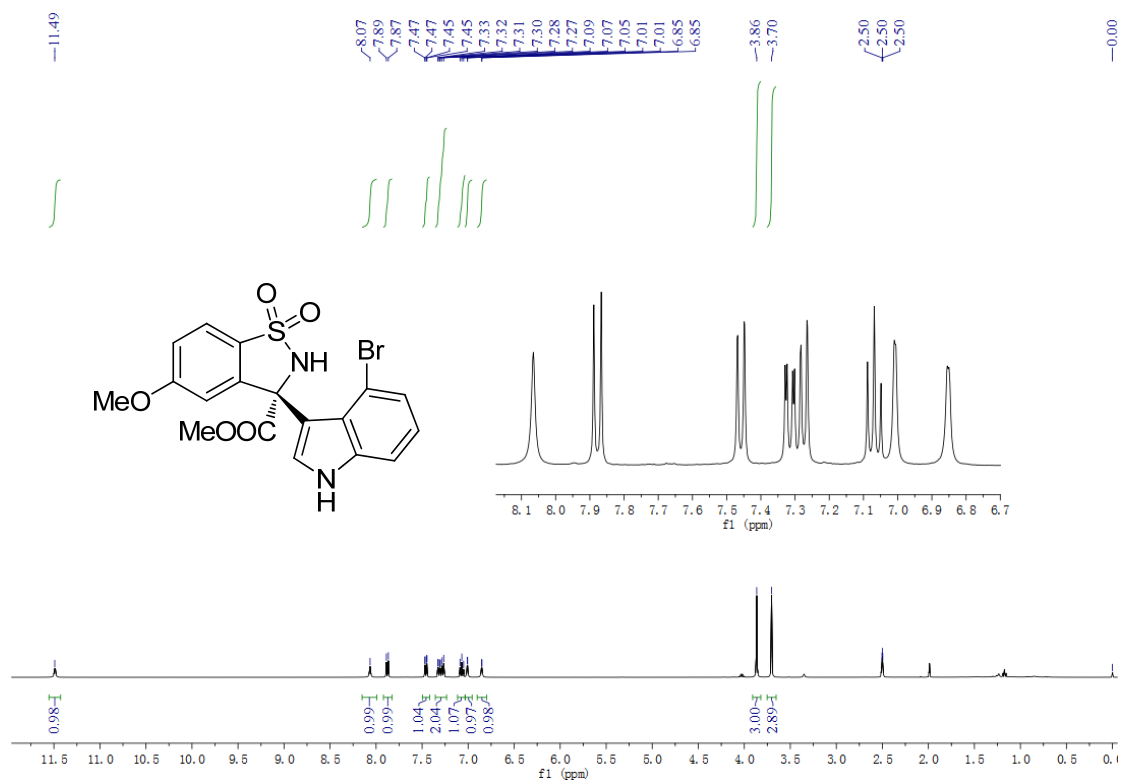
(S)-3-methoxycarbonyl-3-(5-methyl-3-indolyl)-5-methoxy-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3r**)



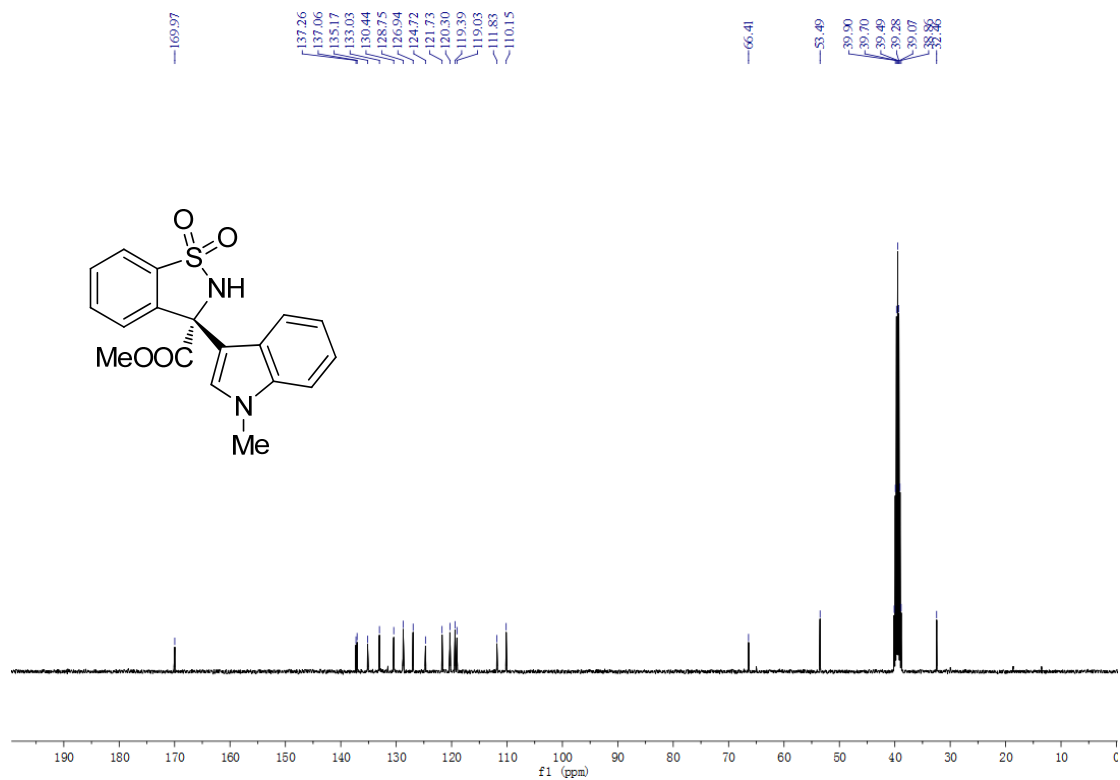
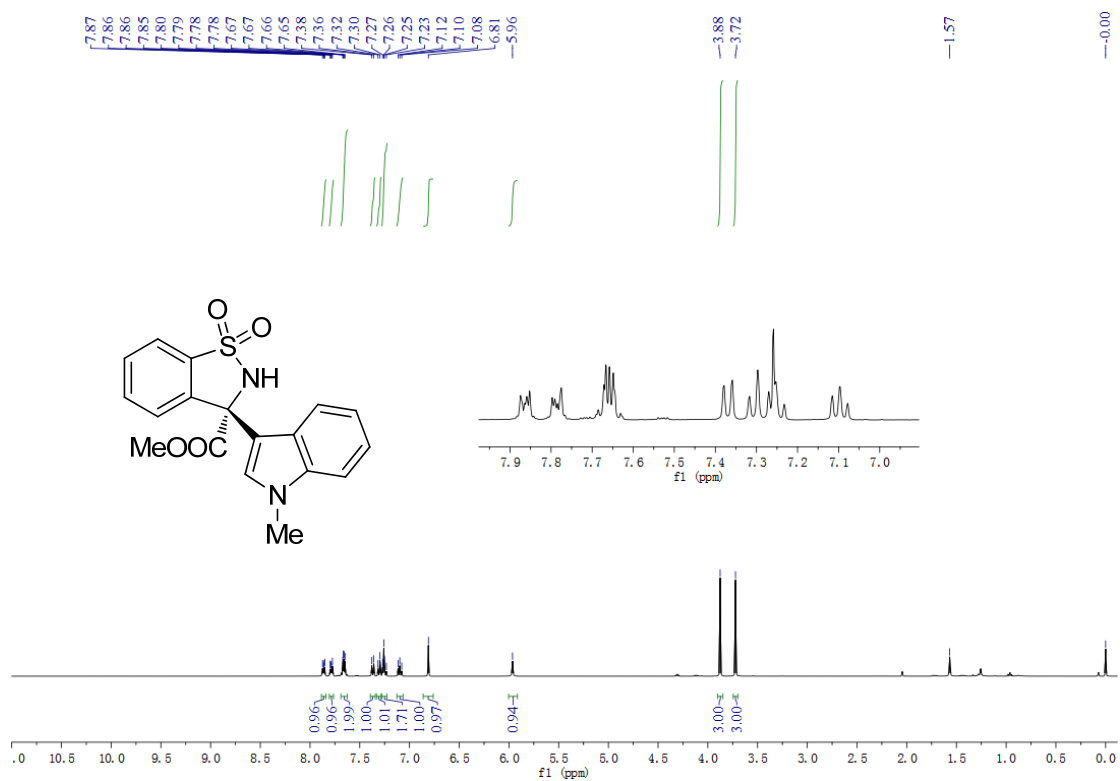
(S)-3-methoxycarbonyl-3-(7-methyl-3-indolyl)-5-methoxy-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3s**)



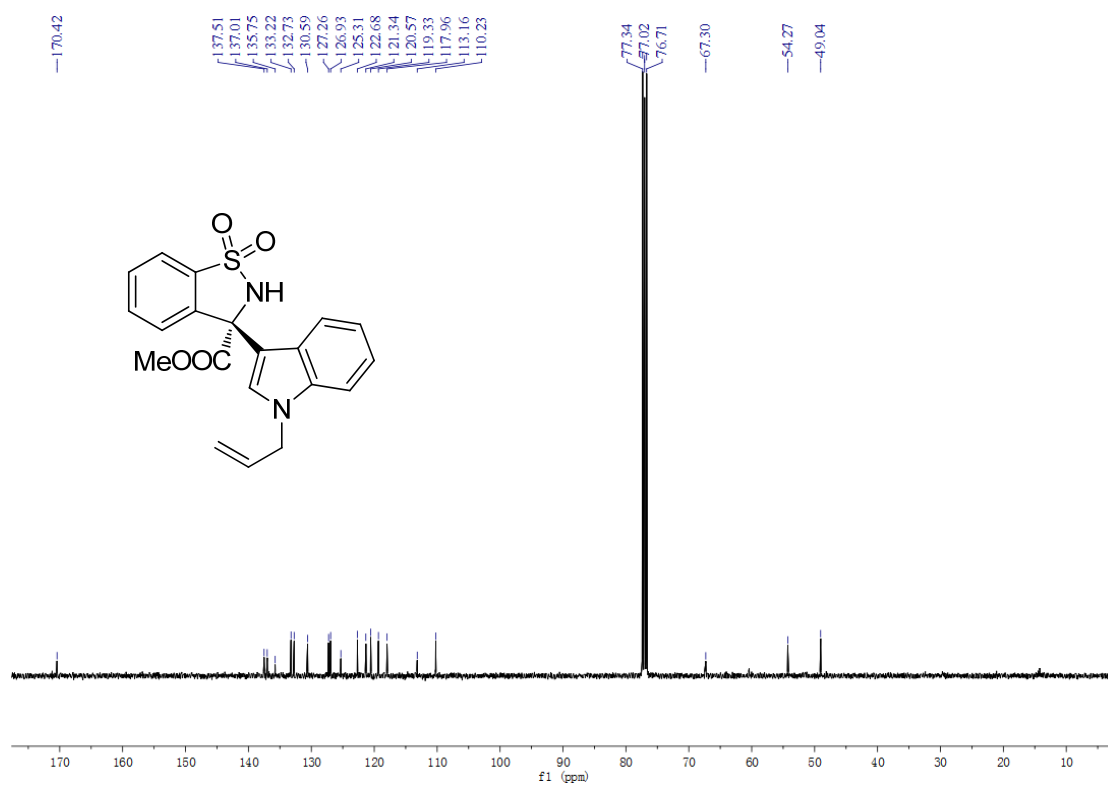
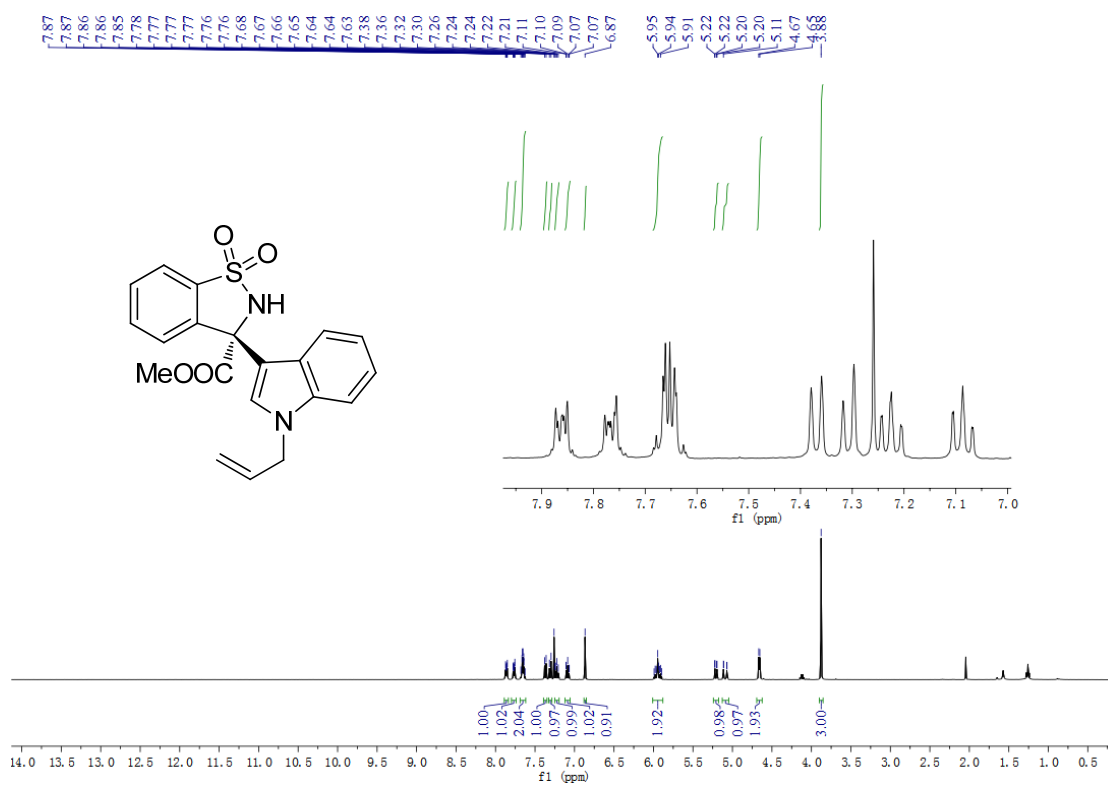
(S)-3-methoxycarbonyl-3-(4-bromo-3-indolyl)-5-methoxy-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3t**)



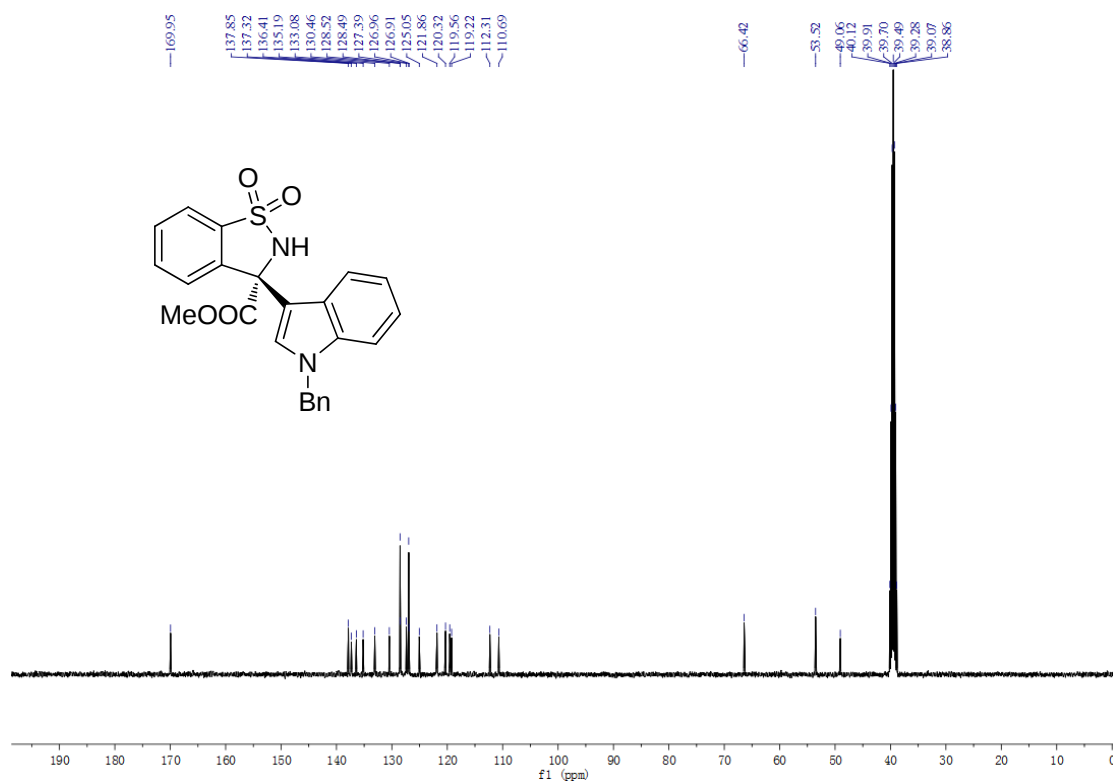
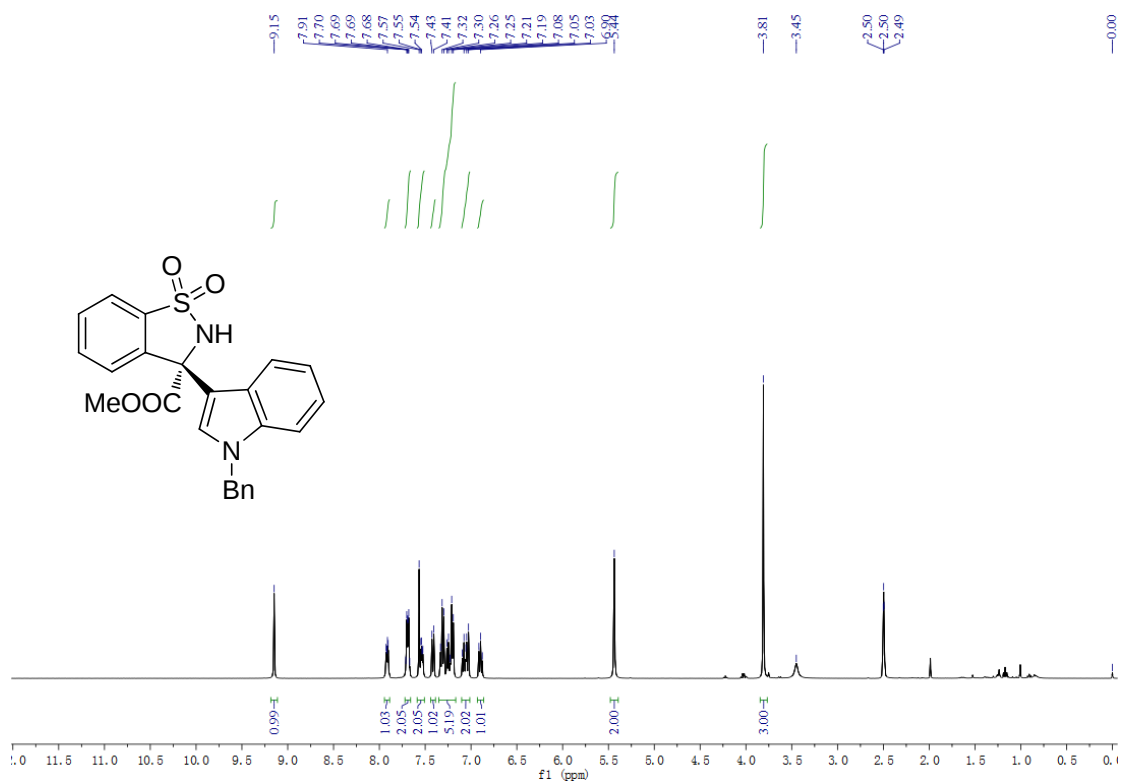
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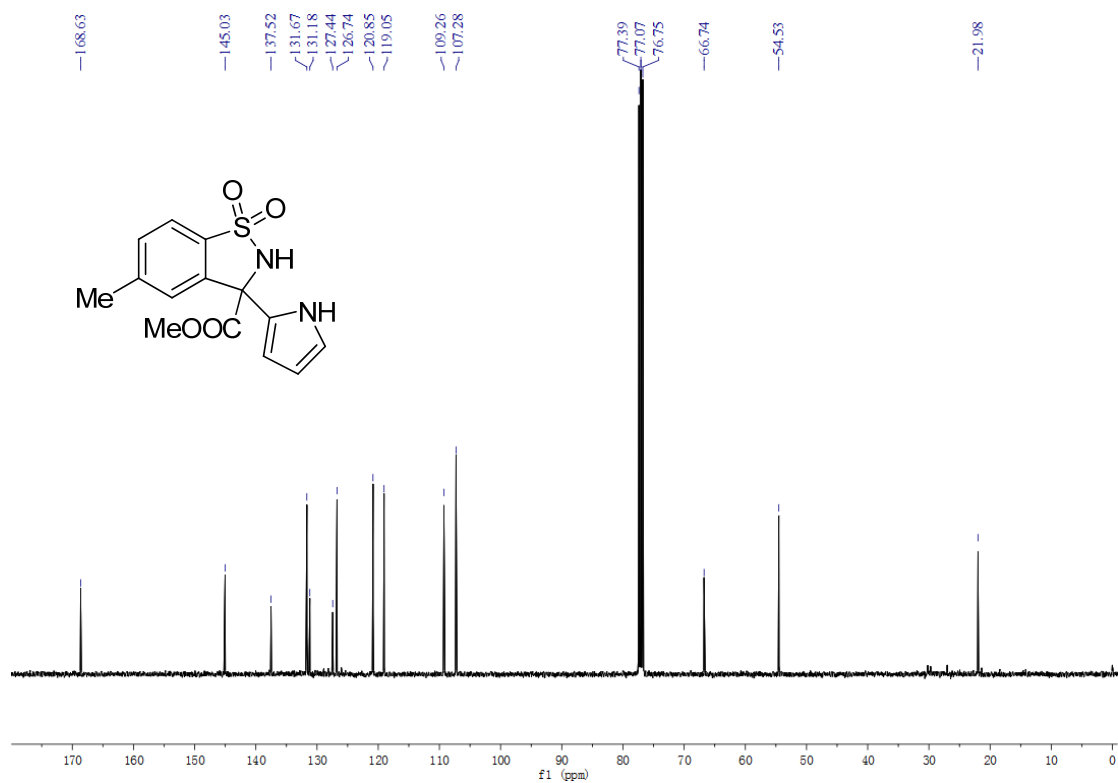
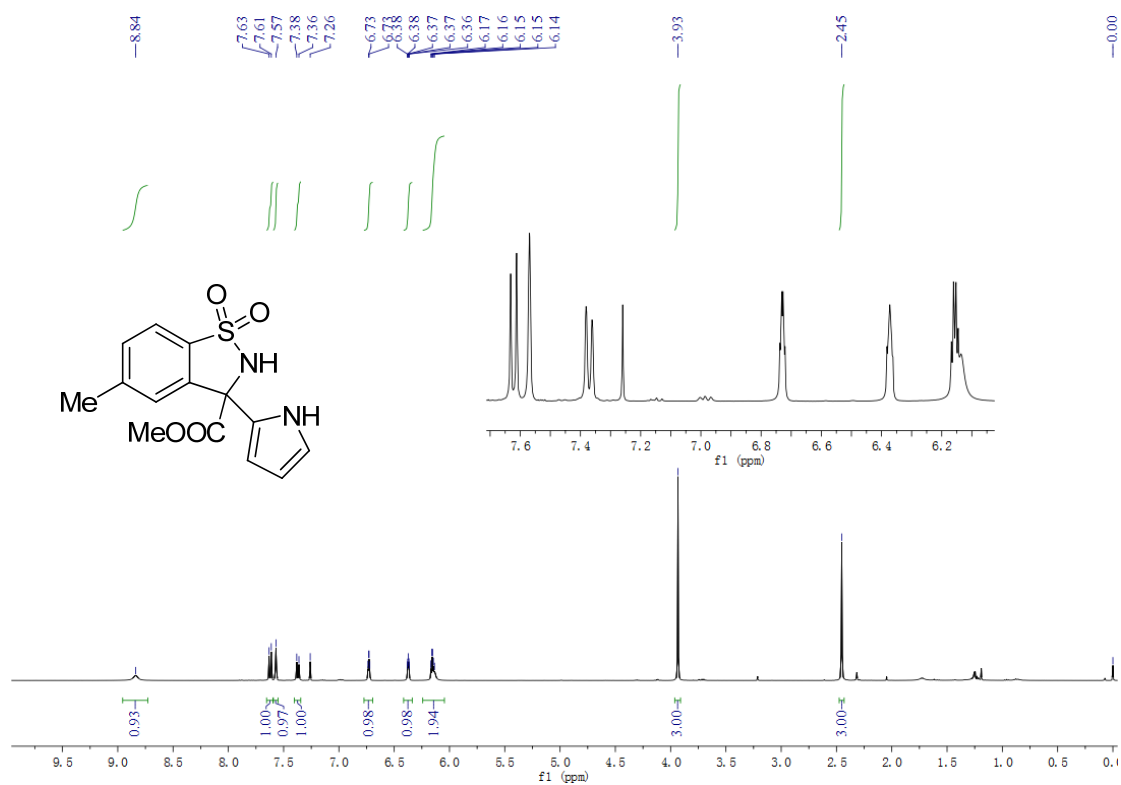
(S)-3-methoxycarbonyl-3-(1-allyl-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3v**)



(S)-3-methoxycarbonyl-3-(1-benzyl-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3w**)

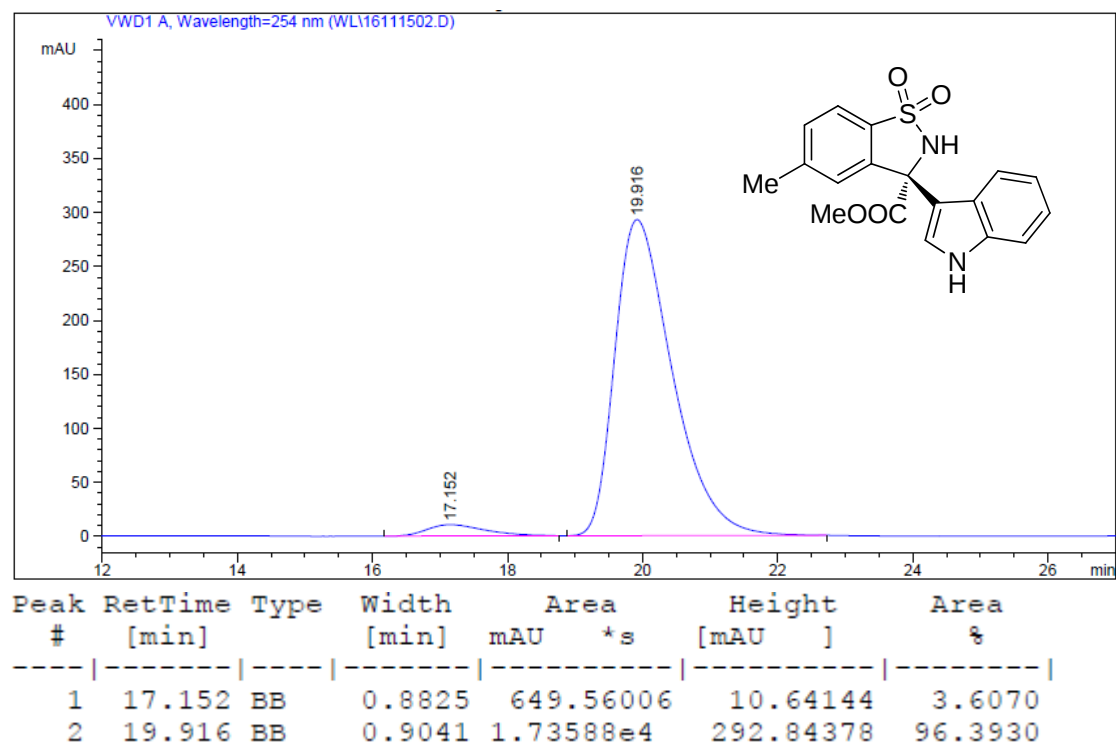
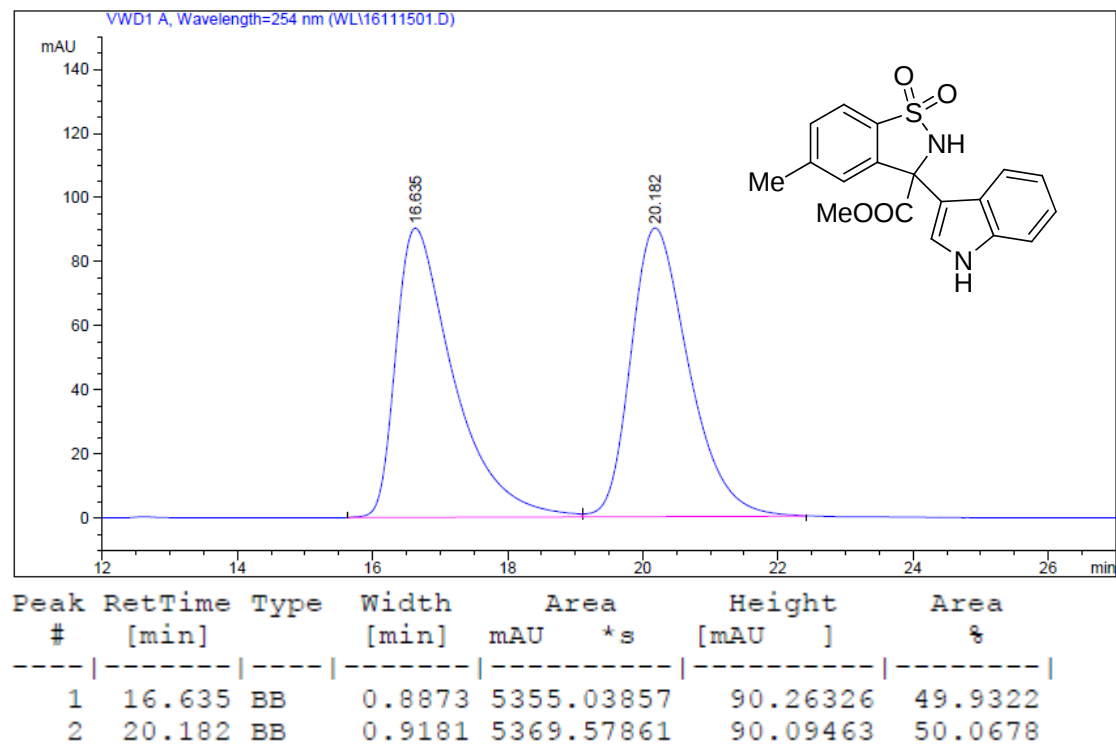


3-methoxycarbonyl-3-(pyrrolyl)-5-methyl-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (7)

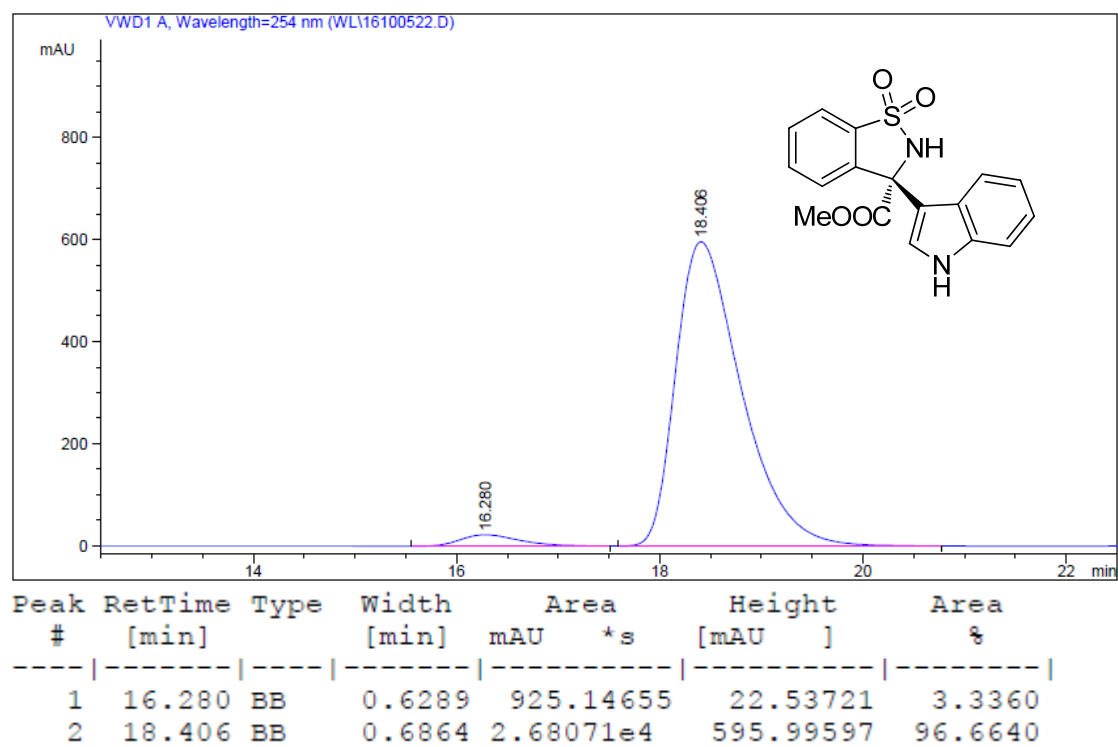
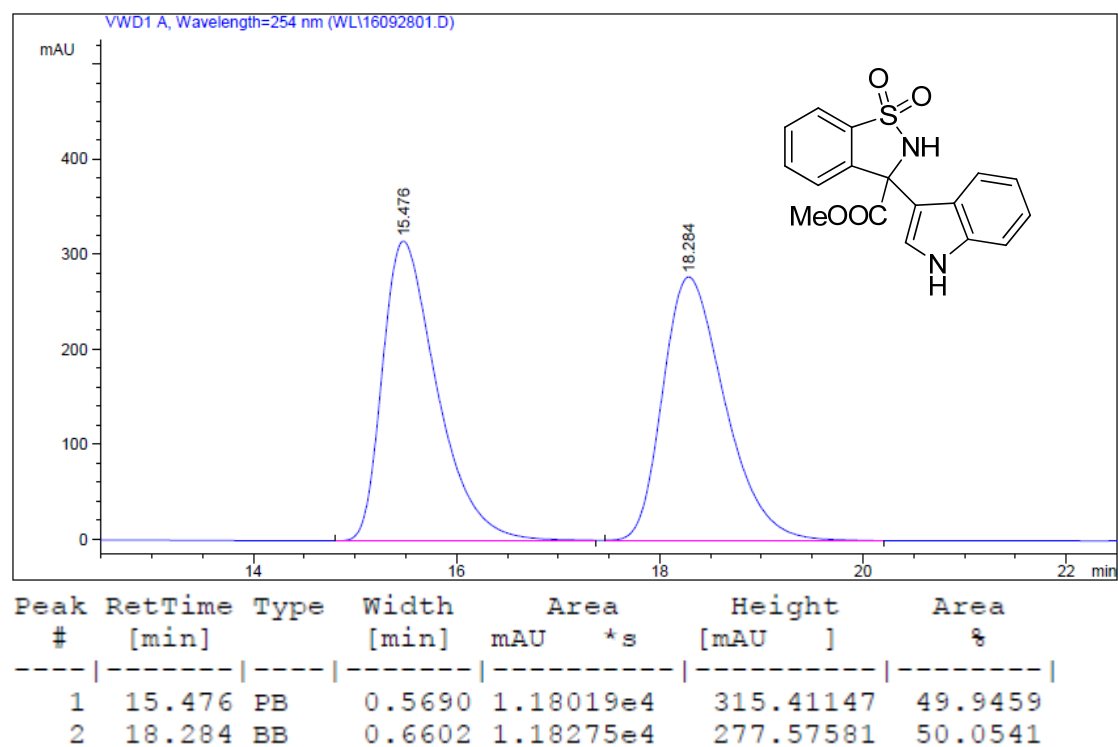


6. Copies of HPLC spectra

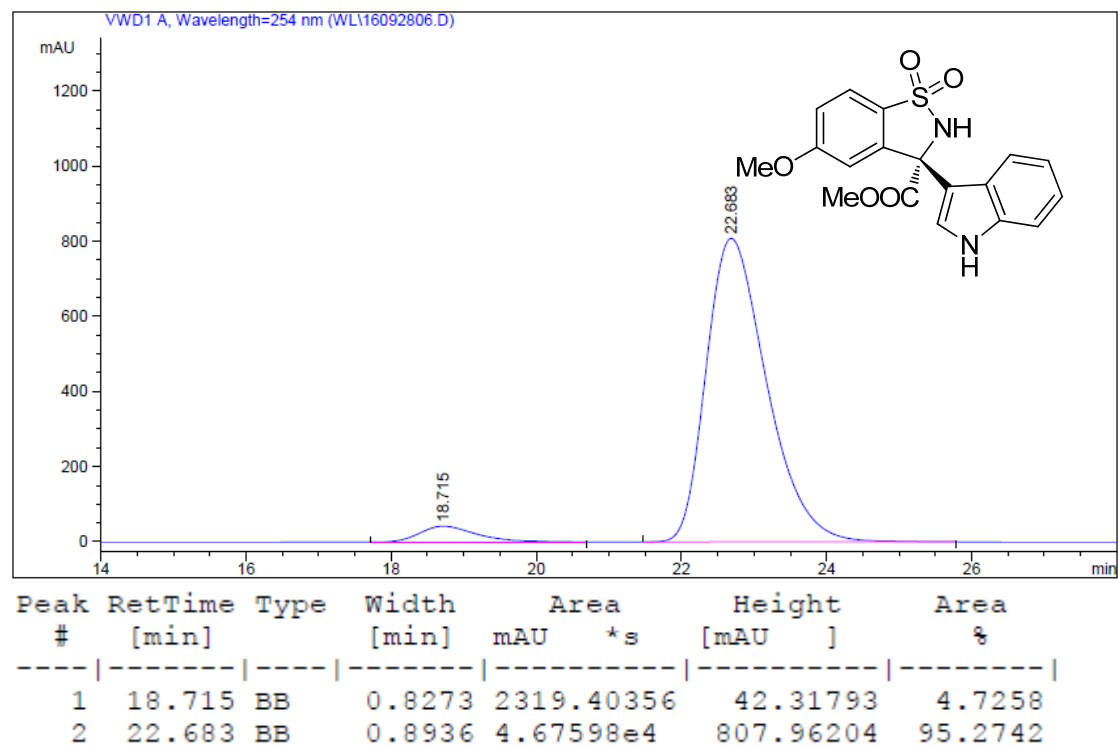
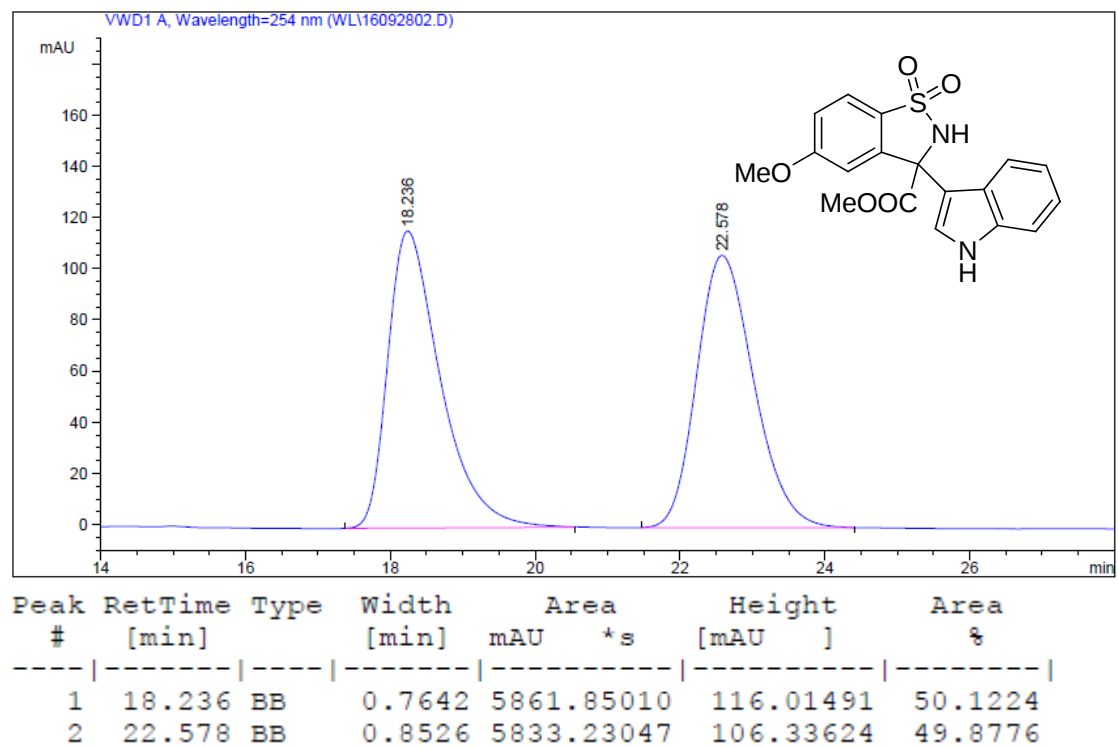
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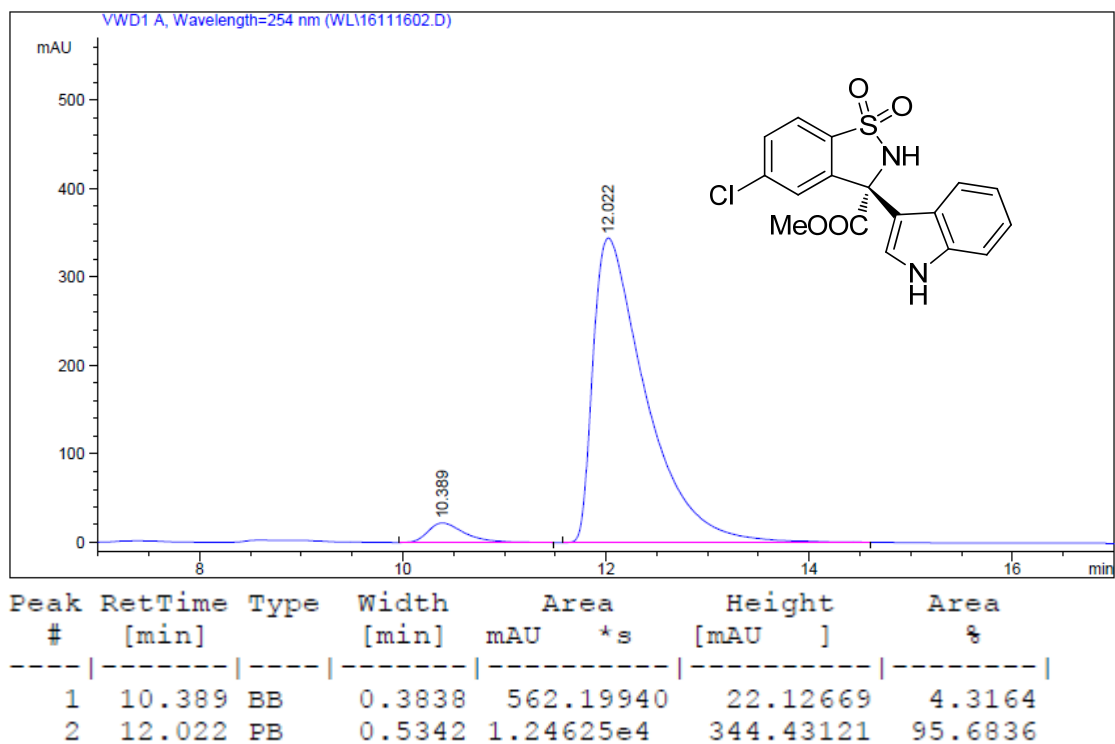
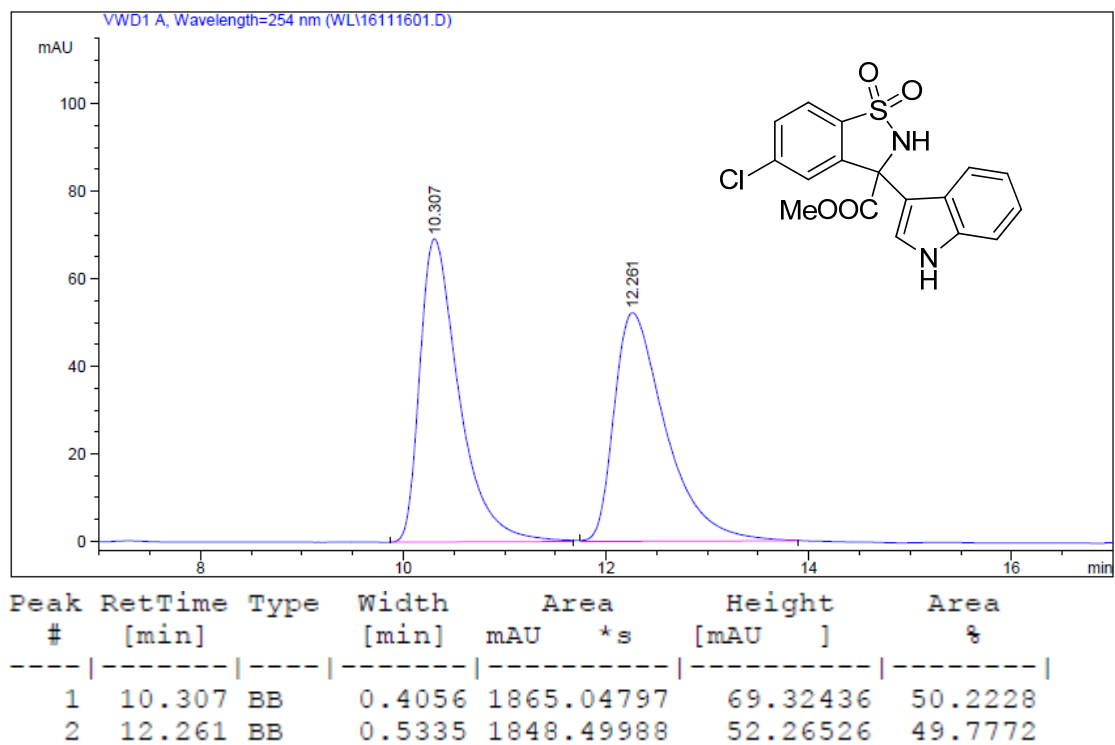
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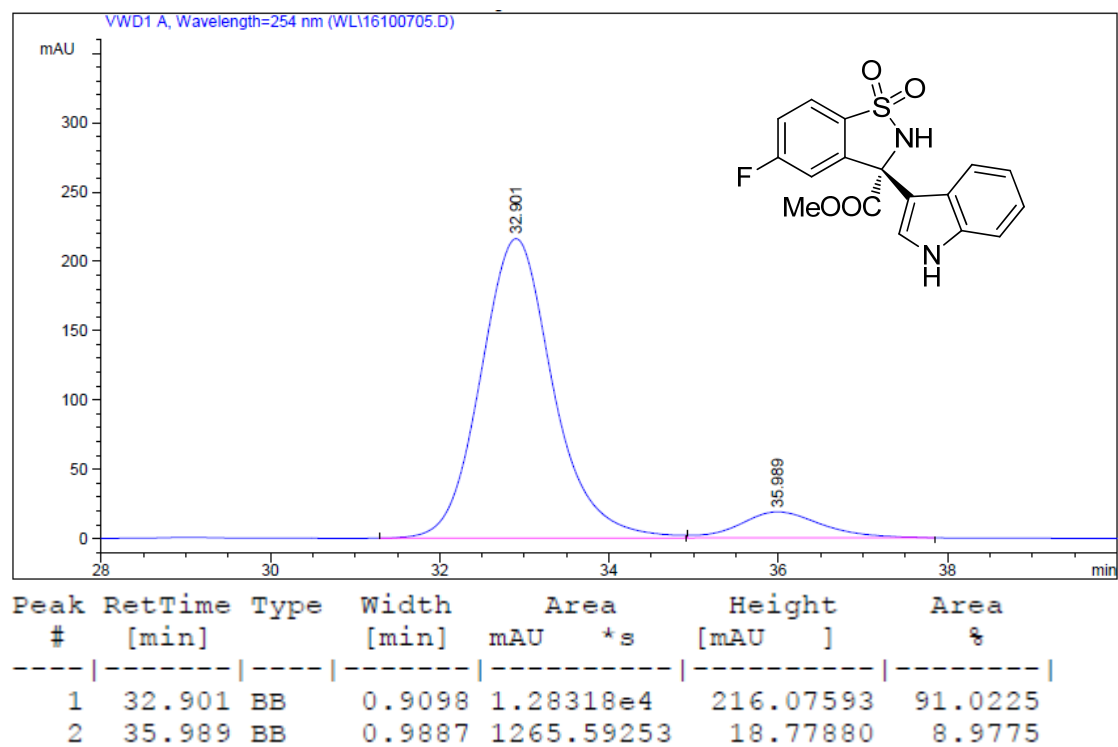
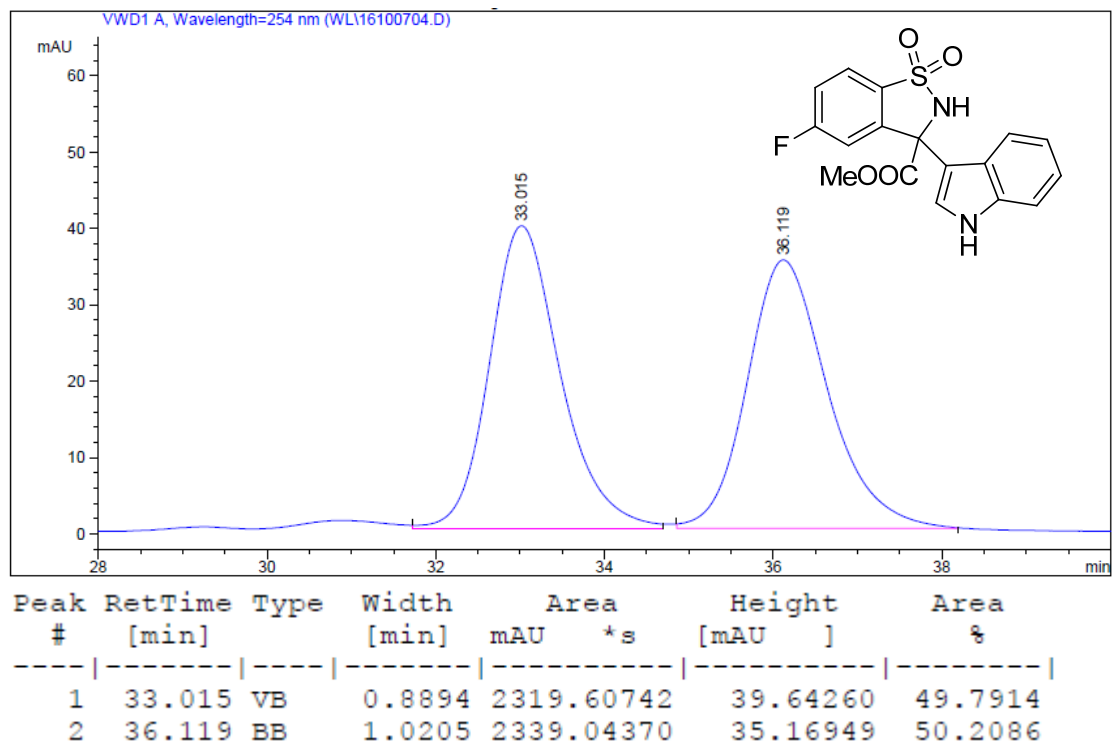
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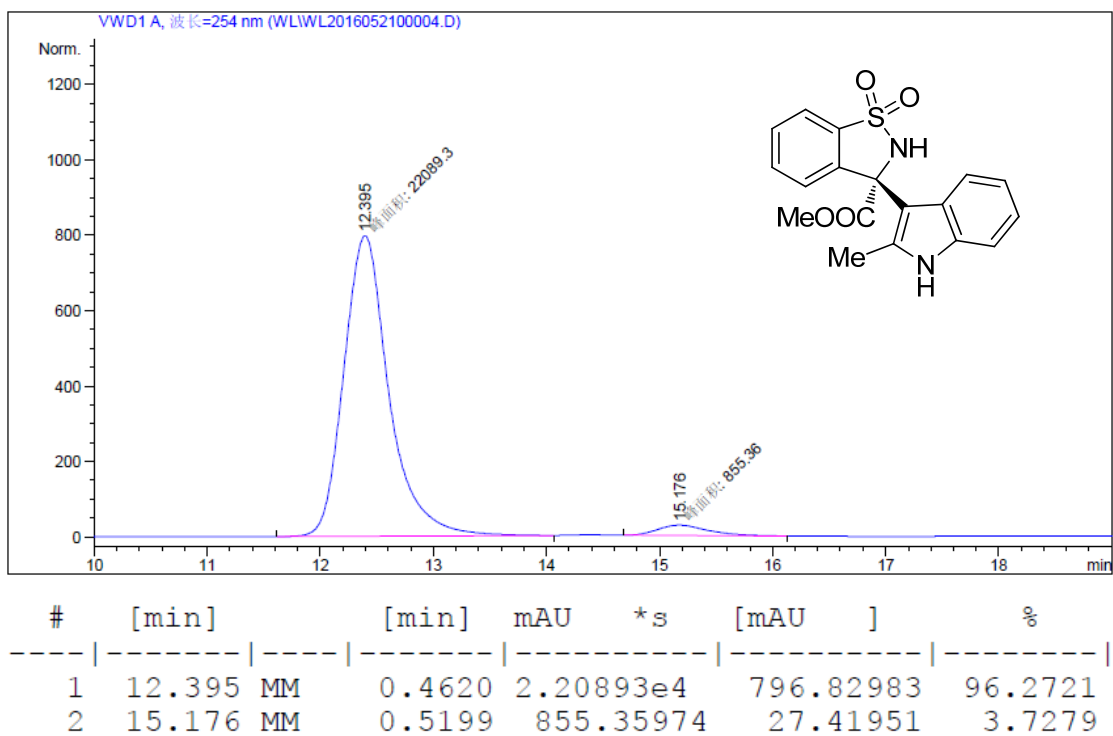
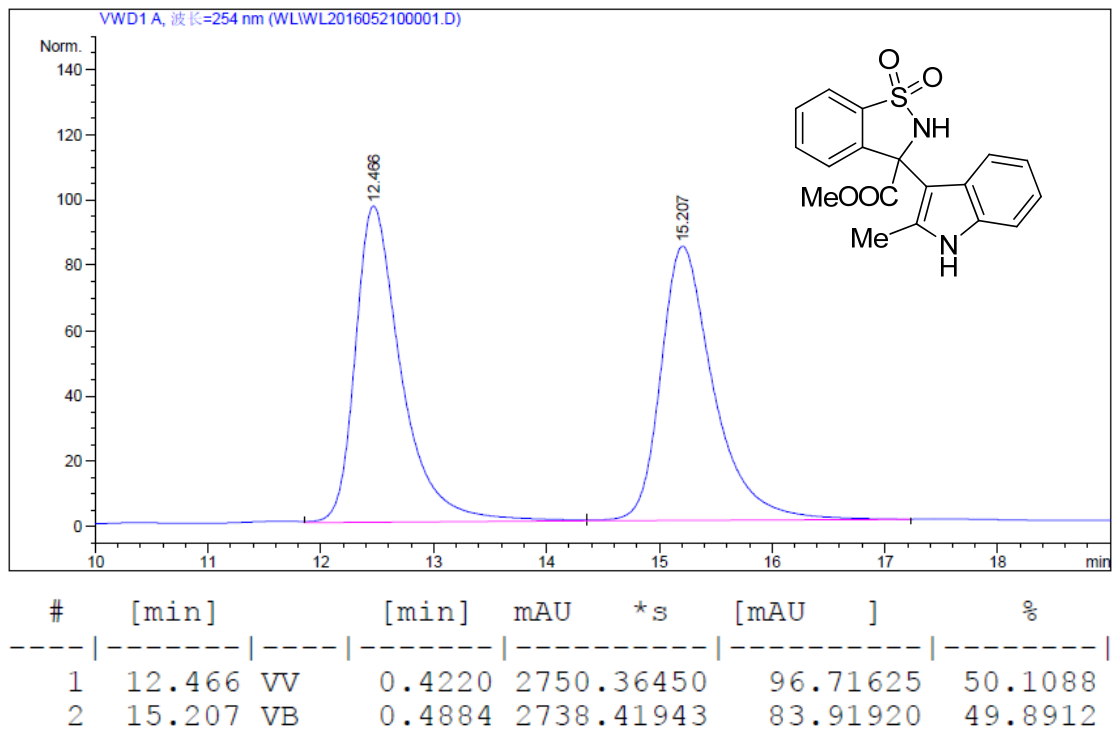
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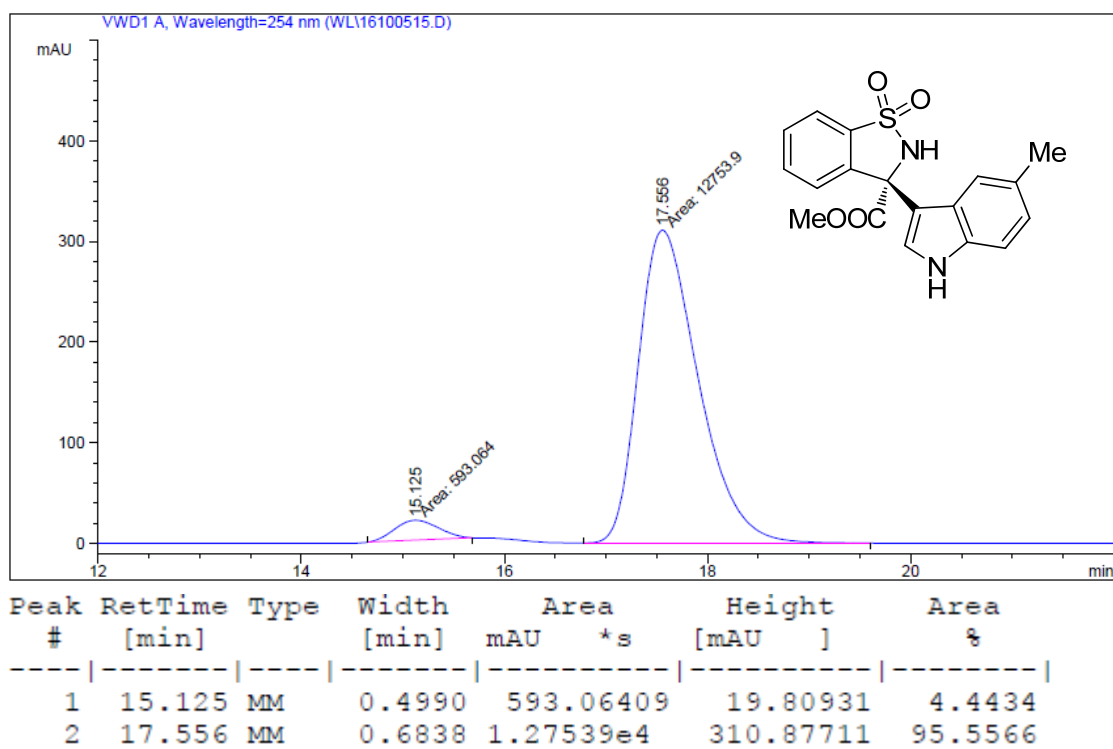
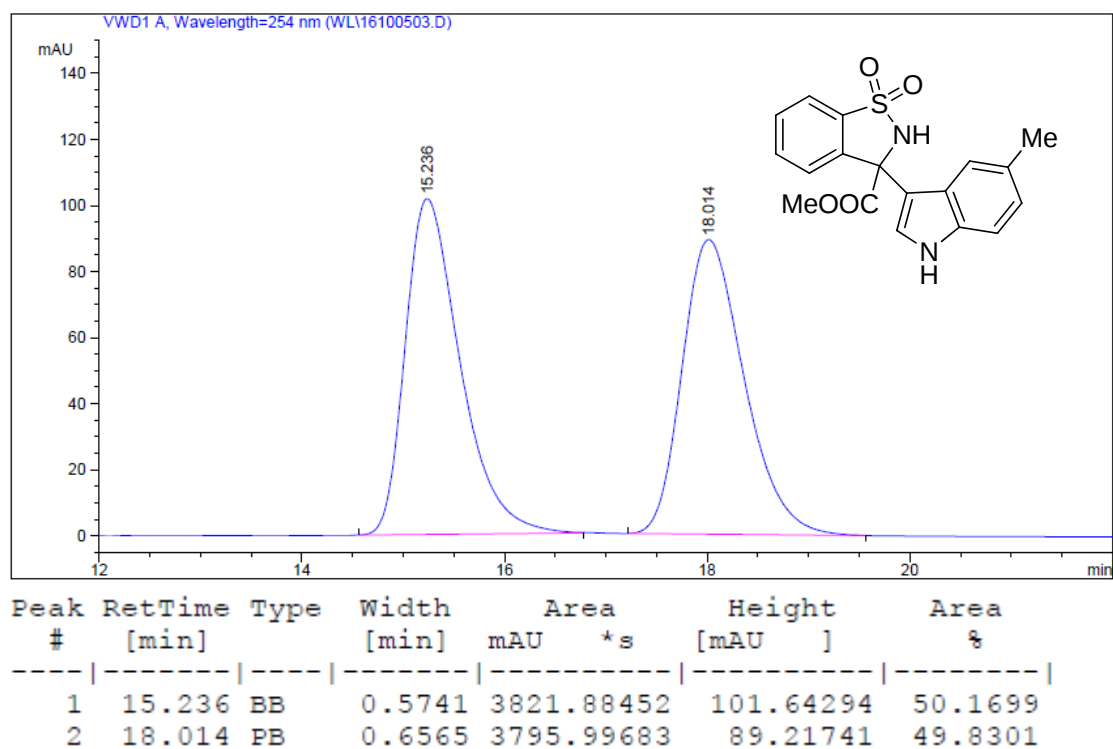
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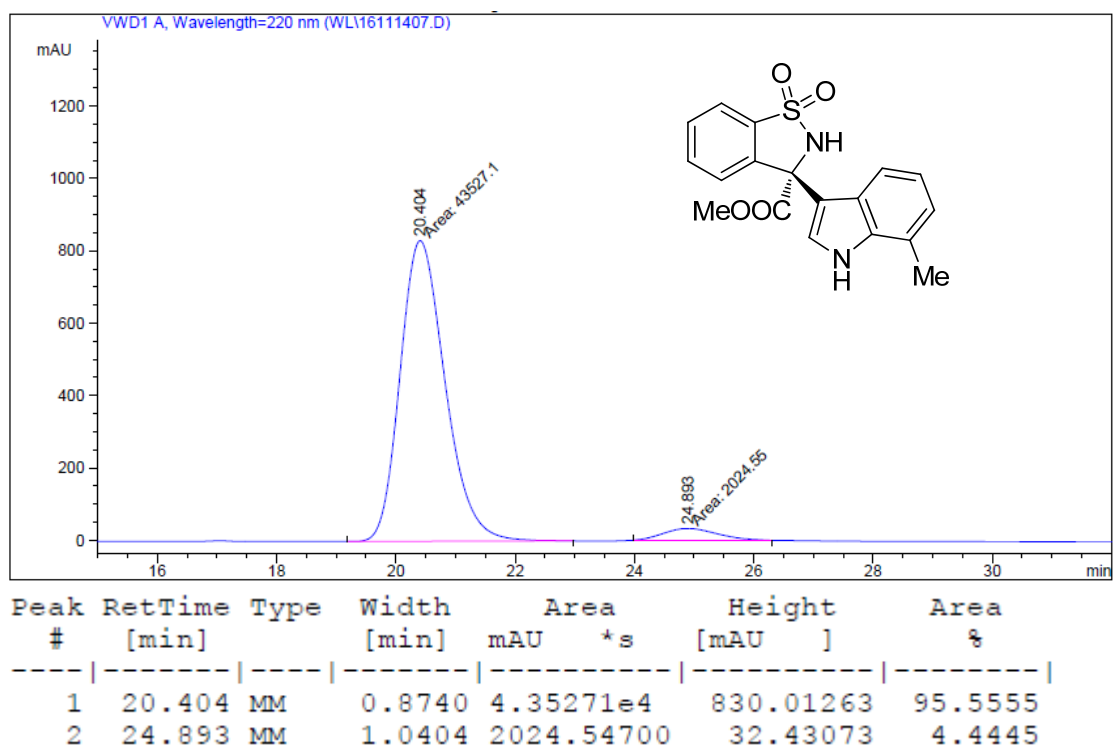
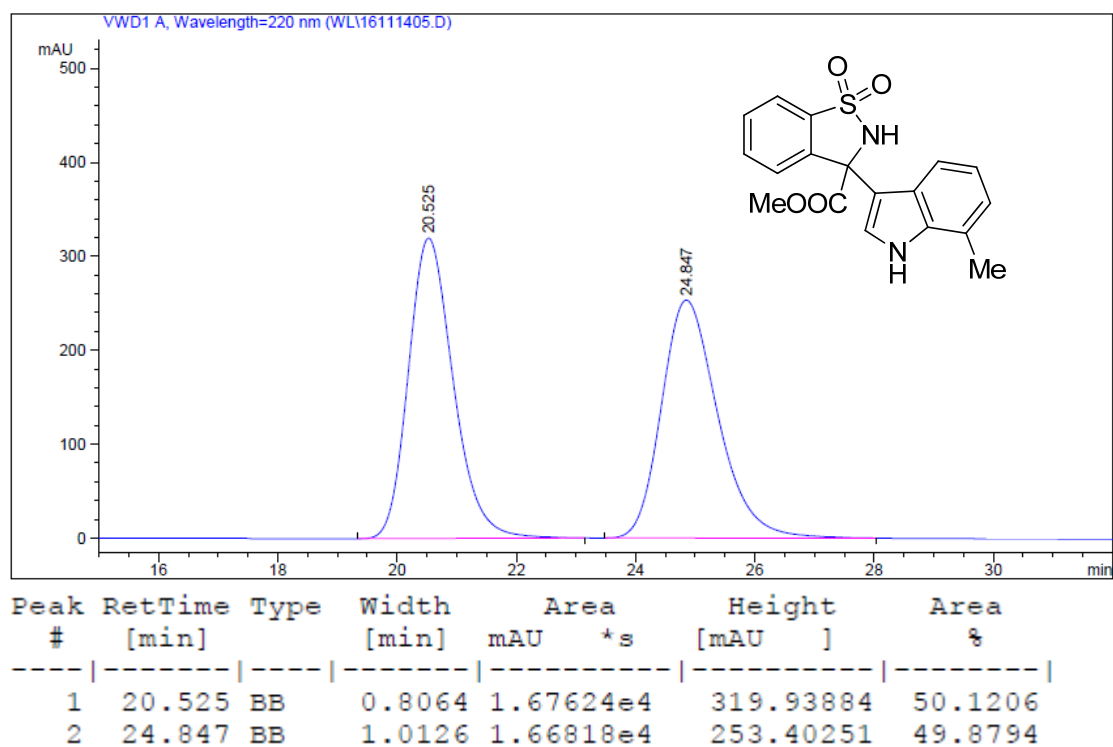
(S)-3-methoxycarbonyl-3-(2-methyl-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3f**)



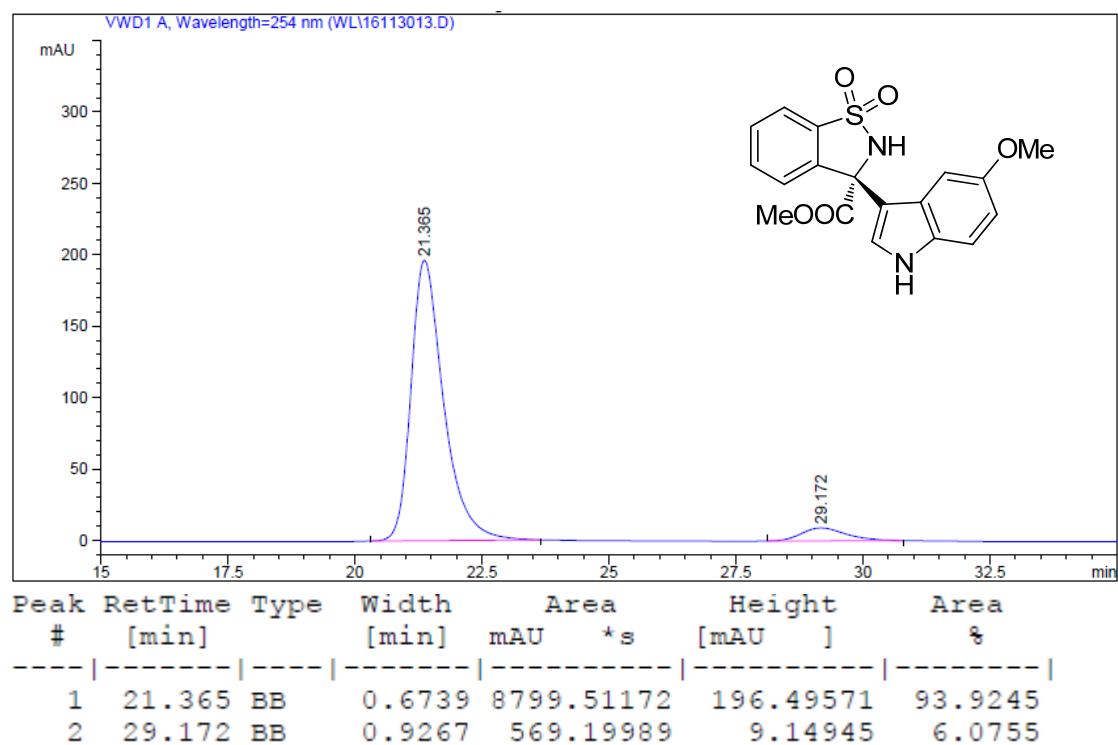
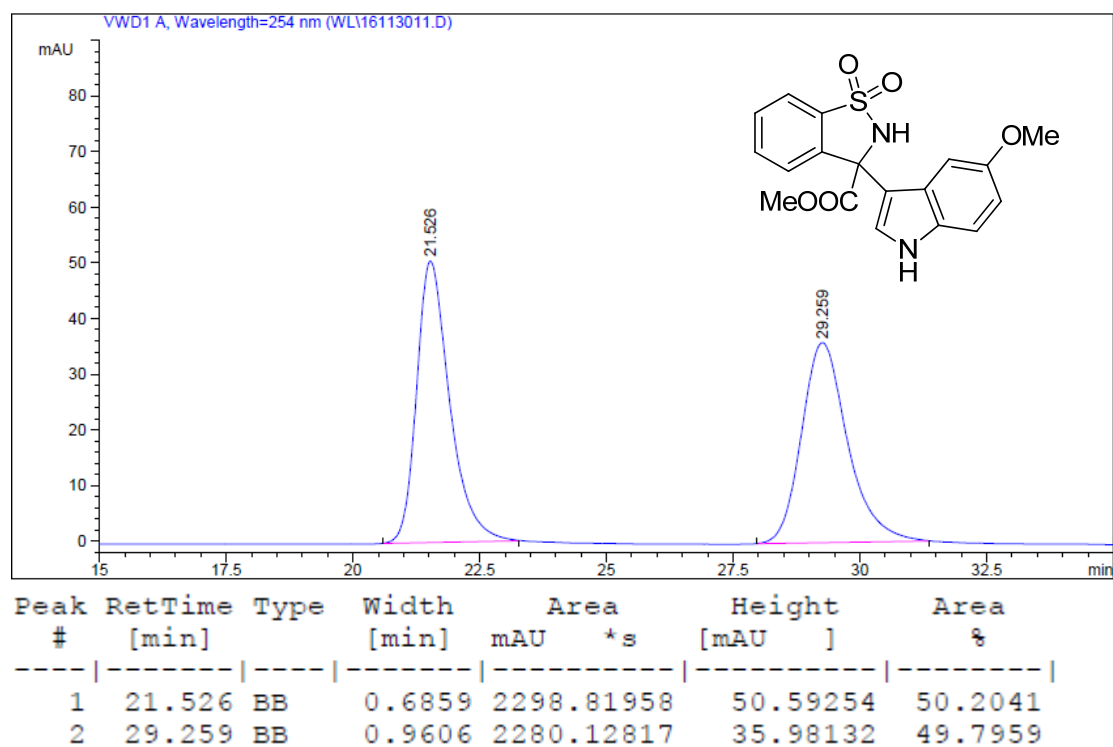
(S)-3-methoxycarbonyl-3-(5-methyl-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3g**)

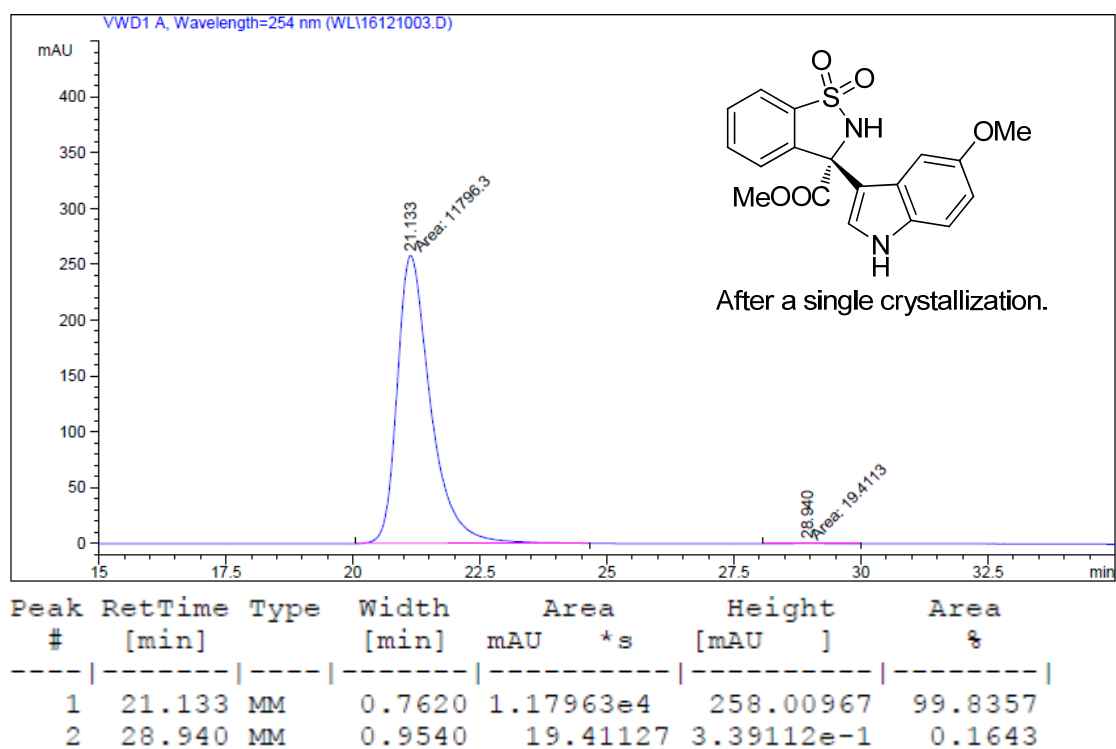


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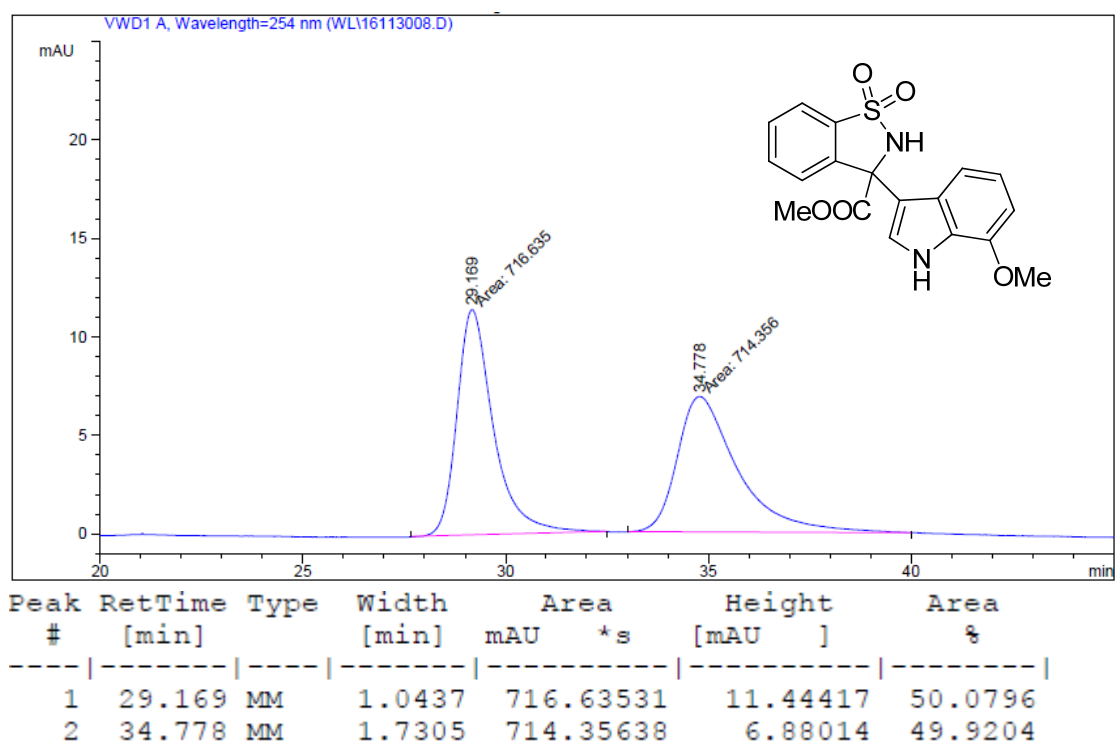


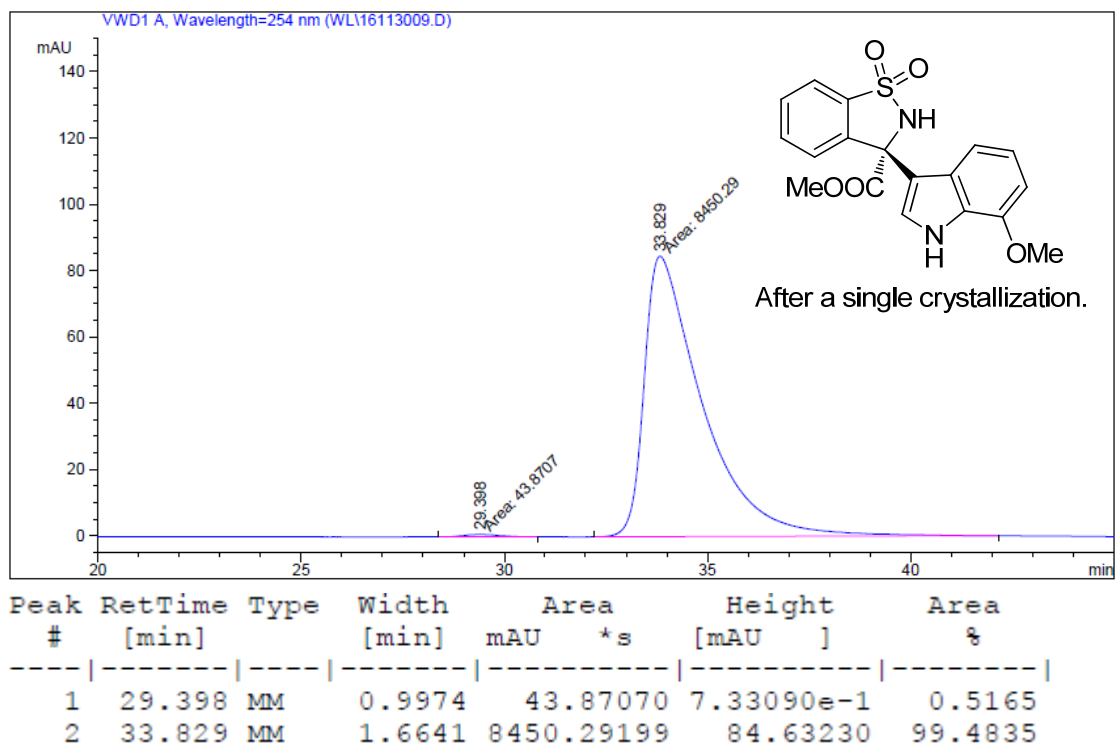
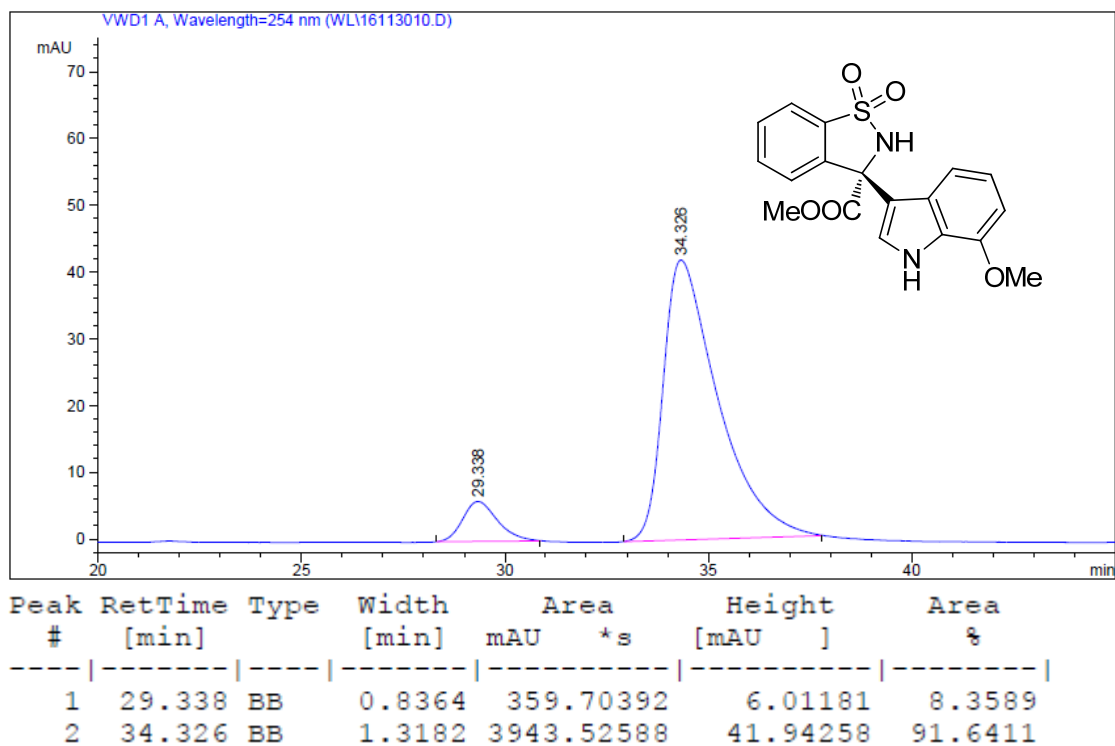
(S)-3-methoxycarbonyl-3-(5-methoxy-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3i**)



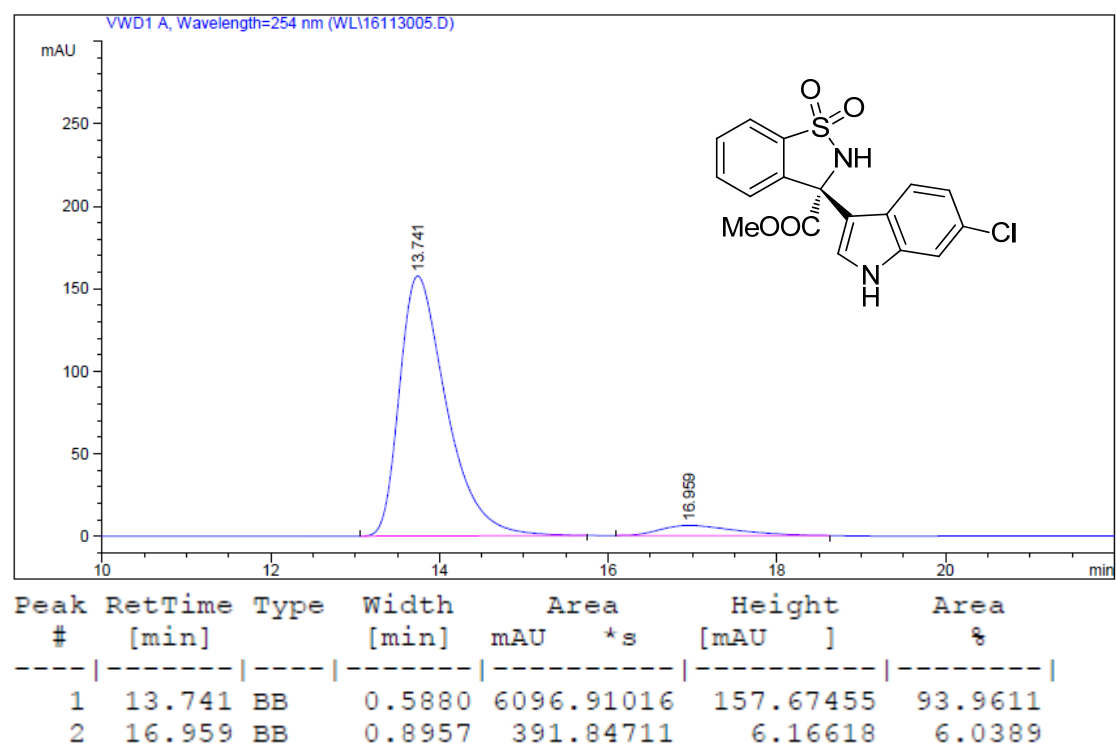
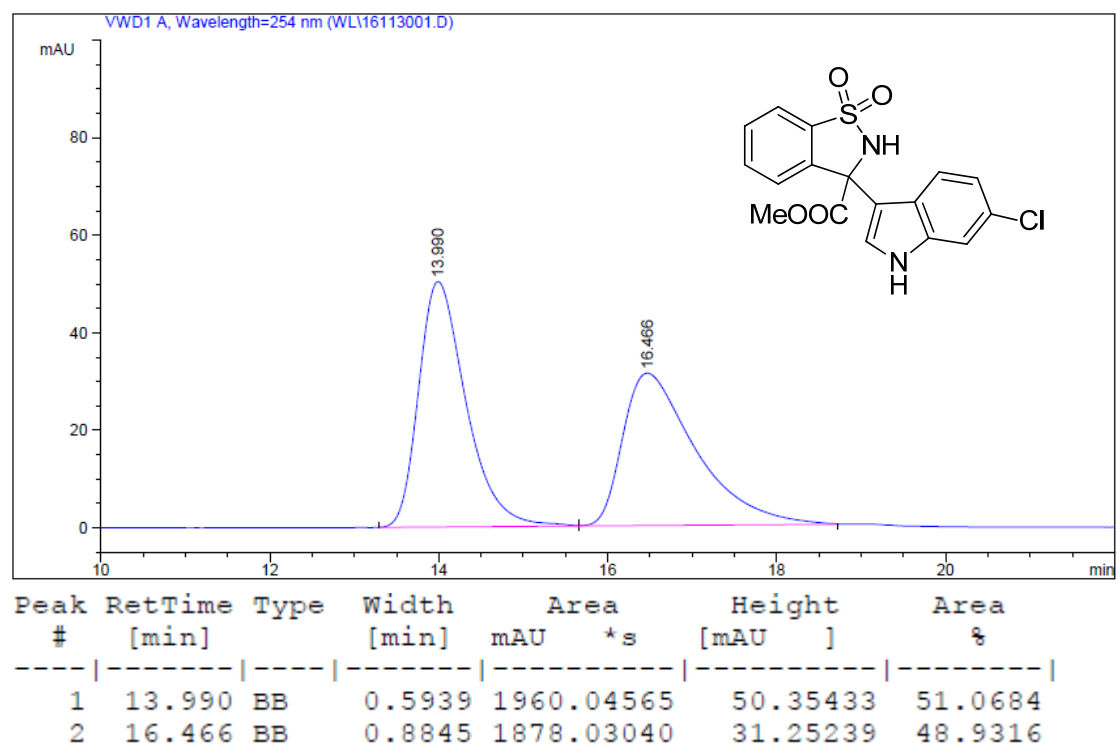


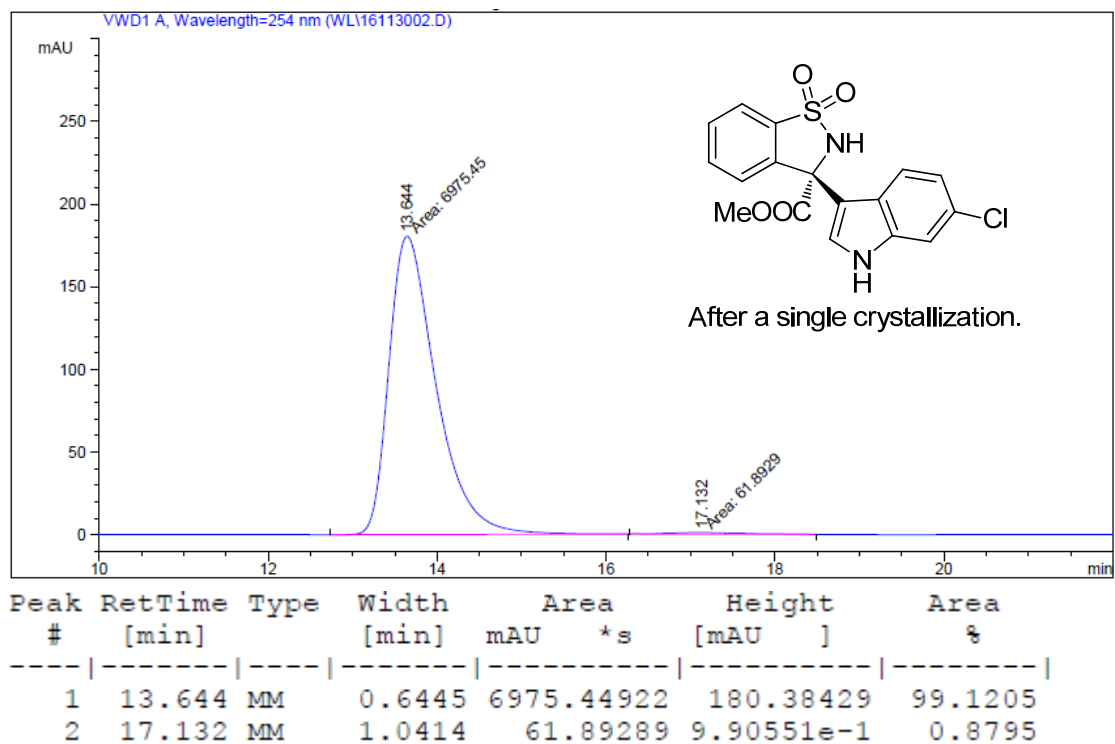
(S)-3-methoxycarbonyl-3-(7-methoxy-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3j**)



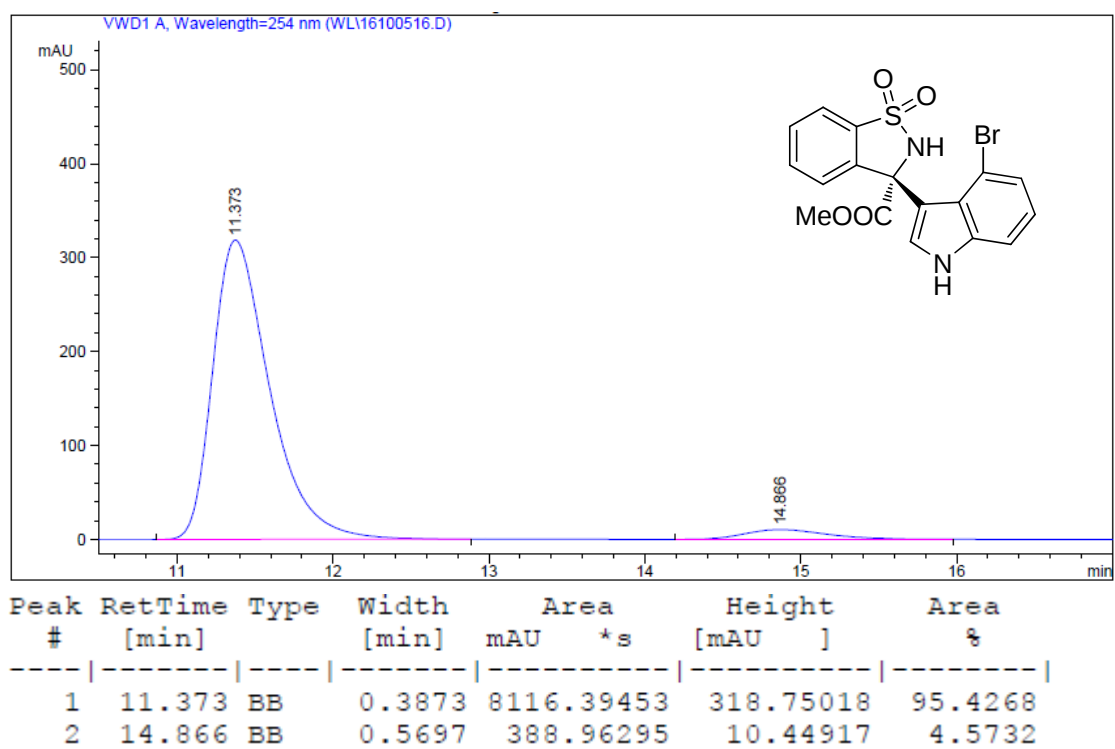
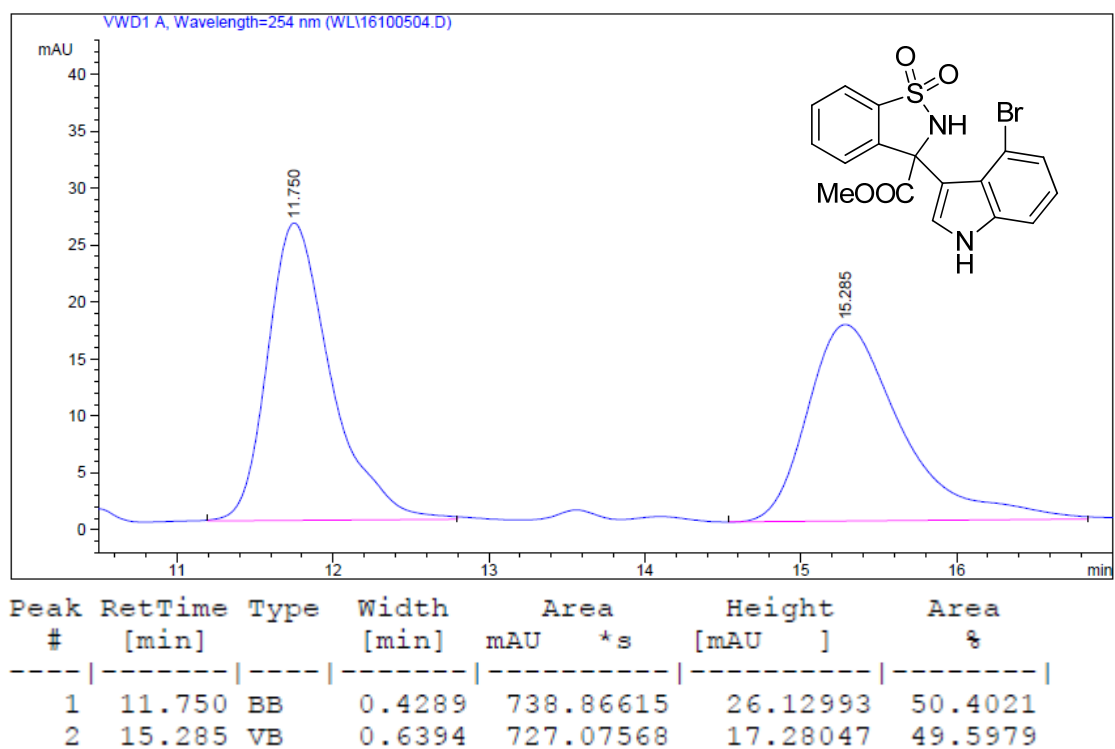


(S)-3-methoxycarbonyl-3-(6-chloro-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3k**)

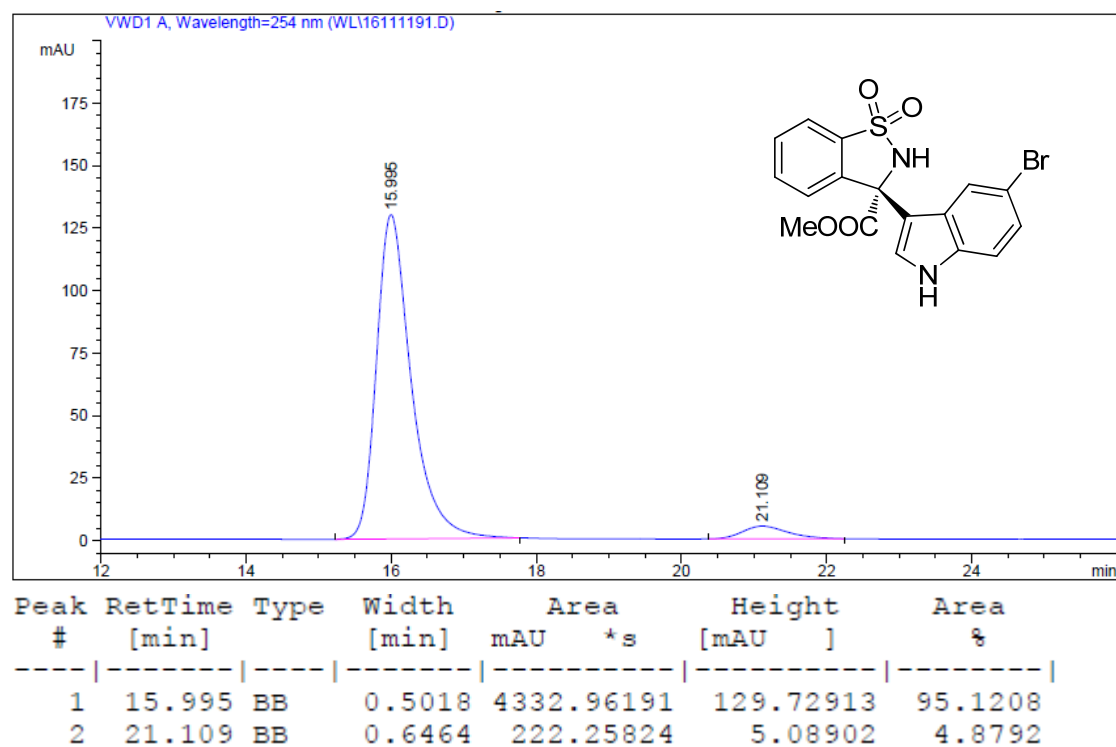
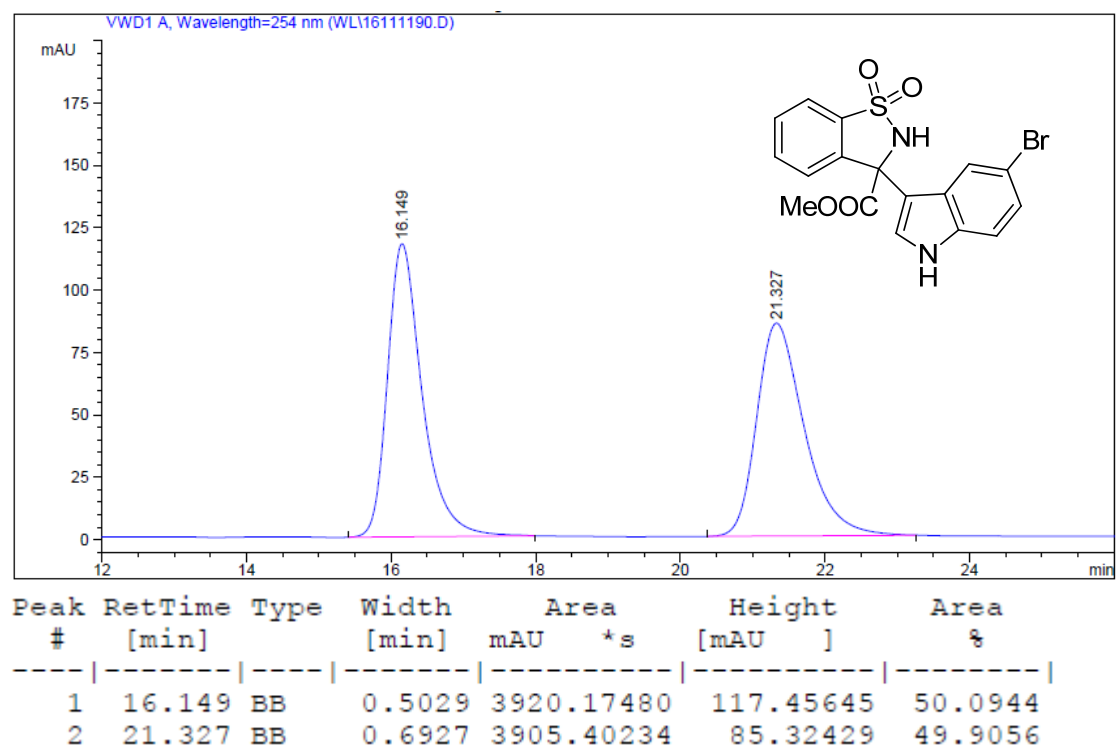




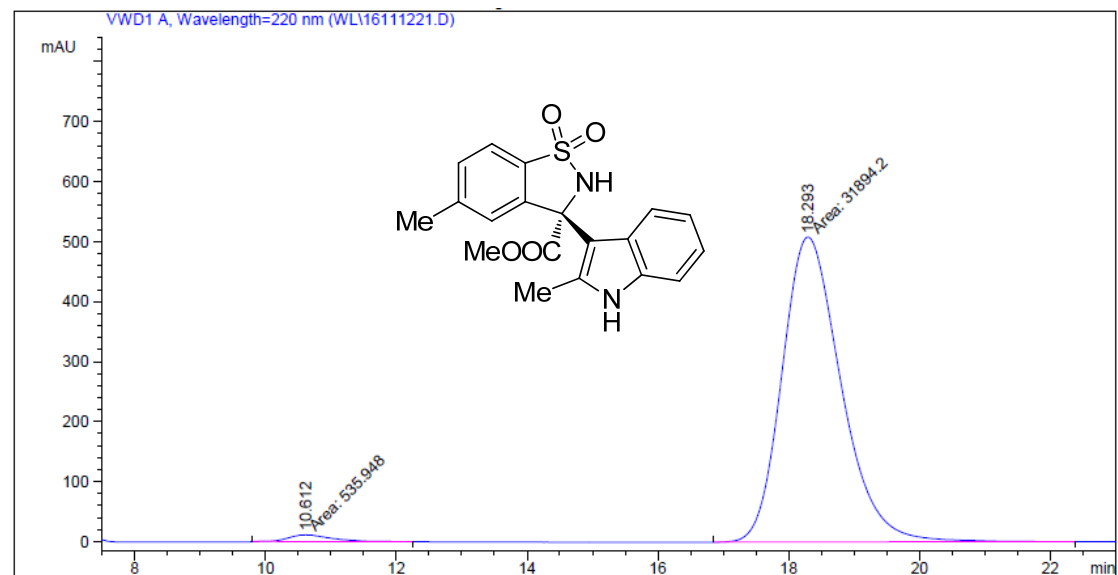
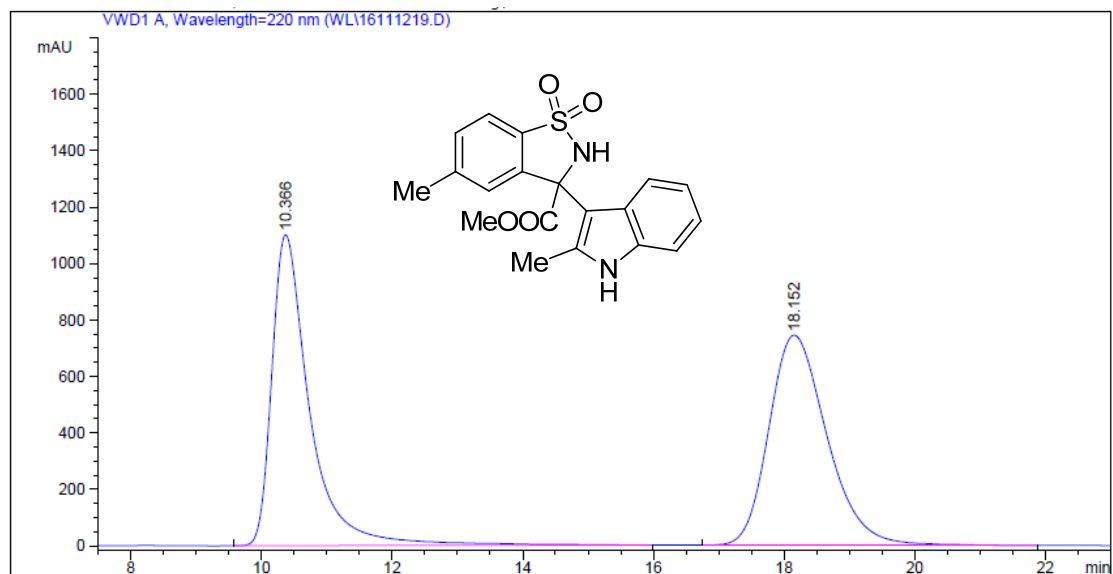
(S)-3-methoxycarbonyl-3-(4-bromo-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3l**)



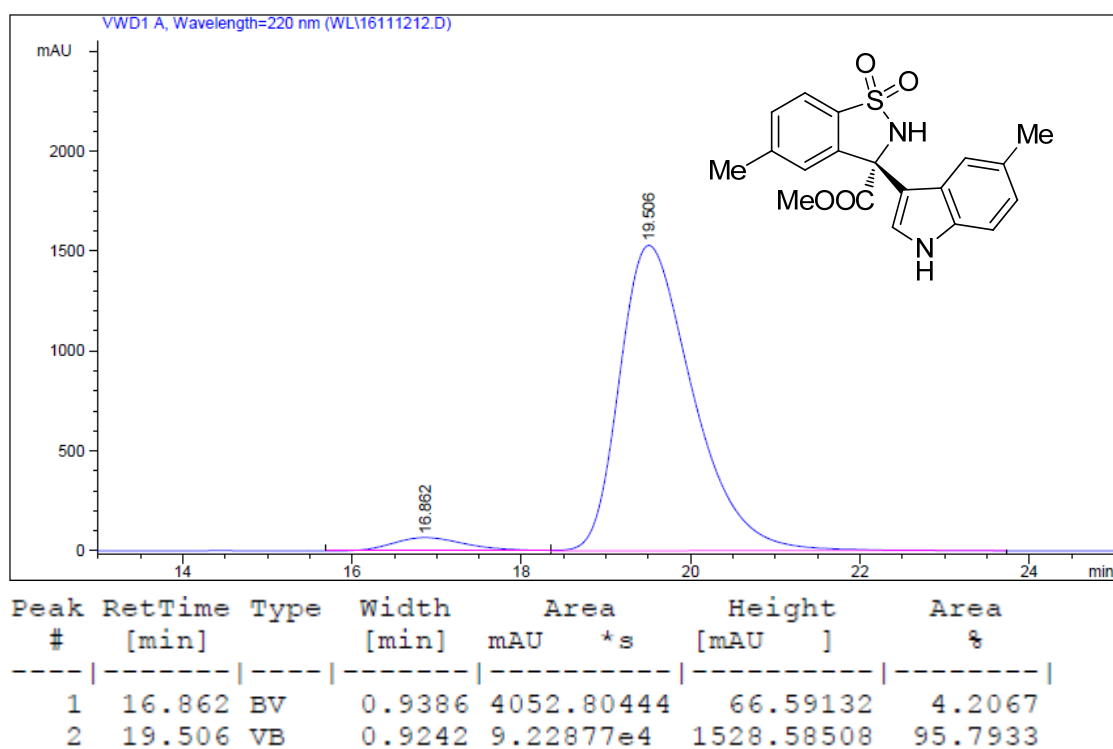
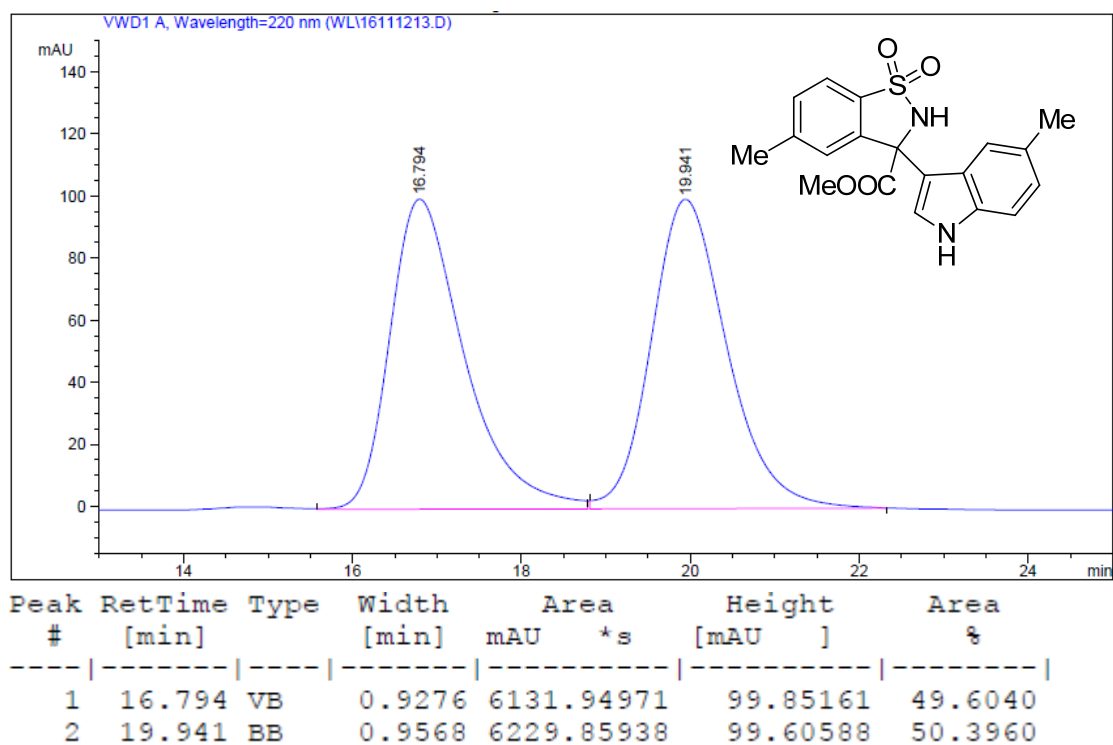
(S)-3-methoxycarbonyl-3-(5-bromo-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3m**)



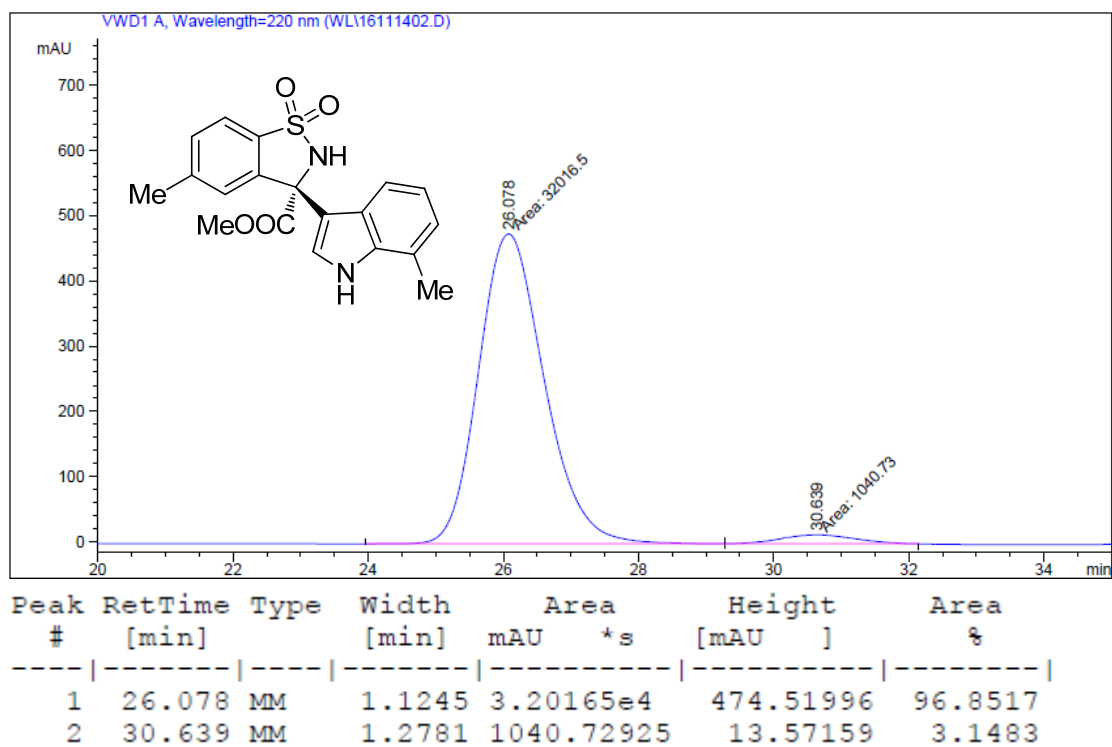
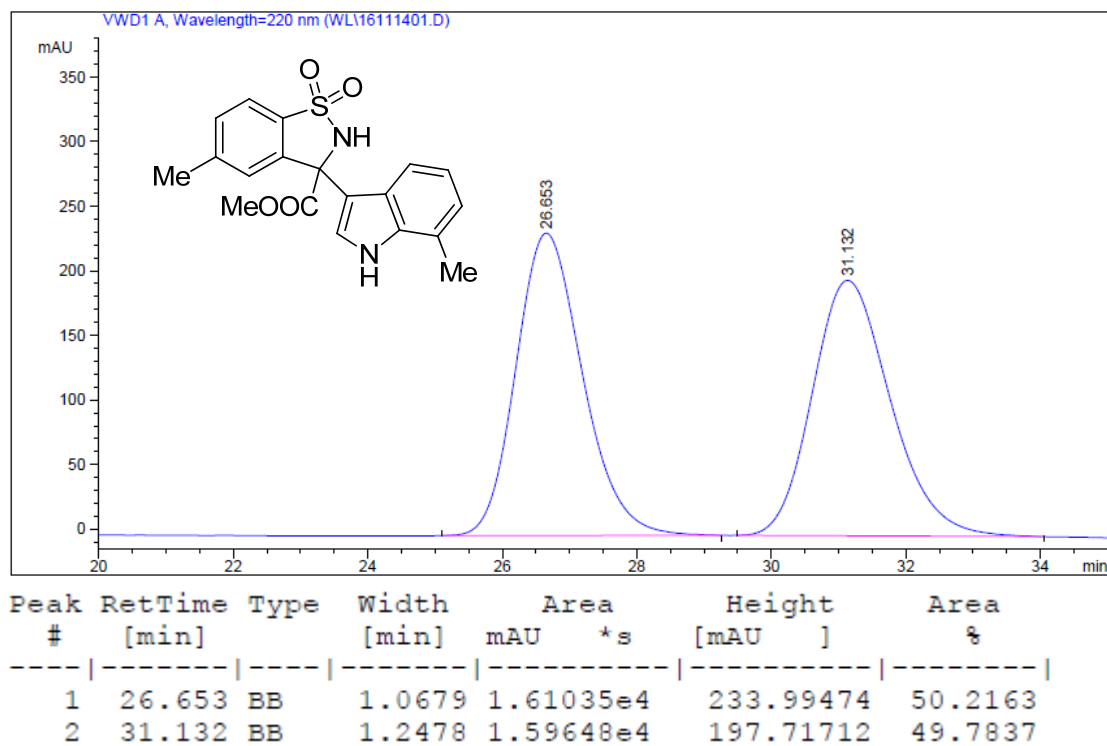
(S)-3-methoxycarbonyl-3-(2-methyl-3-indolyl)-5-methyl-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3n**)



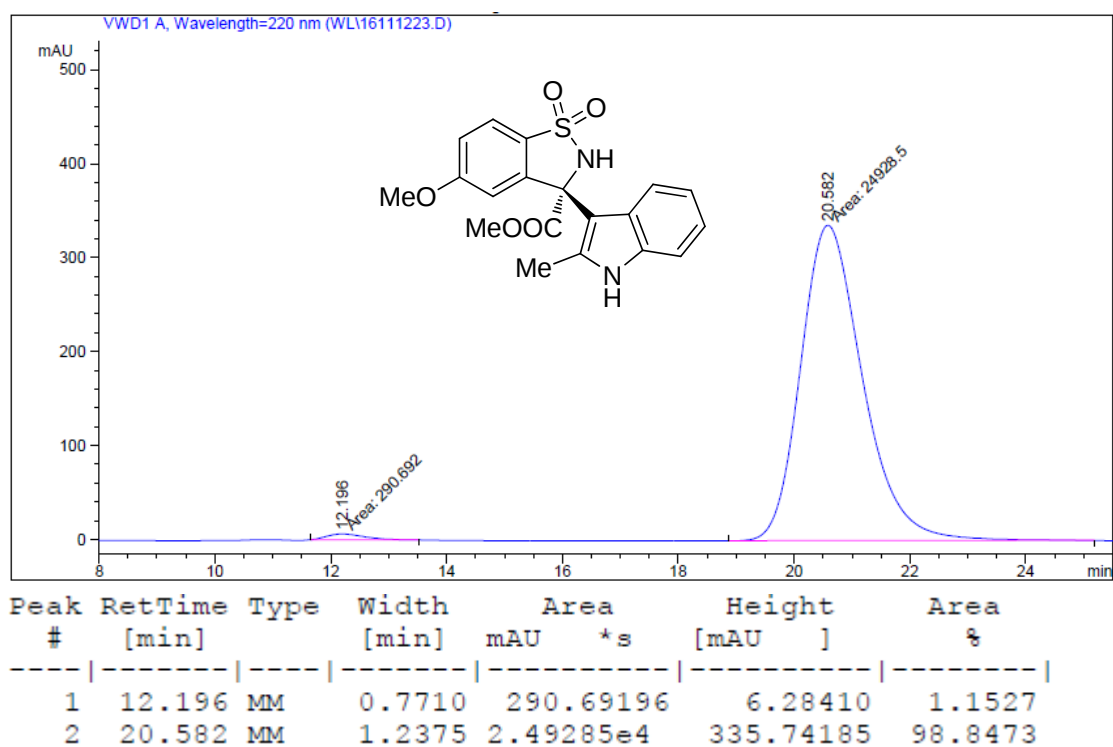
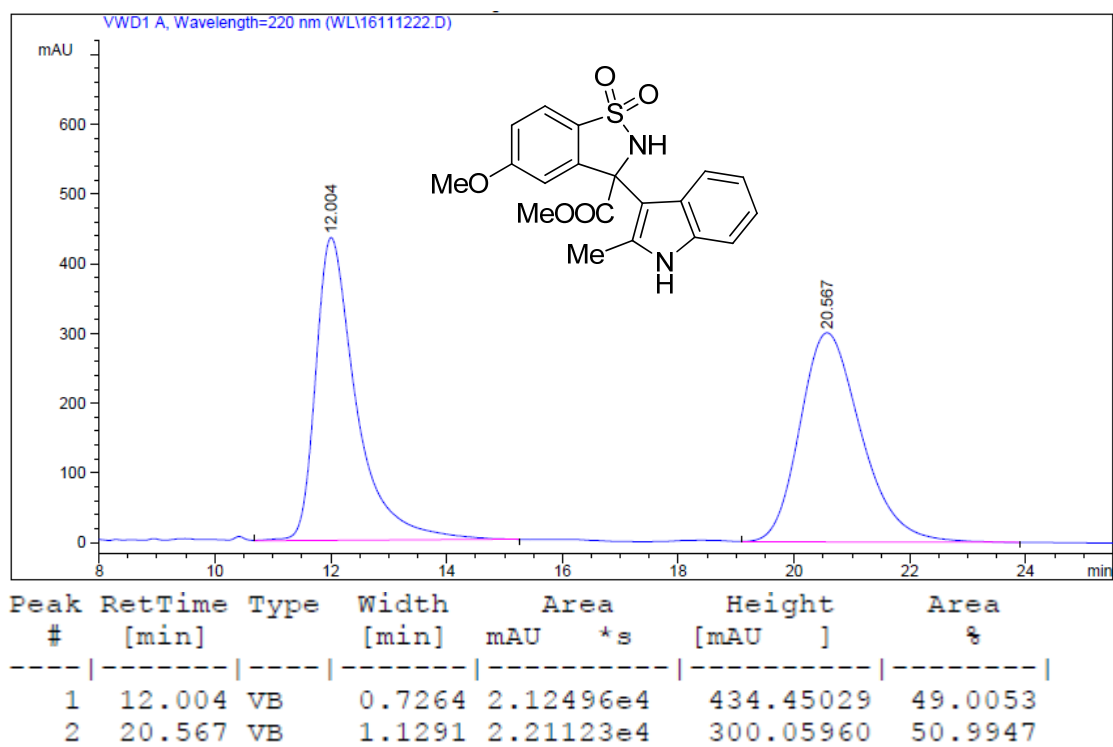
(S)-3-methoxycarbonyl-3-(5-methyl-3-indolyl)-5-methyl-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3o**)



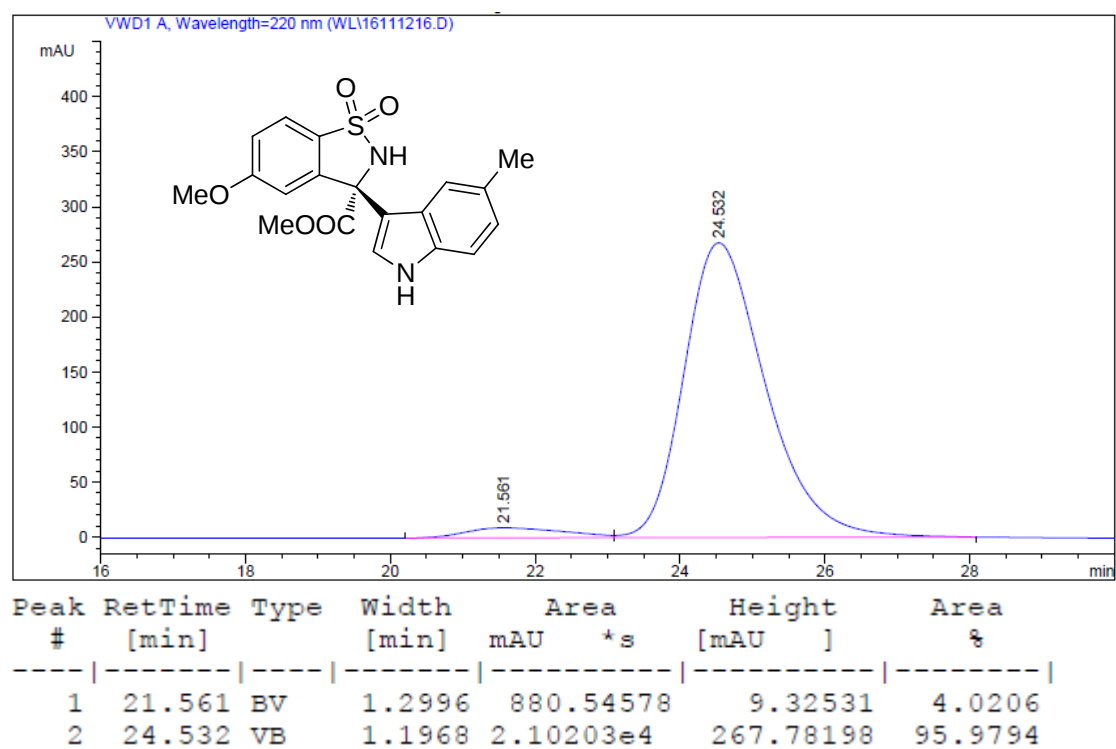
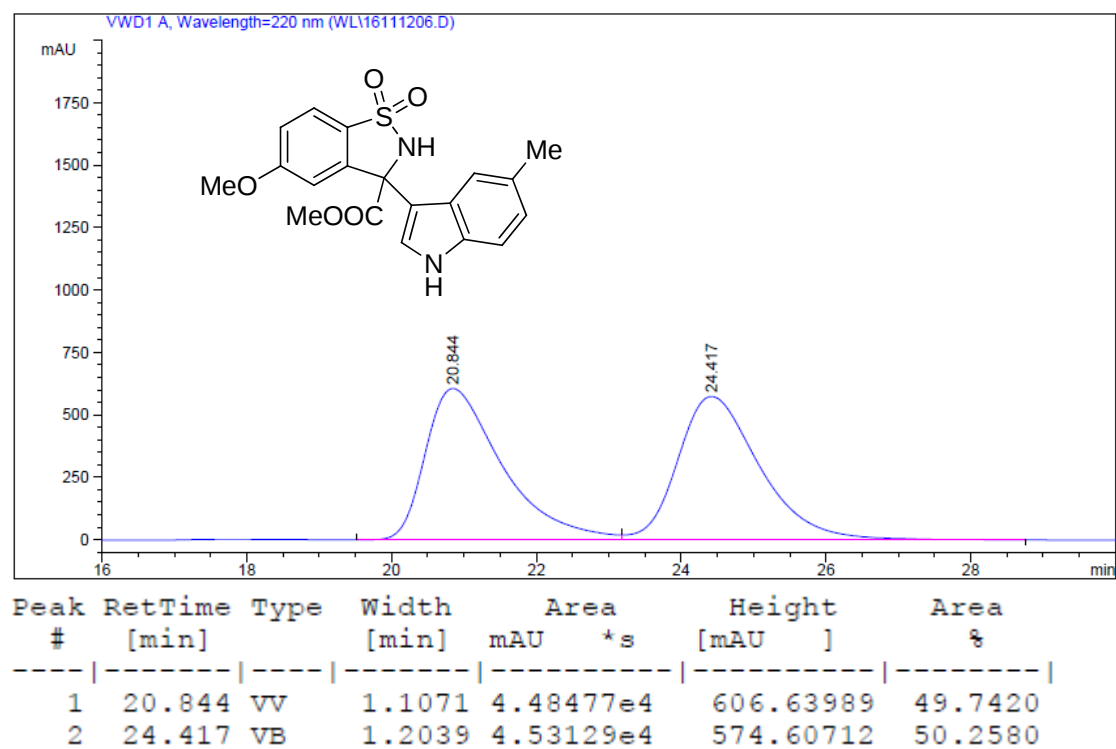
(S)-3-methoxycarbonyl-3-(7-methyl-3-indolyl)-5-methyl-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3p**)



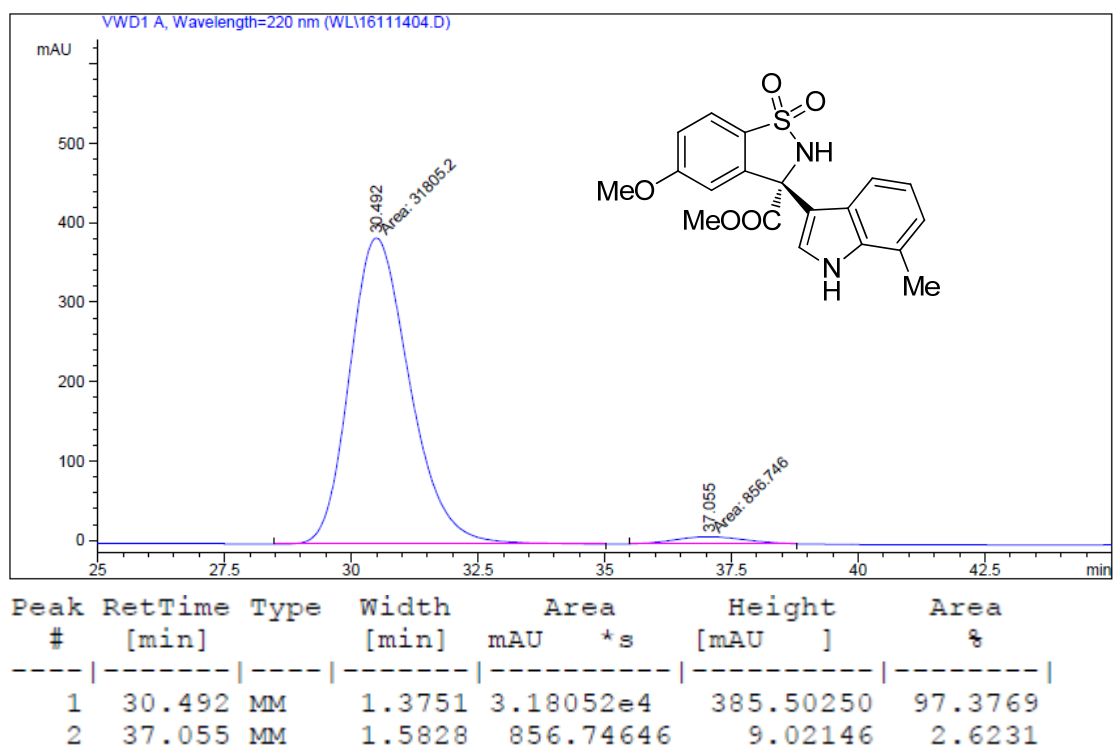
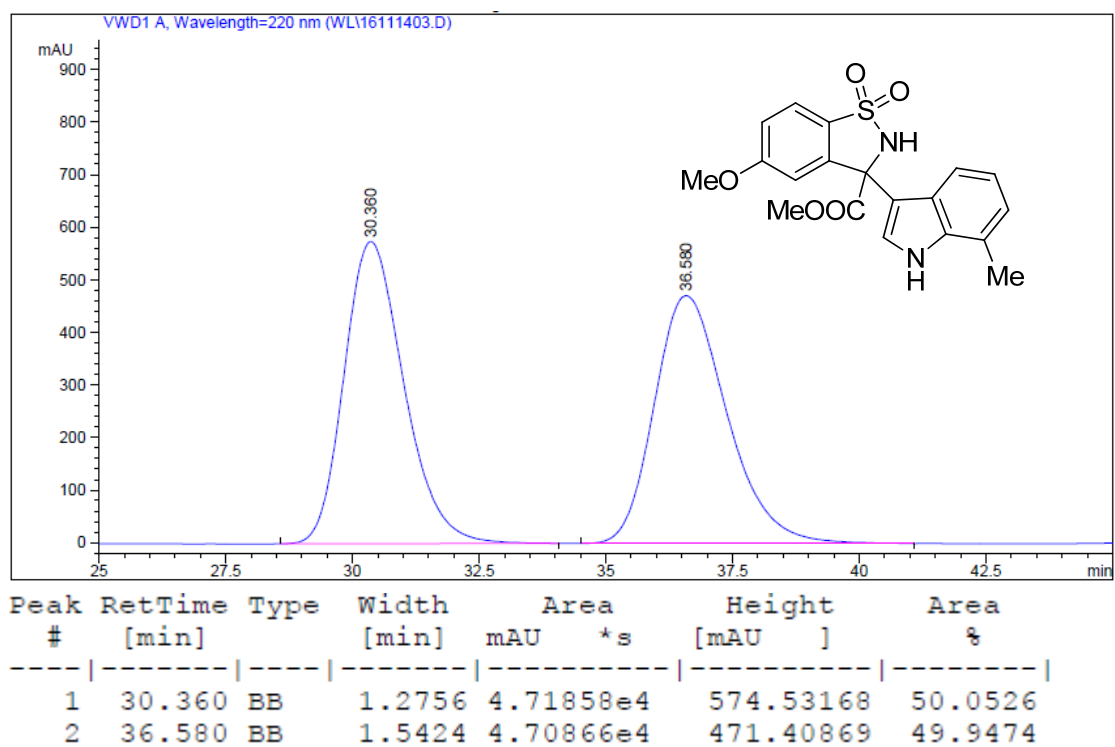
(S)-3-methoxycarbonyl-3-(2-methyl-3-indolyl)-5-methoxy-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3q**)



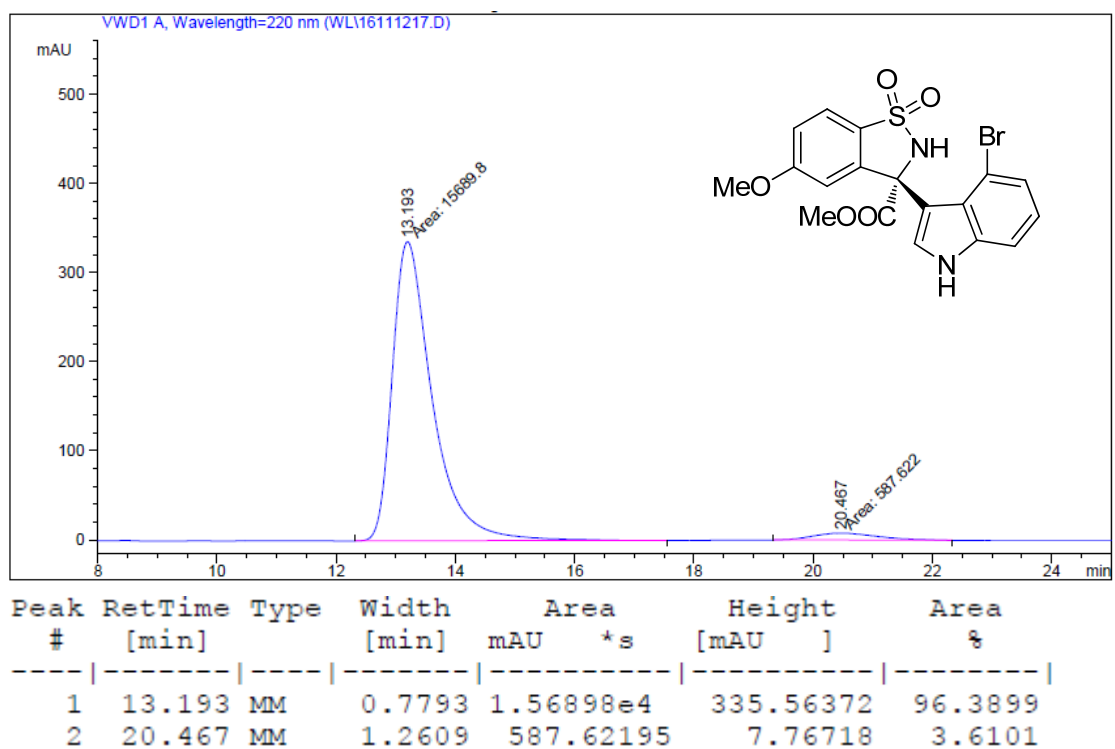
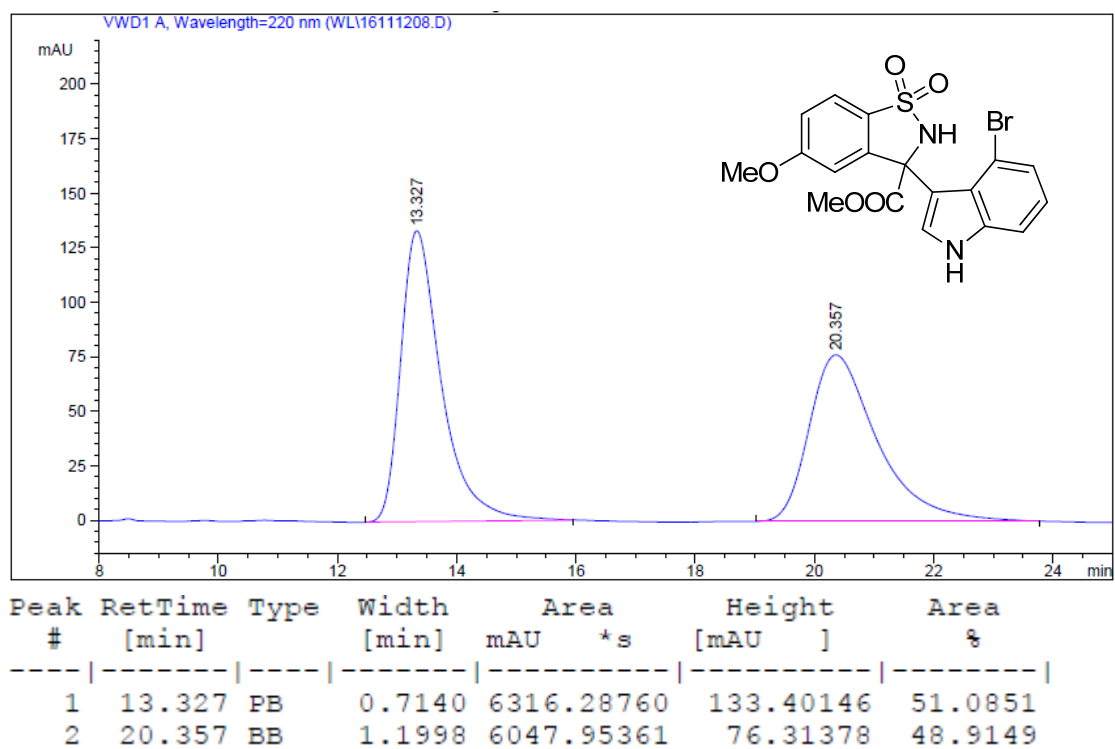
(S)-3-methoxycarbonyl-3-(5-methyl-3-indolyl)-5-methoxy-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3r**)



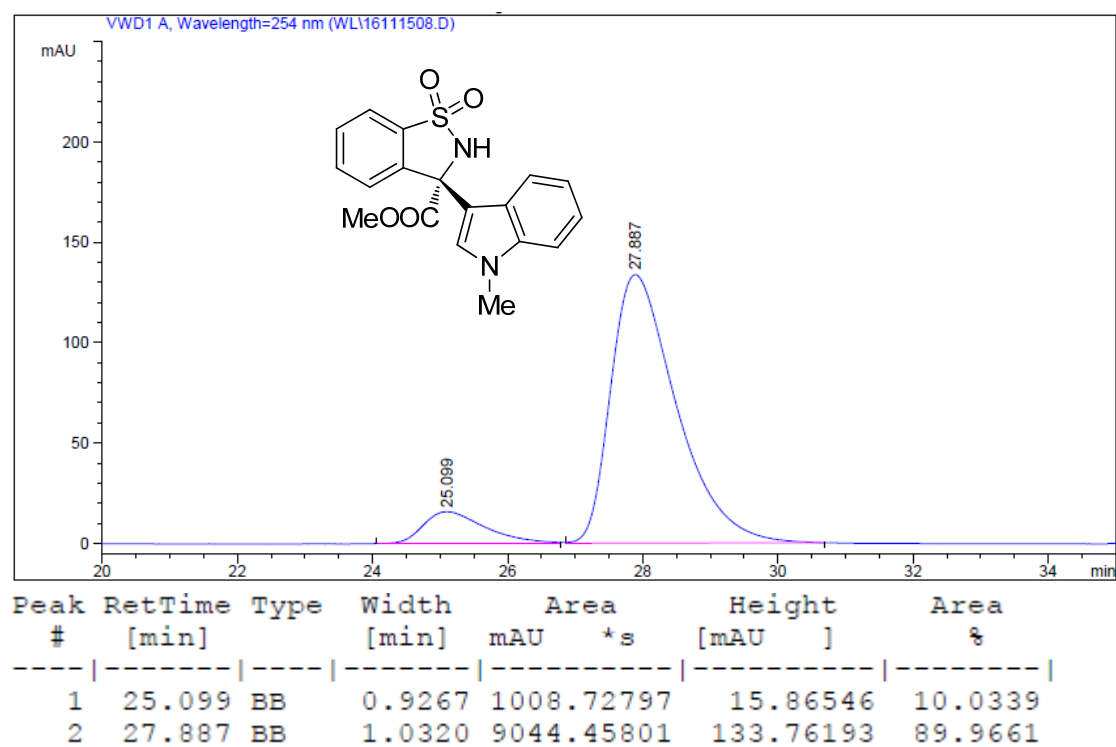
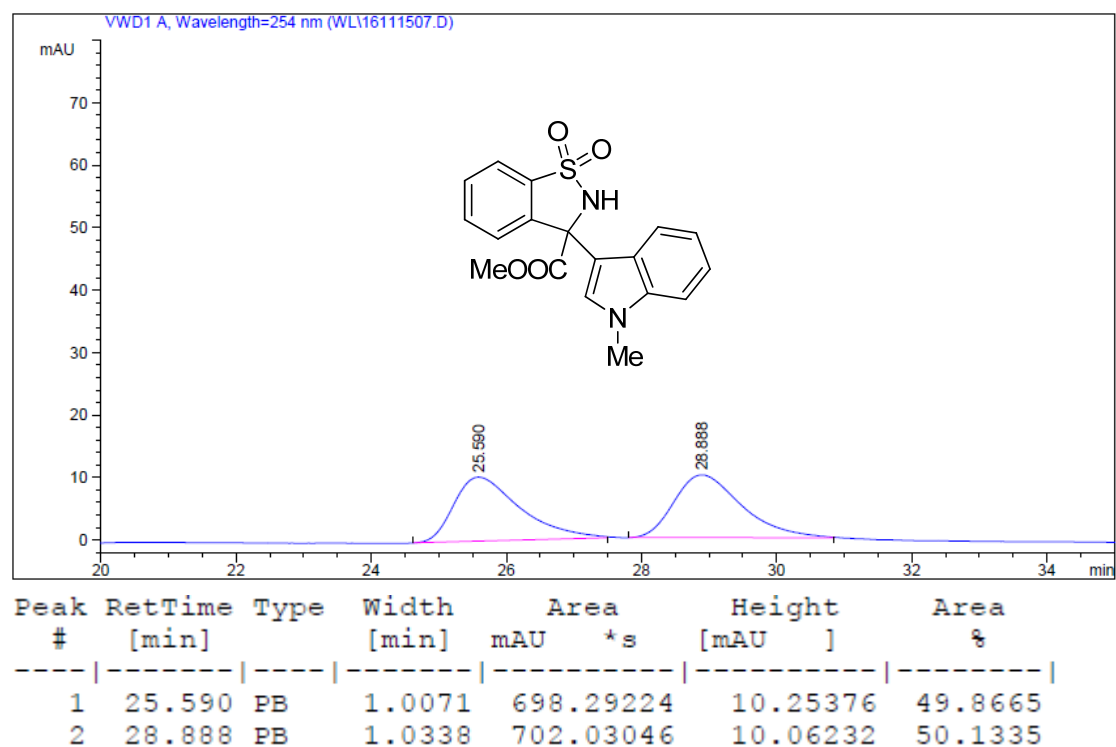
(S)-3-methoxycarbonyl-3-(7-methyl-3-indolyl)-5-methoxy-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3s**)



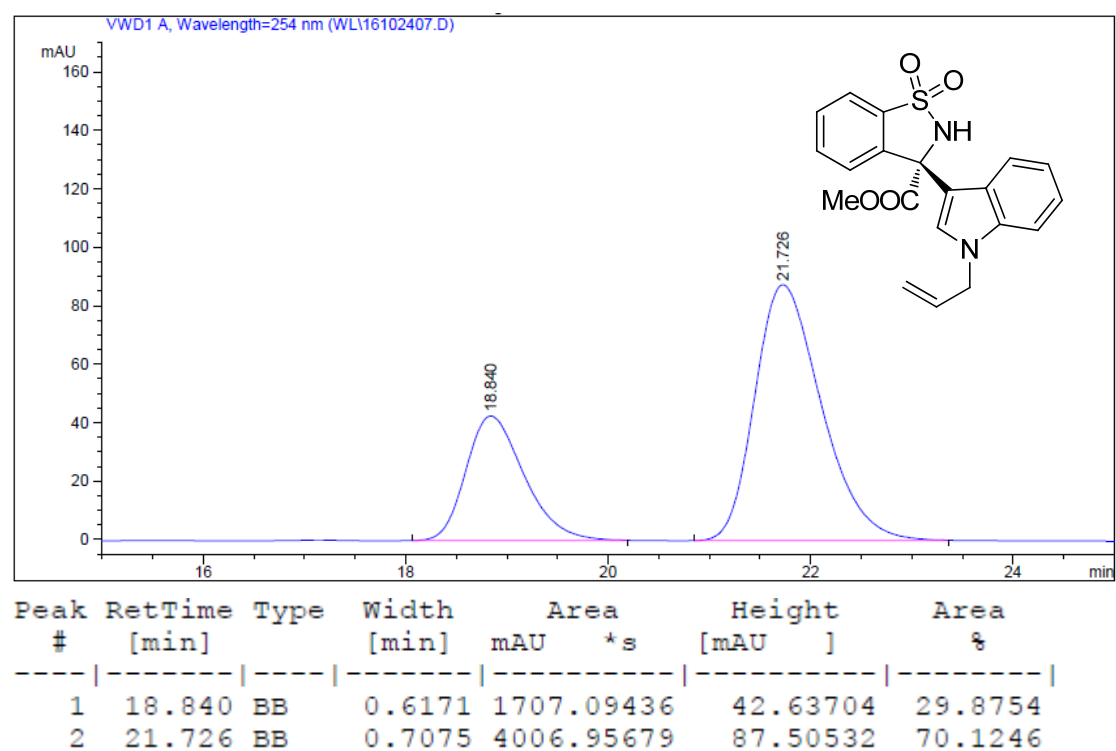
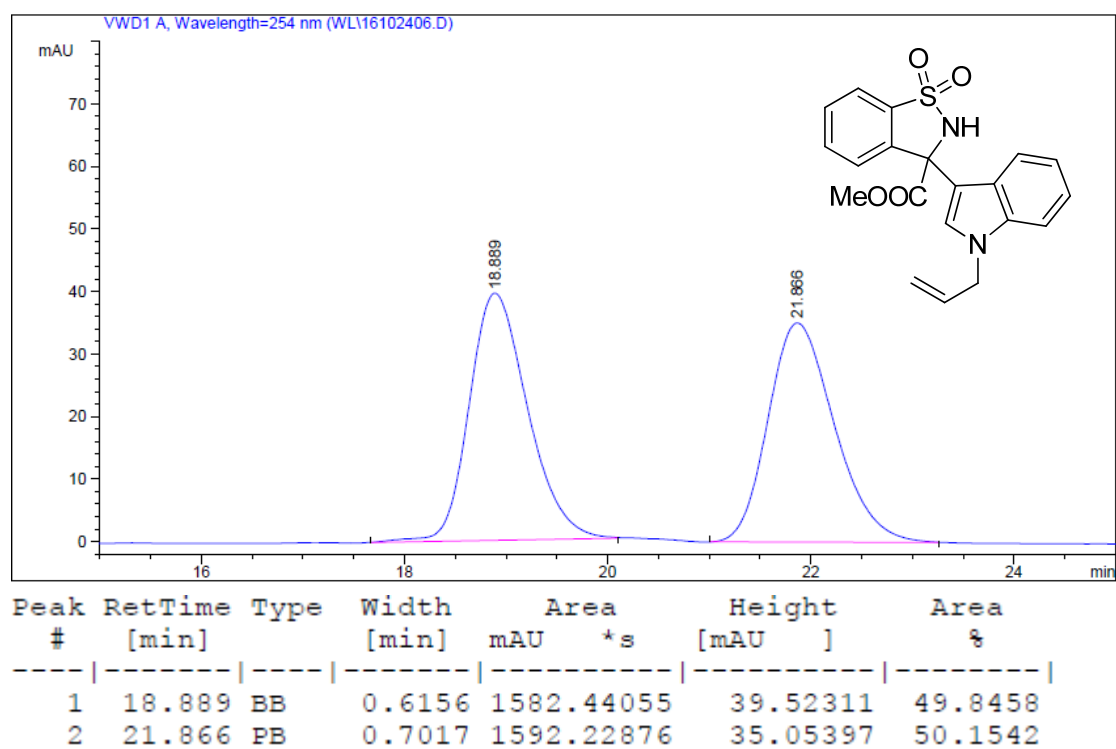
(S)-3-methoxycarbonyl-3-(4-bromo-3-indolyl)-5-methoxy-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3t**)



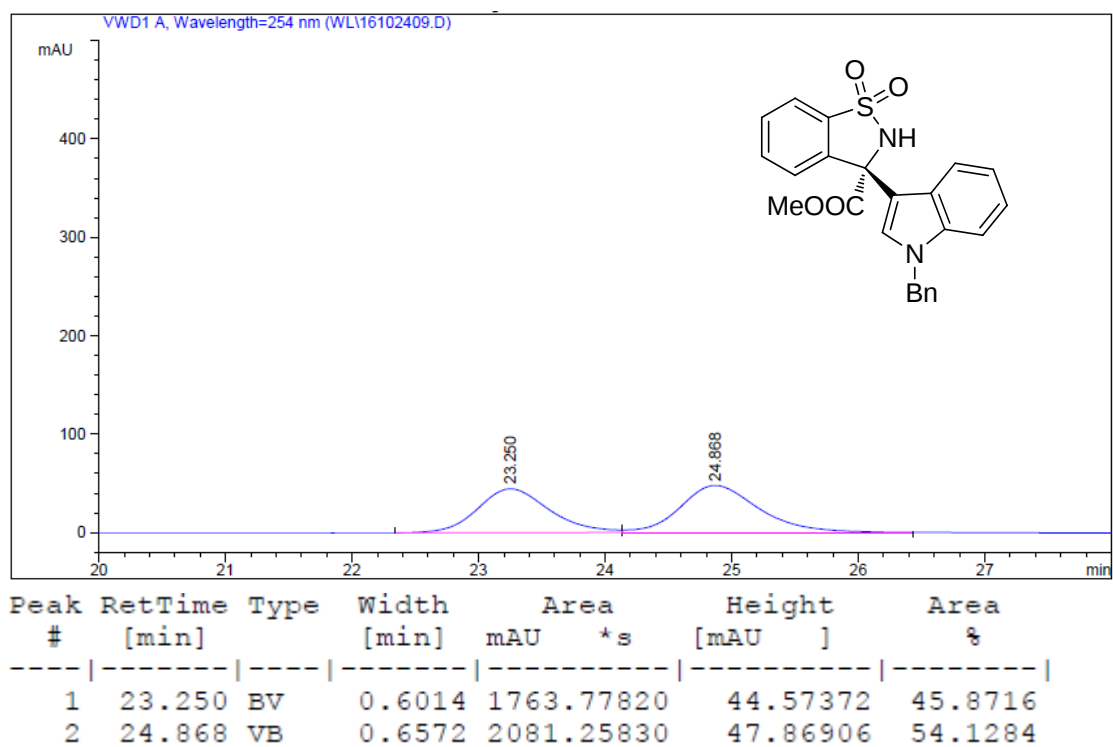
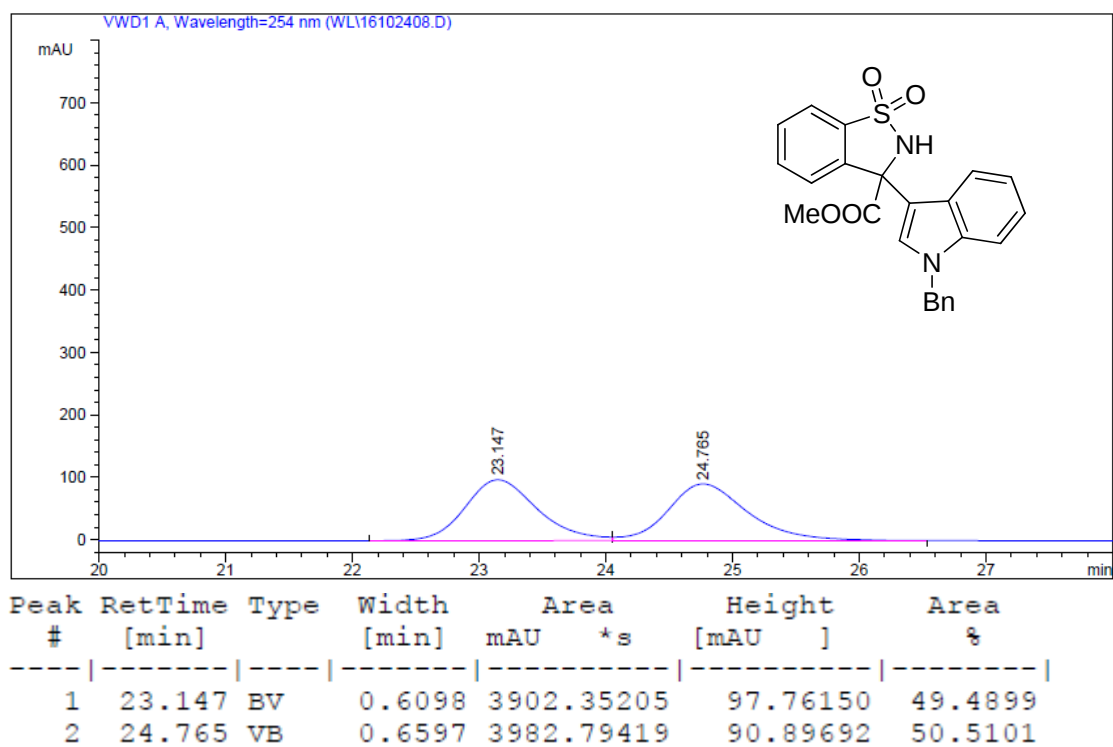
(S)-3-methoxycarbonyl-3-(1-methyl-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3u**)



(S)-3-methoxycarbonyl-3-(1-allyl-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3v**)



(S)-3-methoxycarbonyl-3-(1-benzyl-3-indolyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (**3w**)



3-methoxycarbonyl-3-(pyrrolyl)-5-methyl-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide
(7)

