



## Supporting Information

for

### **Mechanochemical synthesis of poly(trimethylene carbonate)s: an example of rate acceleration**

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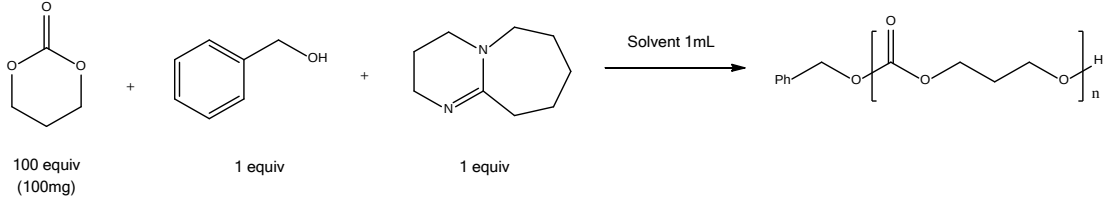
### **Raw data for tables, GPC and NMR spectra**

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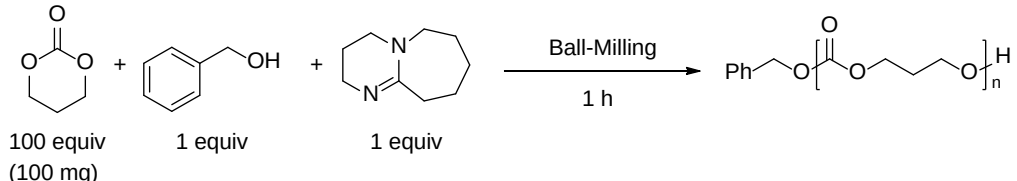
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## A. Raw data for tables

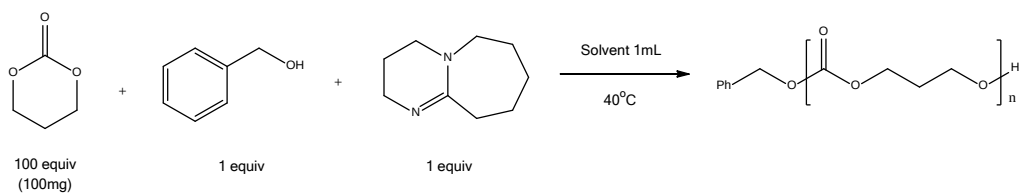
Table S1: DBU-catalyzed polymerization of trimethylene carbonate: solution vs. ball-milling.

|  |                                 |         |                       |                                |                                |                        |                                        |
|------------------------------------------------------------------------------------|---------------------------------|---------|-----------------------|--------------------------------|--------------------------------|------------------------|----------------------------------------|
| Entry                                                                              | Solvent                         | Time(h) | Conv (%) <sup>b</sup> | $M_n$<br>(kg/mol) <sup>c</sup> | $M_w$<br>(kg/mol) <sup>c</sup> | $M_w/M_n$ <sup>c</sup> | Condition                              |
| 1                                                                                  | Chloroform                      | 1       | 1                     | -                              | -                              | -                      | solution,                              |
| 2                                                                                  |                                 | 24      | 24                    | 2120                           | 2270                           | 1.07                   |                                        |
| 3                                                                                  | THF                             | 1       | <1                    | -                              | -                              | -                      | solution                               |
| 4                                                                                  |                                 | 24      | 5                     | -                              | -                              | -                      |                                        |
| 5                                                                                  | Toluene                         | 1       | <1                    | -                              | -                              | -                      | solution                               |
| 6                                                                                  |                                 | 24      | 23                    | 2660                           | 2950                           | 1.11                   |                                        |
| 7                                                                                  | CH <sub>2</sub> Cl <sub>2</sub> | 1       | 3                     | -                              | -                              | -                      | solution                               |
| 8                                                                                  |                                 | 24      | 43                    | 3990                           | 4200                           | 1.05                   |                                        |
| 9-1                                                                                | Ball Mill<br>No-solvent         | 0.5     | 44                    | 3990                           | 4370                           | 1.09                   | 10mL container<br>7mm ball * 3<br>30Hz |
| 9-2                                                                                |                                 | 0.5     | 41                    | 3870                           | 4330                           | 1.12                   |                                        |
| 10-1                                                                               |                                 | 1       | 70                    | 7130                           | 8020                           | 1.12                   |                                        |
| 10-2                                                                               |                                 | 1       | 80                    | 7620                           | 8680                           | 1.14                   |                                        |
| 11-1                                                                               |                                 | 2       | 91                    | 9420                           | 11020                          | 1.17                   |                                        |
| 11-2                                                                               |                                 | 2       | 95                    | 9030                           | 10130                          | 1.12                   |                                        |

**Table S2:** Vibration and ball size effects.

| <div><div><div><div>100 equiv<br/>(100 mg)</div><div>1 equiv</div><div>1 equiv</div><div>Ball-Milling<br/>1 h</div><div><math>\text{PhCH}_2\text{O}-\left[\text{C}(=\text{O})\text{OCH}_2\text{CH}_2\text{CH}_2\text{O}\right]_n\text{H}</math></div></div></div></div> |                             |                         |                                 |                                 |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------------|---------------------------------|---------------------------------|-----------|
| entry                                                                                                                                                                                                                                                                                                                                                     | Frequency and Ball diameter | Conv (%) <sup>[c]</sup> | $M_n$<br>(g/mol) <sup>[d]</sup> | $M_w$<br>(g/mol) <sup>[d]</sup> | $M_w/M_n$ |
| 1-1                                                                                                                                                                                                                                                                                                                                                       | 10 Hz, 7 mm x 3 ea          | 59                      | 5710                            | 6340                            | 1.11      |
| 1-2                                                                                                                                                                                                                                                                                                                                                       |                             | 60                      | 5680                            | 6290                            | 1.11      |
| 2-1                                                                                                                                                                                                                                                                                                                                                       | 20 Hz, 7 mm x 3 ea          | 65                      | 5980                            | 6340                            | 1.09      |
| 2-2                                                                                                                                                                                                                                                                                                                                                       |                             | 61                      | 6030                            | 6680                            | 1.11      |
| 3-1                                                                                                                                                                                                                                                                                                                                                       | 30 Hz, 7 mm x 3 ea          | 70                      | 7130                            | 8020                            | 1.12      |
| 3-2                                                                                                                                                                                                                                                                                                                                                       |                             | 80                      | 7620                            | 8680                            | 1.14      |
| 4-1                                                                                                                                                                                                                                                                                                                                                       | 30 Hz, 7 mm x 5 ea          | 89                      | 7120                            | 8150                            | 1.14      |
| 4-2                                                                                                                                                                                                                                                                                                                                                       |                             | 87                      | 6640                            | 7470                            | 1.13      |
| 5-1                                                                                                                                                                                                                                                                                                                                                       | 30 Hz, 12 mm x 1 ea         | 81                      | 6610                            | 7420                            | 1.12      |
| 5-2                                                                                                                                                                                                                                                                                                                                                       |                             | 86                      | 6710                            | 7590                            | 1.13      |

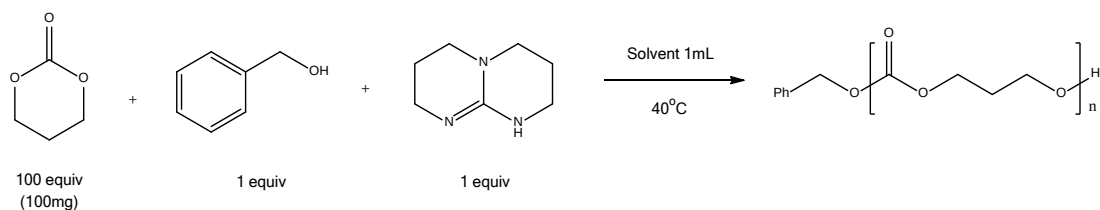
\* Entries 3-1 and 3-2 are from entries 10-1 and 10-2 of Table S1.

**Table S3.** DBU-catalyzed polymerization of trimethylene carbonate at 40 °C.

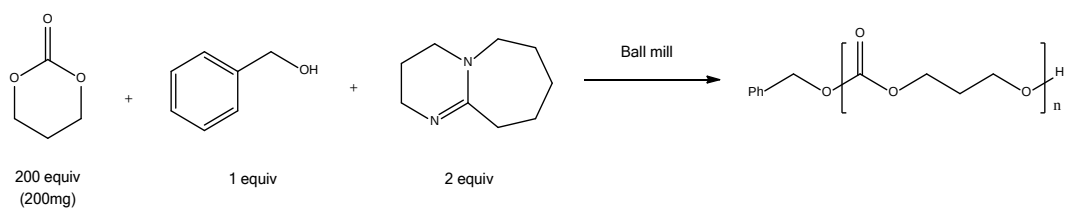
| Entry | Solvent                         | Time(h) | Conv (%) <sup>b</sup> | $M_n$<br>(kg/mol) <sup>c</sup> | $M_w$<br>(kg/mol) <sup>c</sup> | $M_w/M_n$ <sup>c</sup> | Condition                 |
|-------|---------------------------------|---------|-----------------------|--------------------------------|--------------------------------|------------------------|---------------------------|
| 1     | Chloroform                      | 1       | 3                     | -                              | -                              | -                      | solution, 40°C            |
| 2     |                                 | 24      | 41                    | 3490                           | 3770                           | 1.08                   |                           |
| 3     | THF                             | 1       | <1                    | -                              | -                              | -                      | solution, 40°C            |
| 4     |                                 | 24      | 6                     | -                              | -                              | -                      |                           |
| 5     | Toluene                         | 1       | <1                    | -                              | -                              | -                      | solution, 40°C            |
| 6     |                                 | 24      | 70                    | 7130                           | 8380                           | 1.17                   |                           |
| 7     | CH <sub>2</sub> Cl <sub>2</sub> | 1       | 4                     | -                              | -                              | -                      | solution, 40°C            |
| 8     |                                 | 24      | 41                    | 3000                           | 3210                           | 1.07                   |                           |
| 9-1   | Ball Mill                       | 1       | 70                    | 7130                           | 8020                           | 1.12                   |                           |
| 9-2   | No-solvent                      | 1       | 80                    | 7620                           | 8680                           | 1.14                   |                           |
| 10-1  | Ball Mill                       | 2       | 91                    | 9420                           | 11020                          | 1.17                   | Final temperature 36.3 °C |
| 10-2  | No-solvent                      | 2       | 95                    | 9030                           | 10130                          | 1.12                   | Final temperature 36.1 °C |

\* Entries 9 and 10 are from entries 10 and 11 of Table S1.

**Table S4.** TBD catalyzed polymerization of trimethylene carbonate: solution vs. ball-milling.



| Entry | Solvent                                 | Time(min) | Conv (%) <sup>b</sup> | $M_n$<br>(kg/mol) <sup>c</sup> | $M_w$<br>(kg/mol) <sup>c</sup> | $M_w/M_n$ <sup>c</sup> | Condition                              |
|-------|-----------------------------------------|-----------|-----------------------|--------------------------------|--------------------------------|------------------------|----------------------------------------|
| 1     | Toluene                                 | 5         | 99                    | 12300                          | 19970                          | 1.62                   | Solution                               |
| 2     | Chloroform                              | 5         | 96                    | 8650                           | 9810                           | 1.13                   | Solution                               |
| 3     | <del>CH<sub>2</sub>Cl<sub>2</sub></del> | 5         | 86                    | 9330                           | 10530                          | 1.13                   | Solution                               |
| 4     | THF                                     | 5         | 76                    | 7710                           | 8750                           | 1.13                   | solution                               |
| 5-1   | Ball-Mill                               | 5         | 98                    | 13250                          | 28810                          | 2.17                   | 10mL container<br>7mm ball * 3<br>30Hz |
| 5-2   |                                         | 5         | 99                    | 11120                          | 20050                          | 1.80                   |                                        |

**Table S5.** PTMC synthesis with a high monomer to initiator ratio.

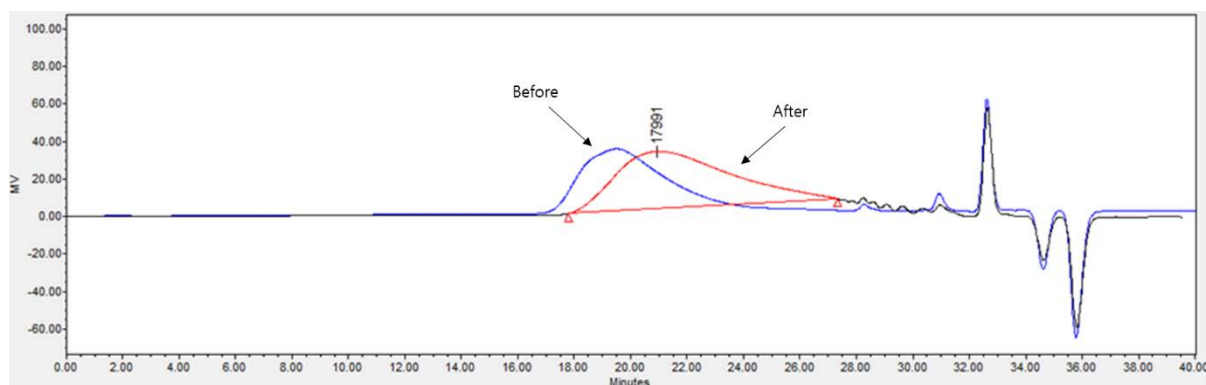
| Entry | Solvent                           | Time(h) | Conv (%) <sup>b</sup> | $M_n$ (kg/mol) <sup>c</sup> | $M_w$ (kg/mol) <sup>c</sup> | $M_w/M_n$ <sup>c</sup> | Condition                              |
|-------|-----------------------------------|---------|-----------------------|-----------------------------|-----------------------------|------------------------|----------------------------------------|
| 1-1   | Ball mill                         | 3       | 97                    | 10800                       | 13690                       | 1.27                   | 10mL container                         |
| 1-2   | (No solvent)                      | 3       | 98                    | 11010                       | 13510                       | 1.23                   | 7mm ball * 3<br>30Hz                   |
| 2     | Ball mill<br>(Toluene 10 $\mu$ L) | 3       | 86                    | 11940                       | 13090                       | 1.09                   | 10mL container<br>7mm ball * 3<br>30Hz |
| 3     | Ball mill<br>(Toluene 20 $\mu$ L) | 3       | 93                    | 11520                       | 13690                       | 1.19                   | 10mL container<br>7mm ball * 3<br>30Hz |
| 4     | Ball mill<br>(THF 20 $\mu$ L)     | 3       | 96                    | 11400                       | 13940                       | 1.22                   | 10mL container<br>7mm ball * 3<br>30Hz |

## B. High molecular weight PTMC synthesis and its degradation

### Experimental procedure

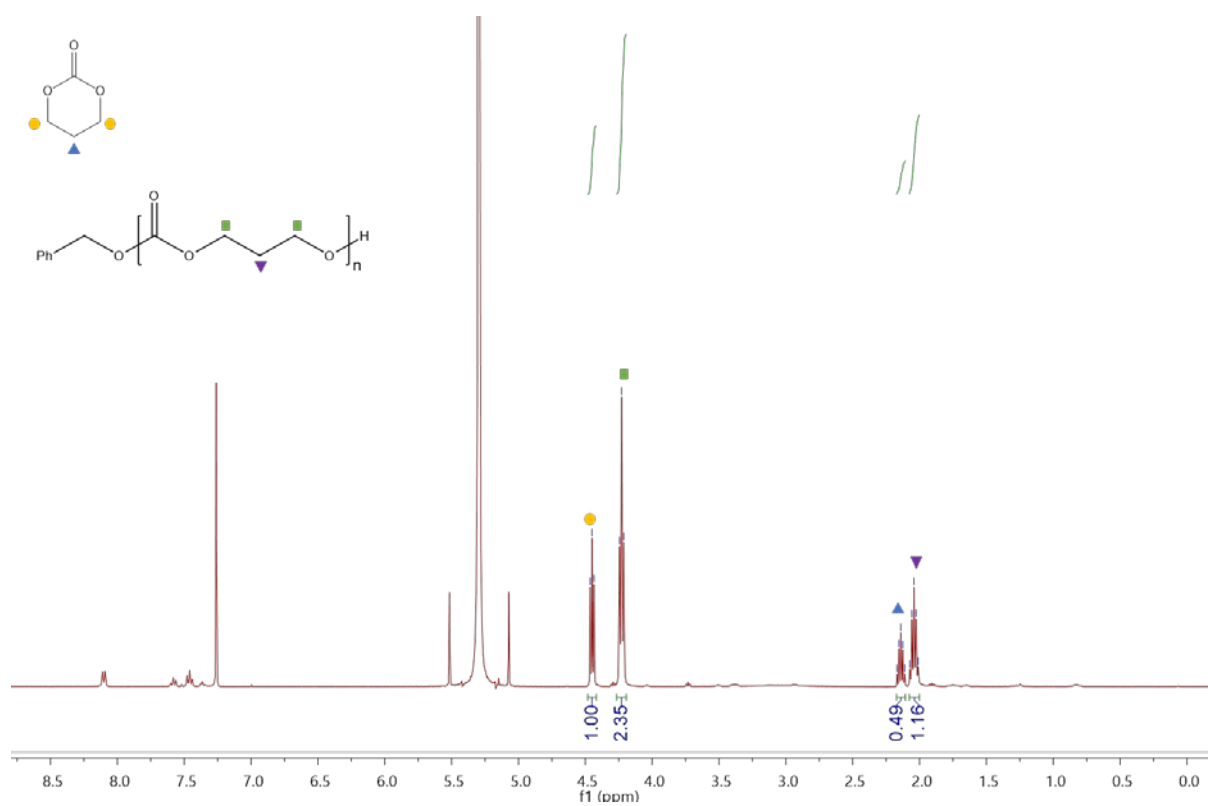
To the solution of trimethylene carbonate (0.25 g) and benzyl alcohol (0.50  $\mu$ L) in  $\text{CHCl}_3$  (0.7 mL), TBD (3.3 mg) in  $\text{CHCl}_3$  (0.5 mL) were added. After 30 min, benzoic acid (10 mg) was added to quench the polymerization reaction. The resulting solution was poured into cold methanol (15 mL) to precipitate PTMC. The precipitation were repeated twice. The viscous PTMC was dried under vacuum (190 mg,  $M_n = 22900$  g/mol,  $M_w = 33900$  g/mol).

Three 7 mm stainless-steel milling balls were placed in a 10 mL stainless-steel milling container and PTMC (0.10 g) was added. The milling vessel was placed in a vibrational ball mill and vibrated (30 Hz). After 2 hours, the vessel was opened and an aliquot was taken for the GPC measurement. ( $M_n = 8220$  g/mol,  $M_w = 16300$  g/mol).





### C. Example of NMR peak assignment (Table S1, entry 10-1)



## D. GPC and NMR Spectra of Table 1-4

Table 1, entry 1

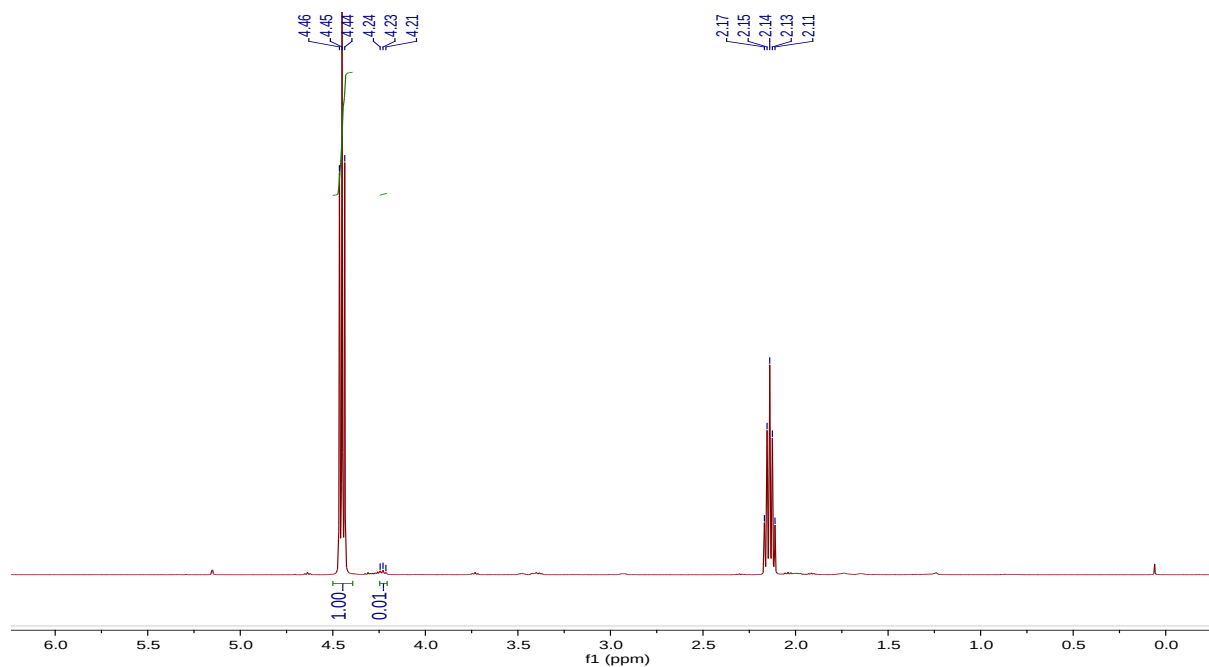
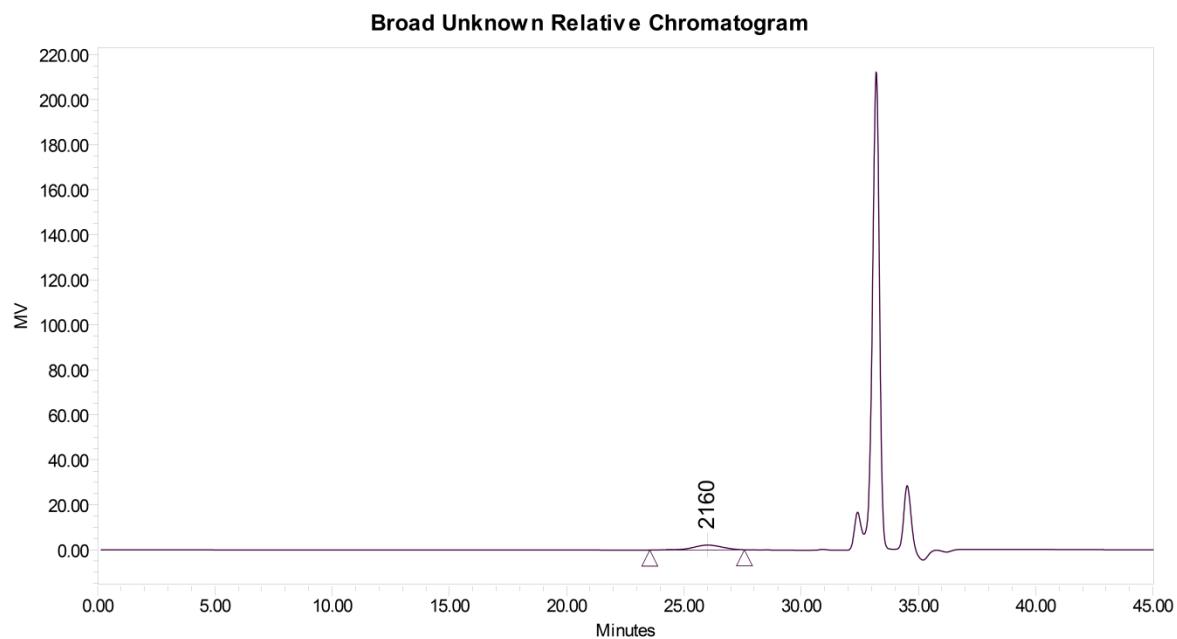


Table 1, entry 2



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 2122         | 2272         | 2160         | 2460         | 2700           | 1.070627       | 1.082662 | 1.188469 |

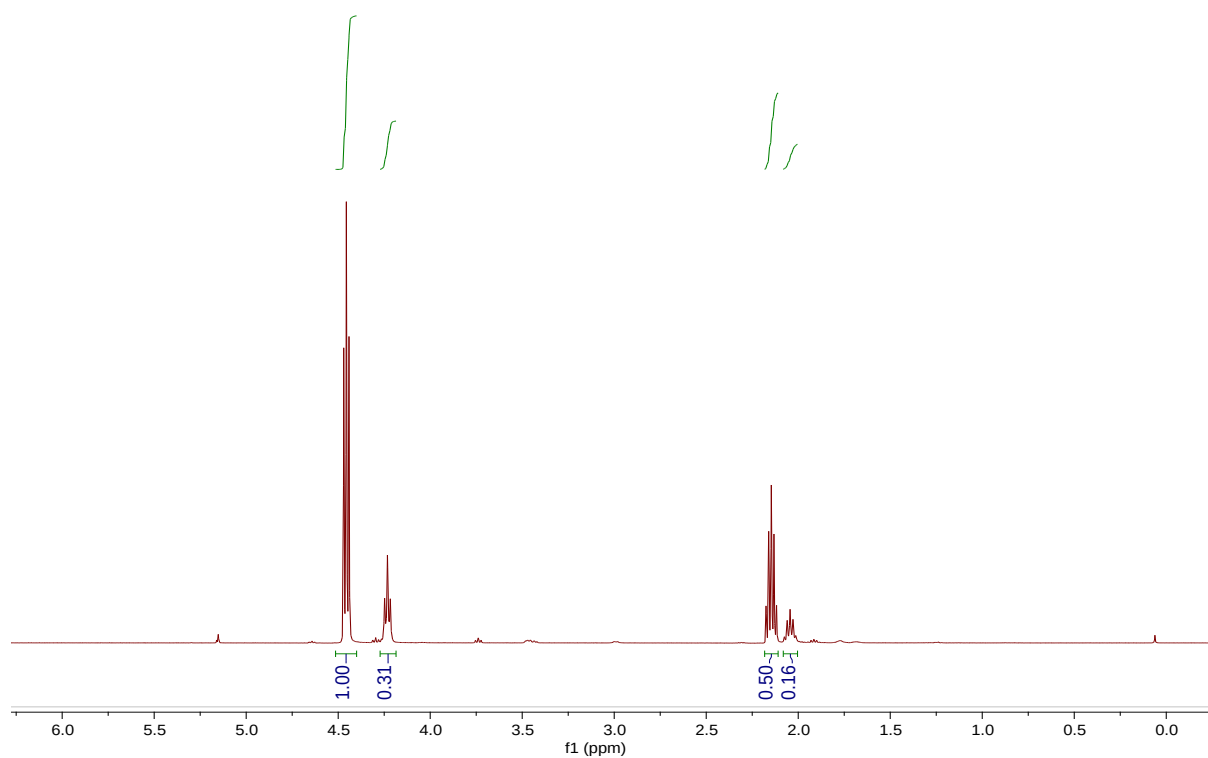


Table 1, entry 3

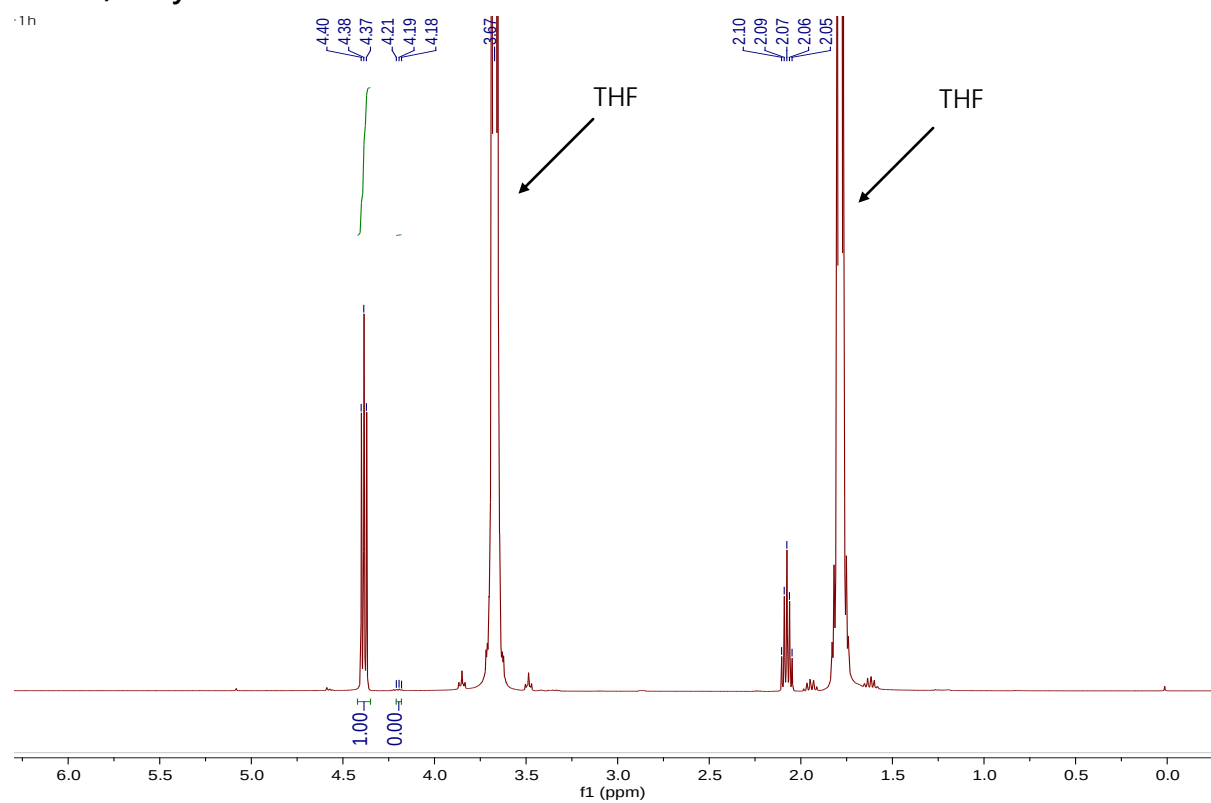


Table 1, entry 4

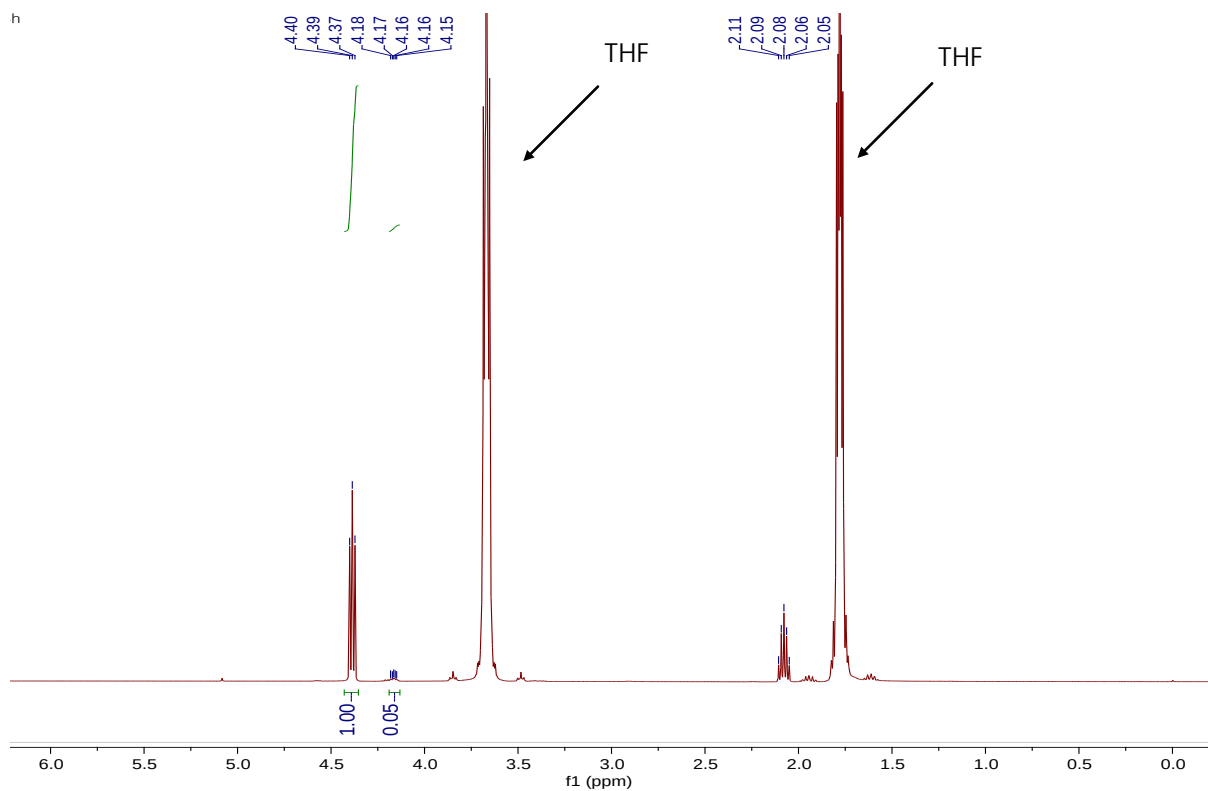


Table 1, entry 5

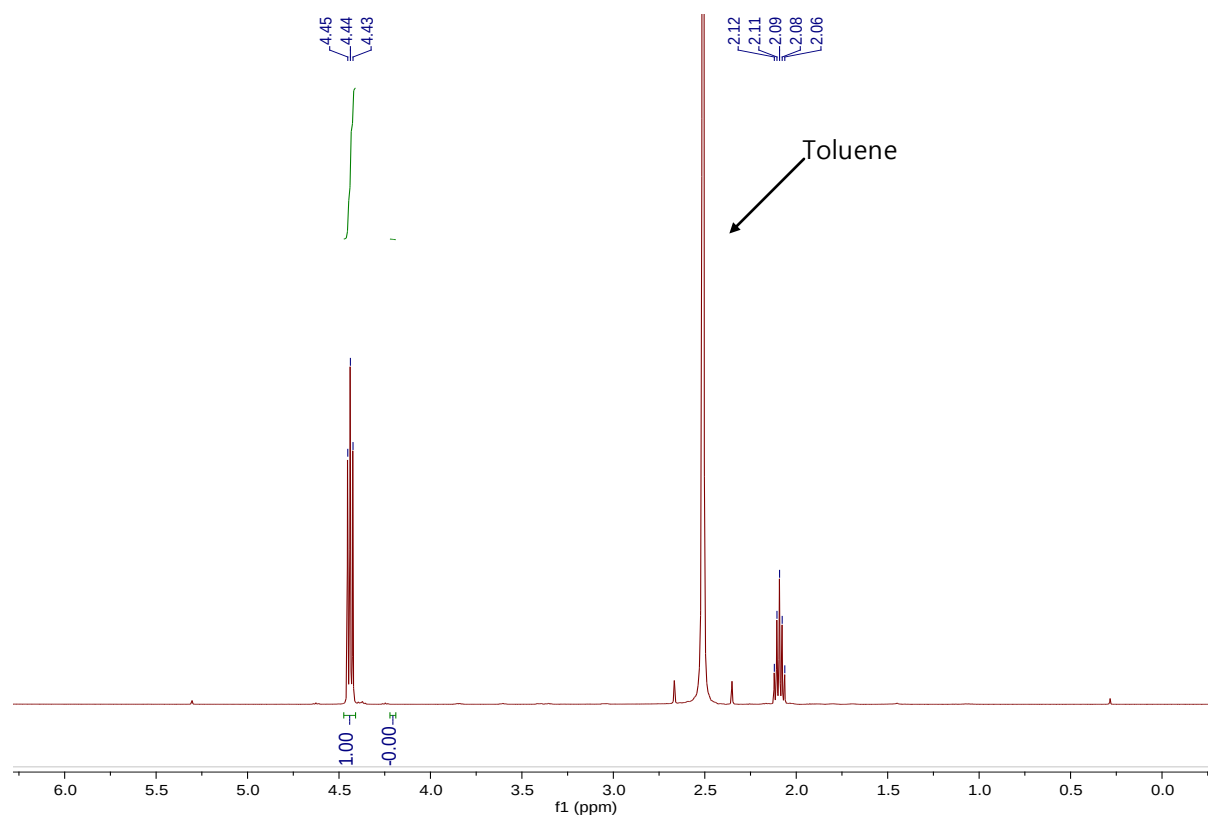
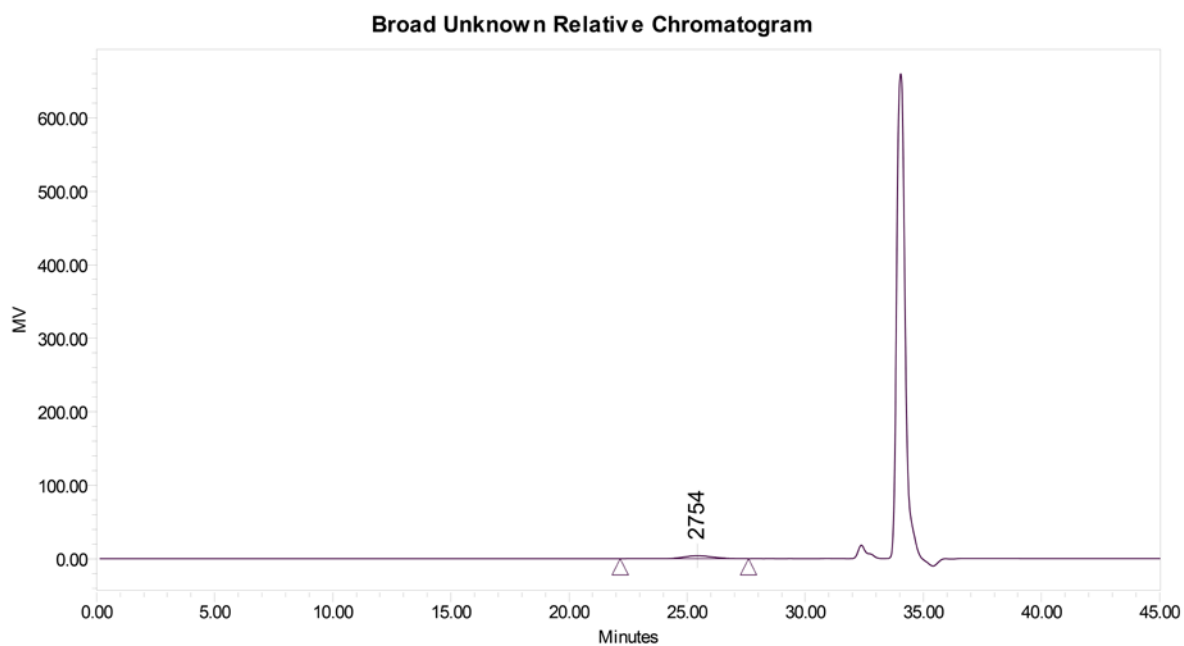


Table 1, entry 6



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 2660         | 2946         | 2754         | 3430         | 4281           | 1.107876       | 1.164053 | 1.452897 |

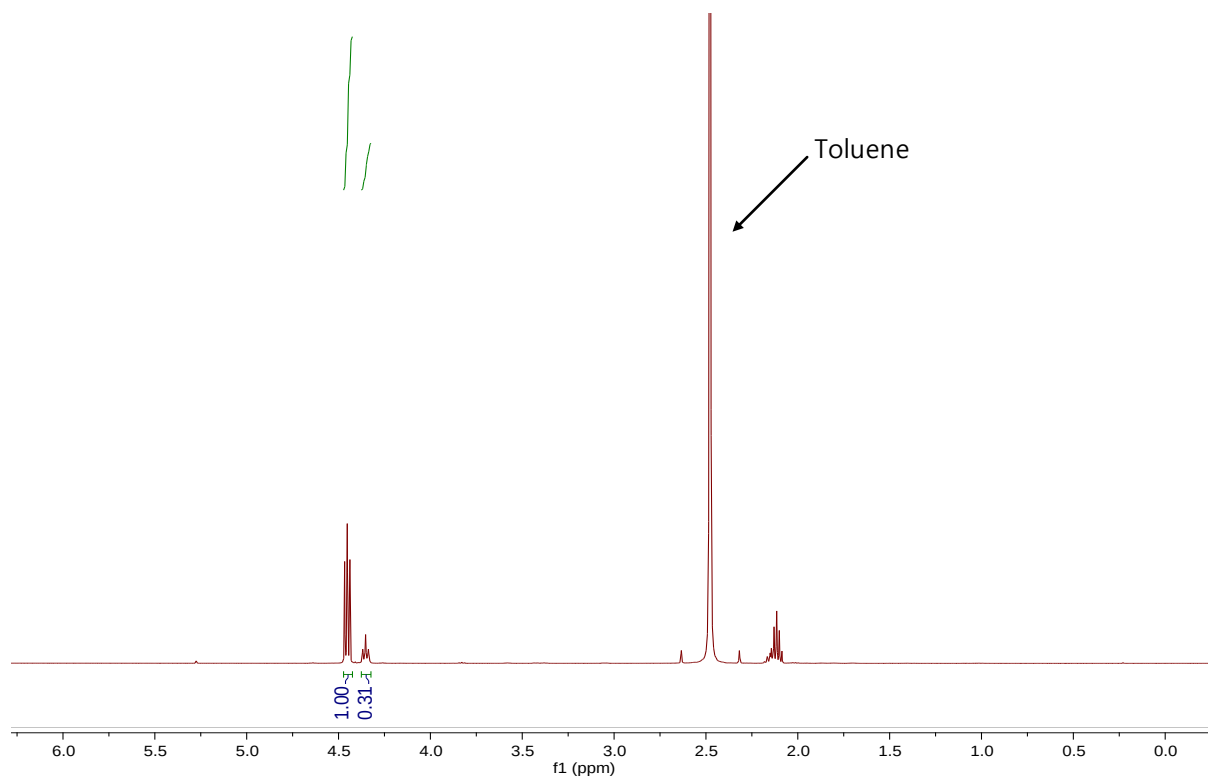


Table 1, entry 7

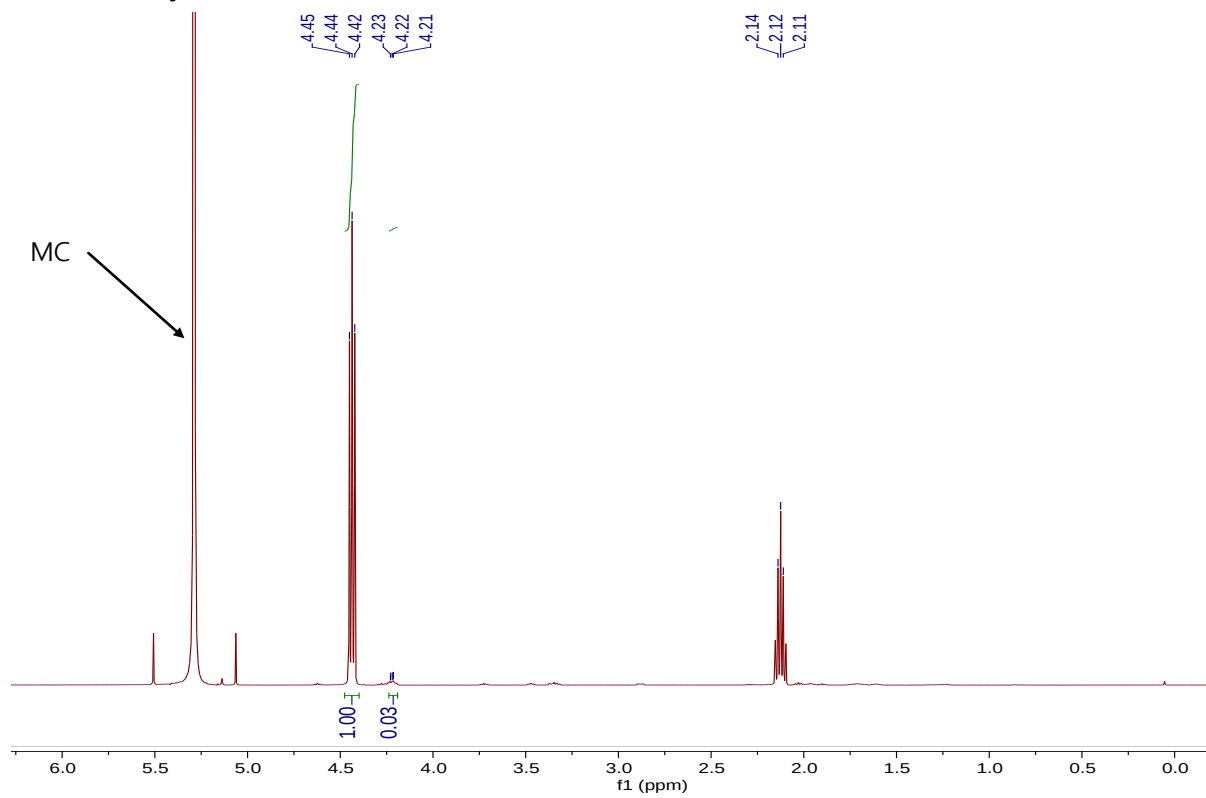
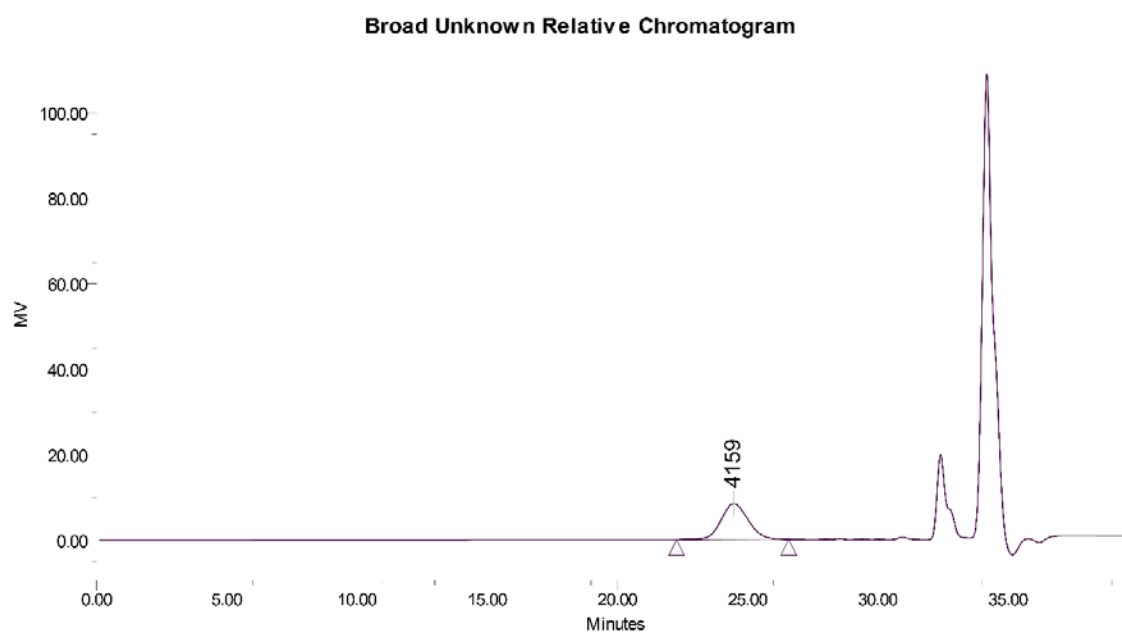




Table 1, entry 8



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 3986         | 4196         | 4159         | 4429         | 4698           | 1.052831       | 1.055417 | 1.119666 |

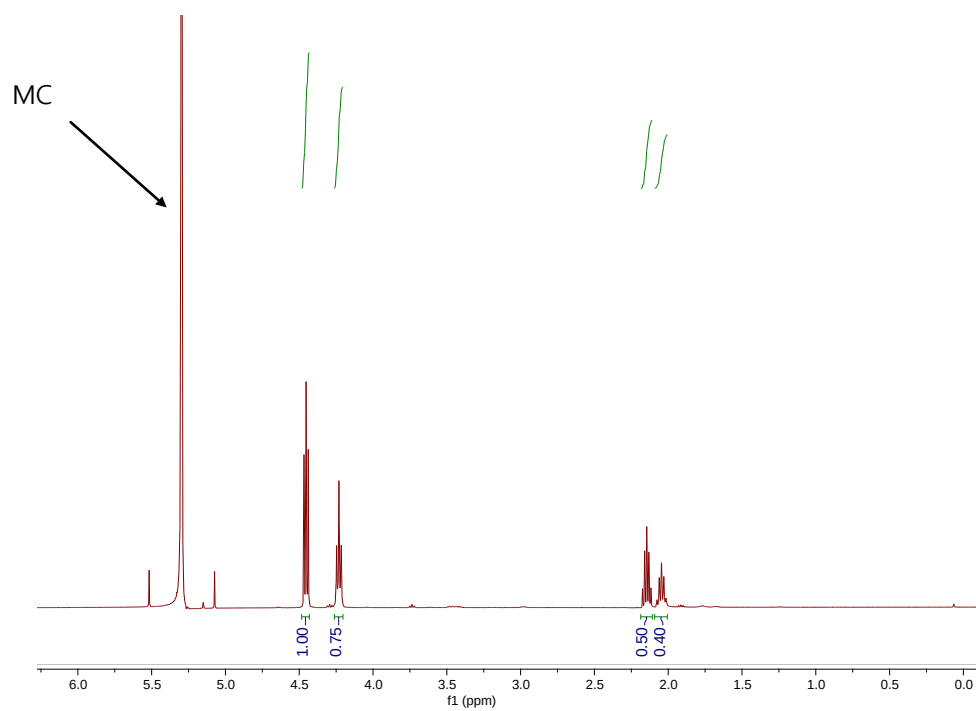
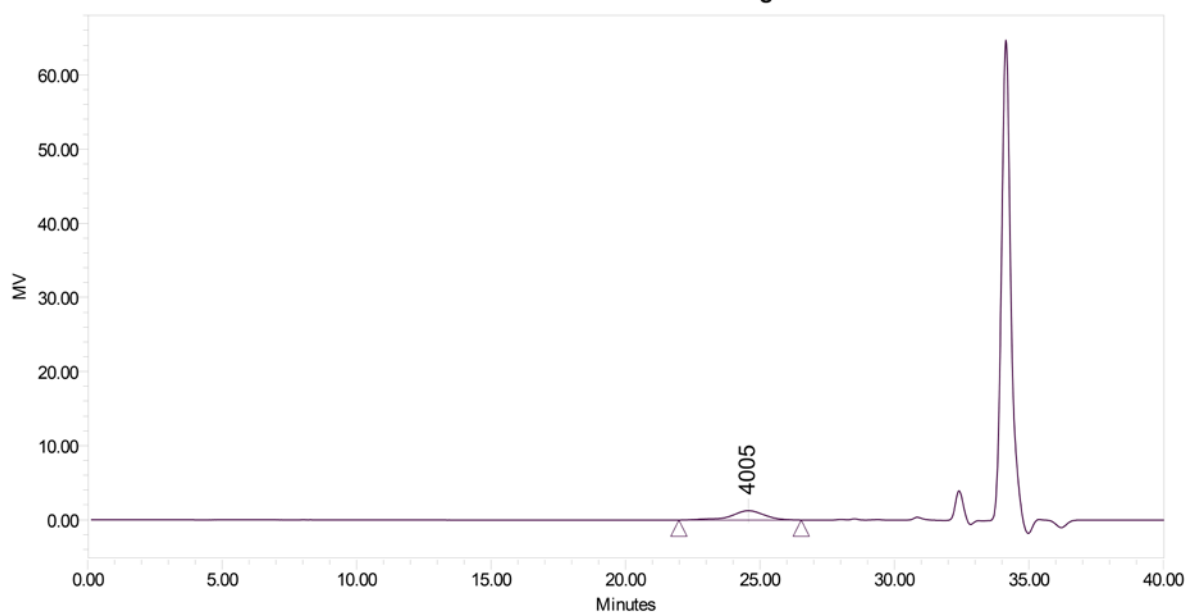


Table 1, entry 9 (Table S1, entry 9-1)

Broad Unknown Relative Chromatogram



Broad Unknown Relative Peak Table

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 3995         | 4372         | 4005         | 4866         | 5501           | 1.094458       | 1.112977 | 1.258153 |

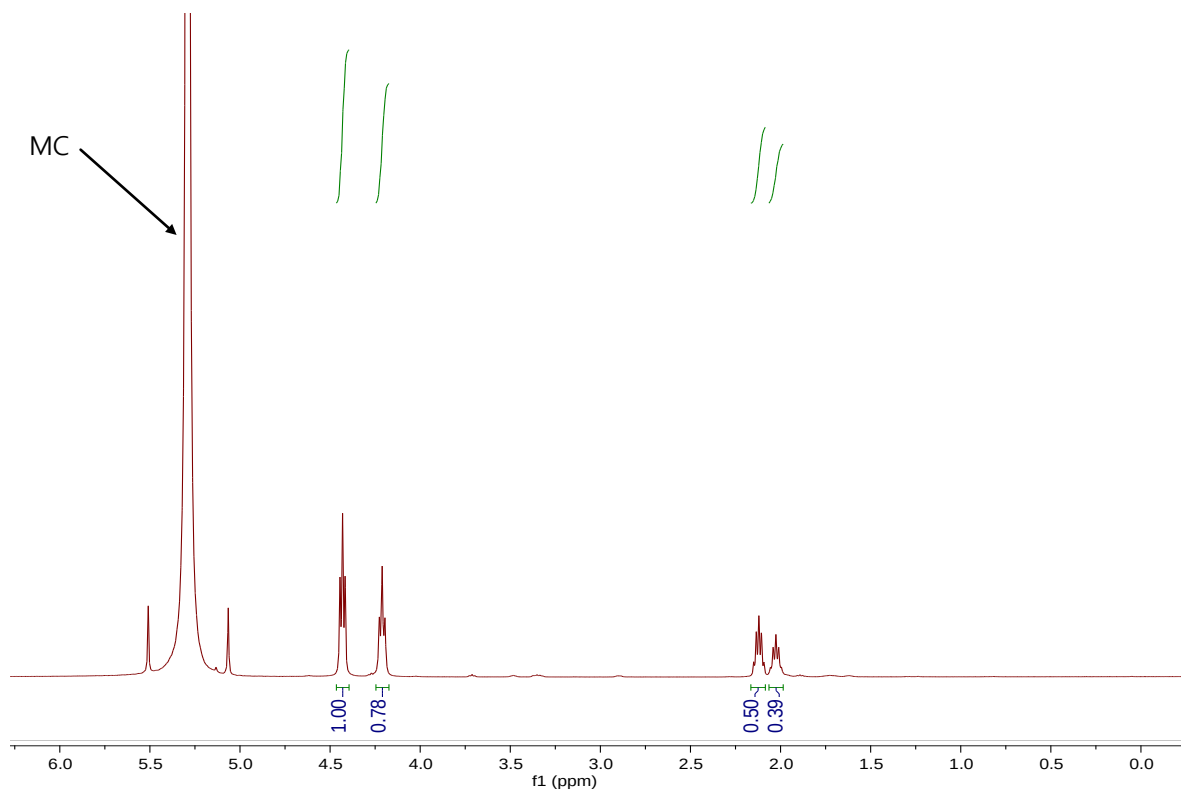
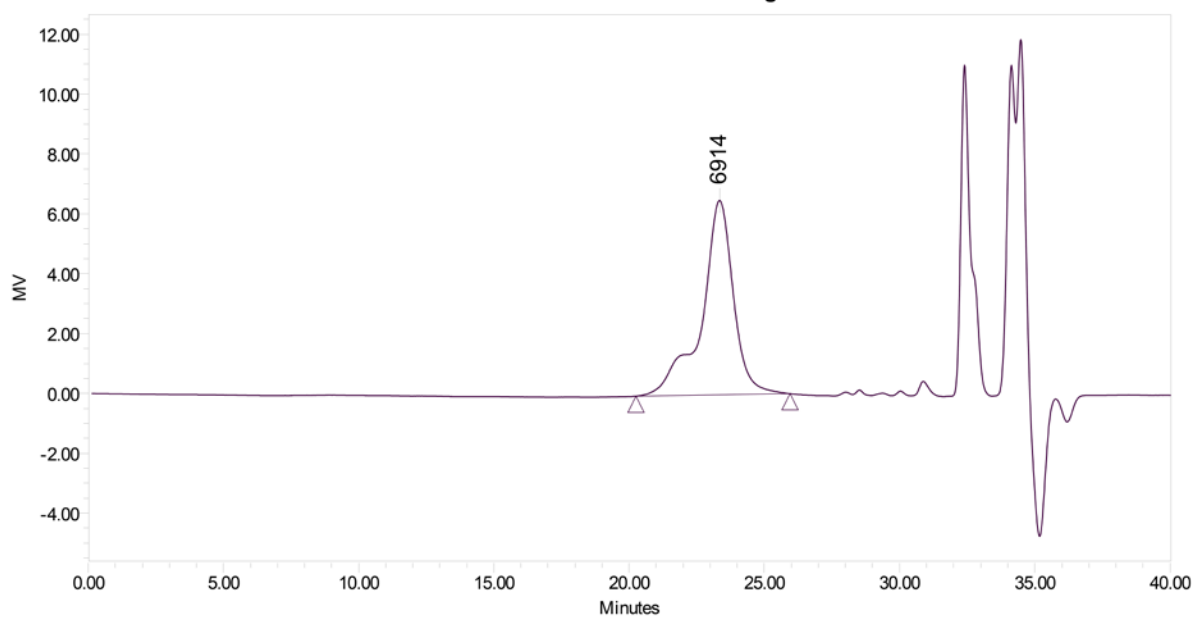


Table 1, entry 10 (Table S1, entry 10-1)

Broad Unknown Relative Chromatogram



Broad Unknown Relative Peak Table

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 7135         | 8018         | 6914         | 9201         | 10724          | 1.123805       | 1.147593 | 1.337472 |

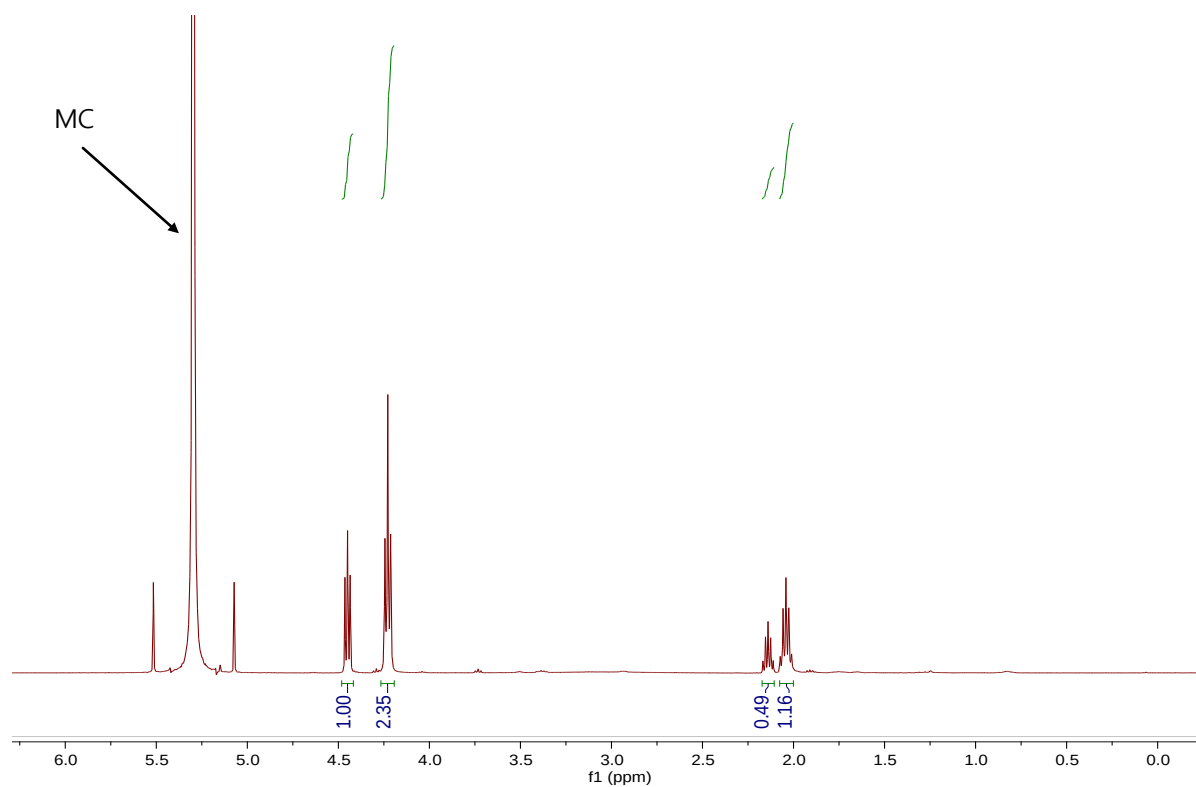
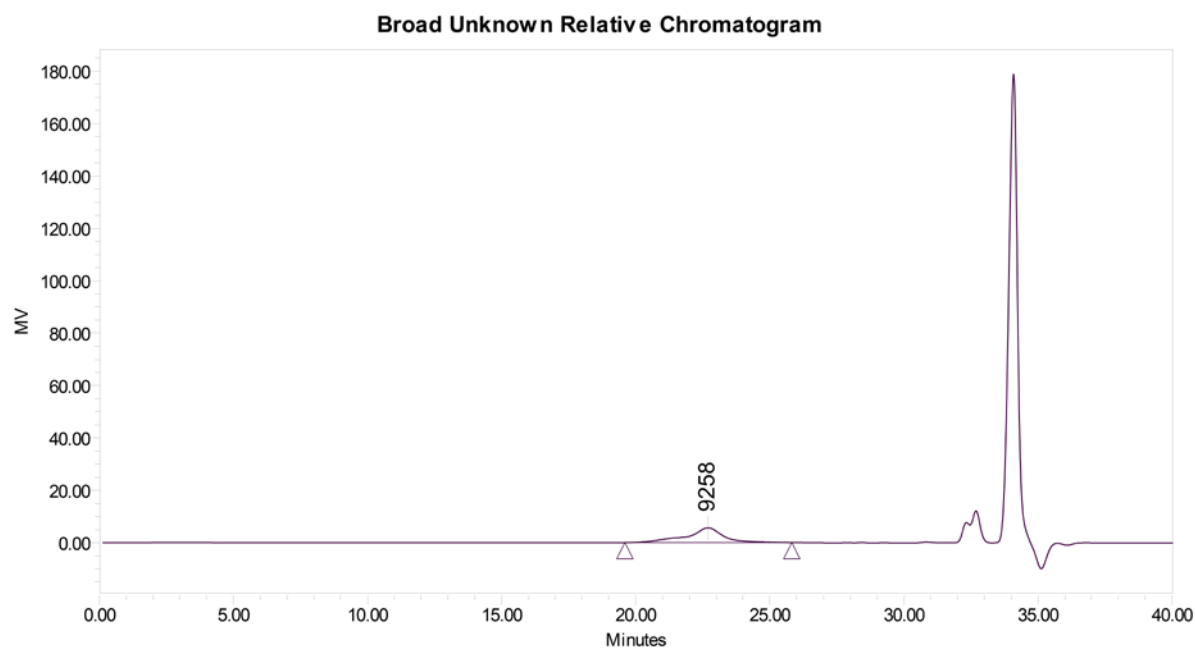


Table 1, entry 11 (Table S1, entry 11-1)



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 9419         | 11024        | 9258         | 12957        | 15226          | 1.170403       | 1.175296 | 1.38113C |

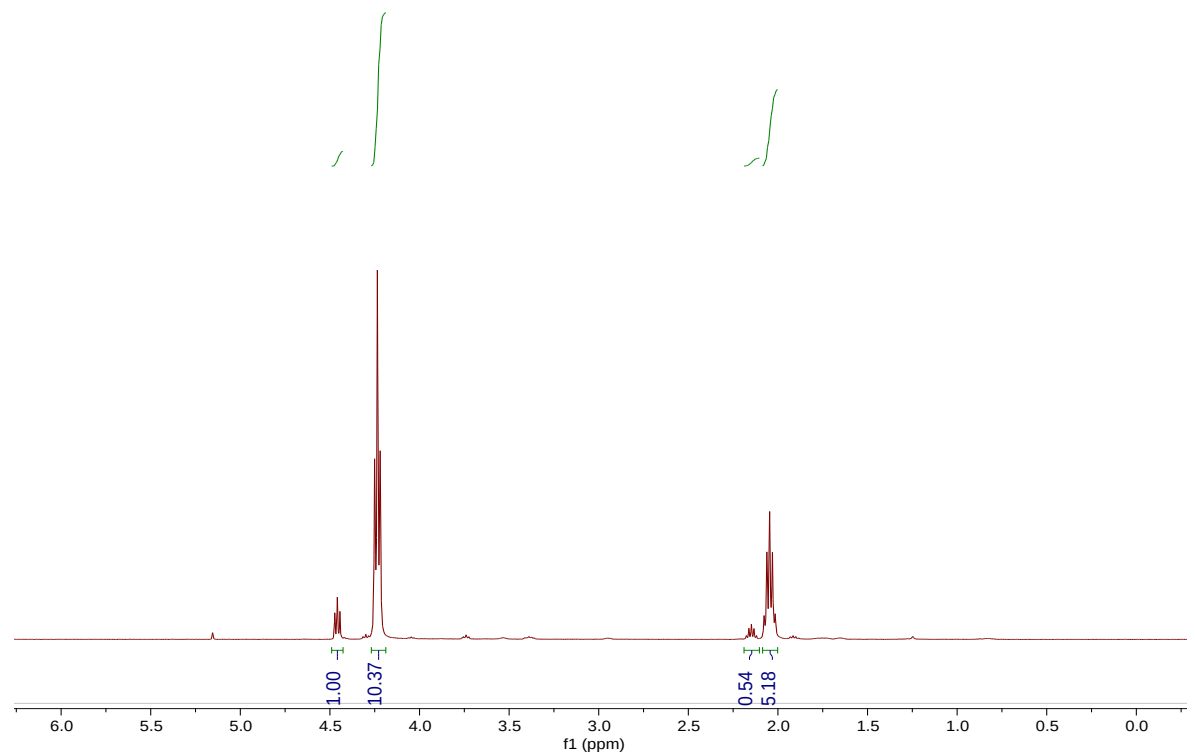
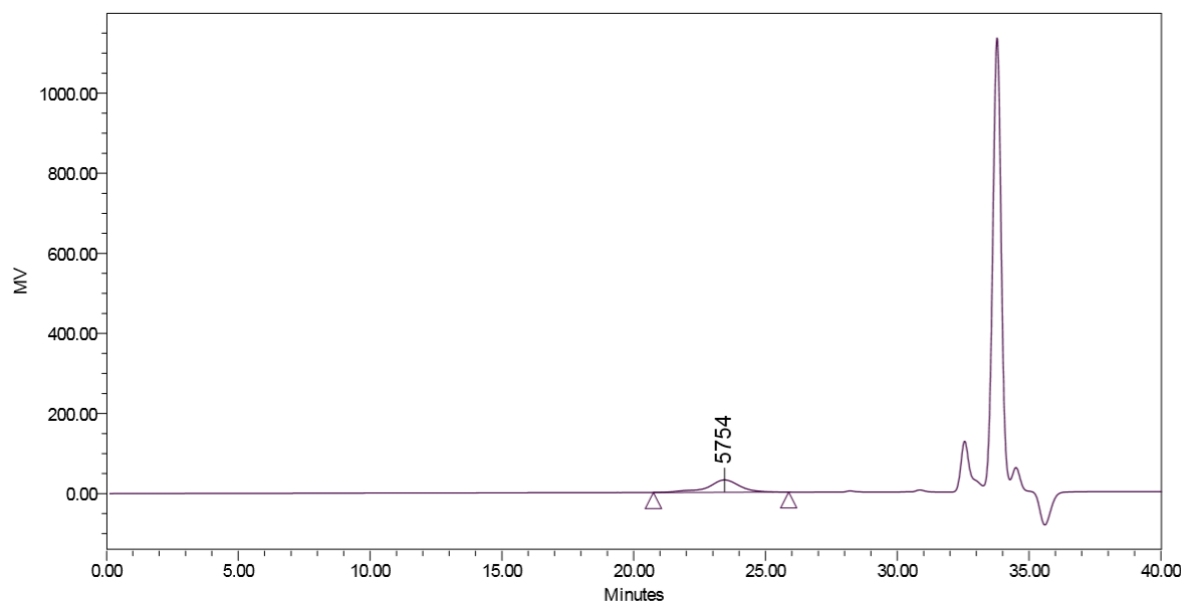


Table 2, entry 1 (Table S2, entry 1-1)



Broad Unknown Relative Peak Table

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 5711         | 6342         | 5754         | 7159         | 8204           | 1.110534       | 1.128841 | 1.293657 |

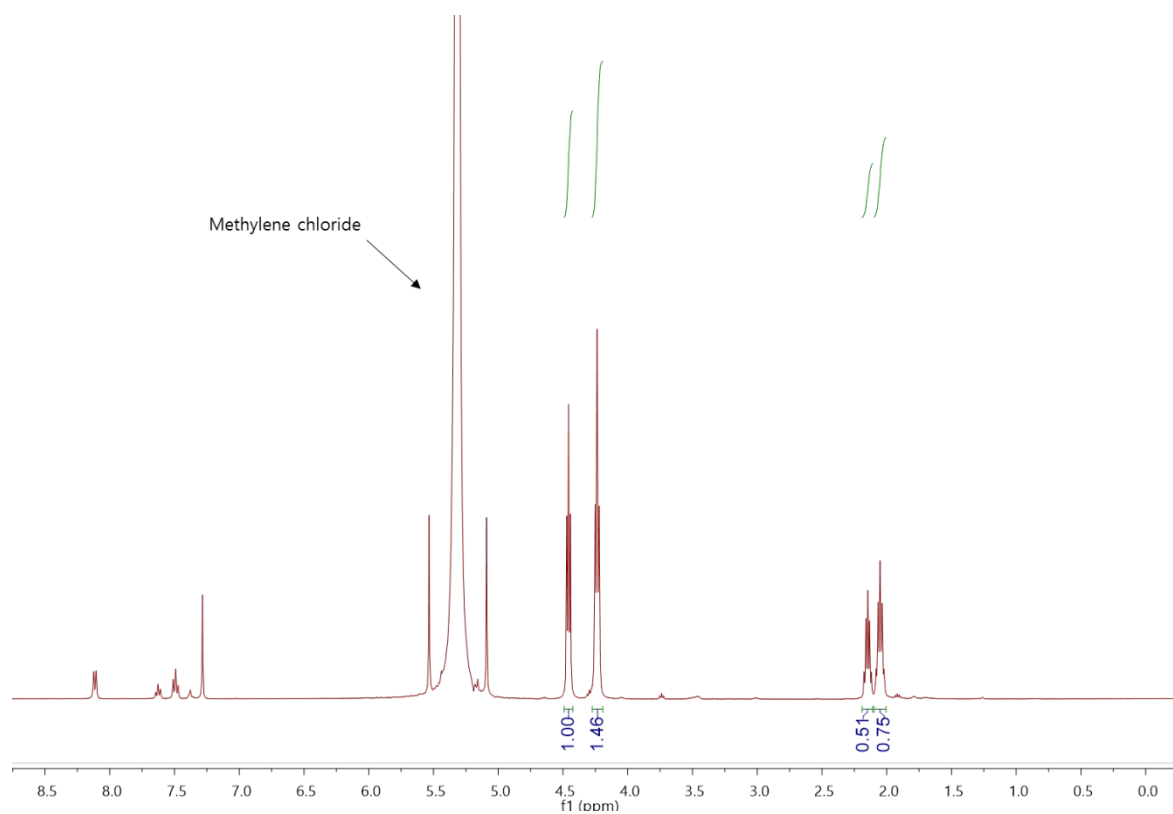
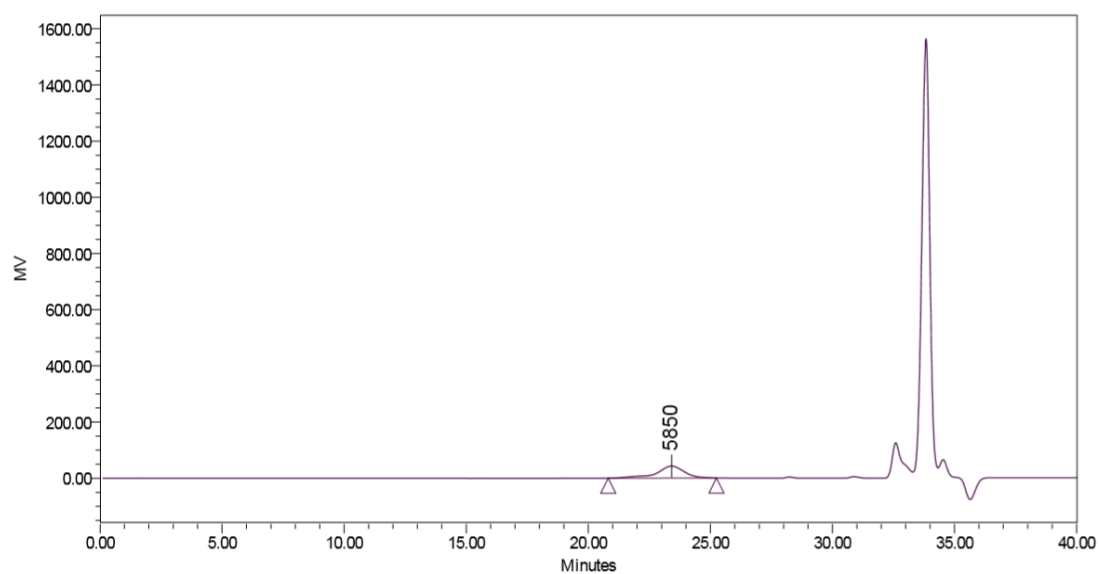


Table 2, entry 2 (Table S2, entry 2-1)



Broad Unknown Relative Peak Table

| Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1                 | 5978         | 6537         | 5850         | 7289         | 8270           | 1.093572       | 1.115043 | 1.265050 |

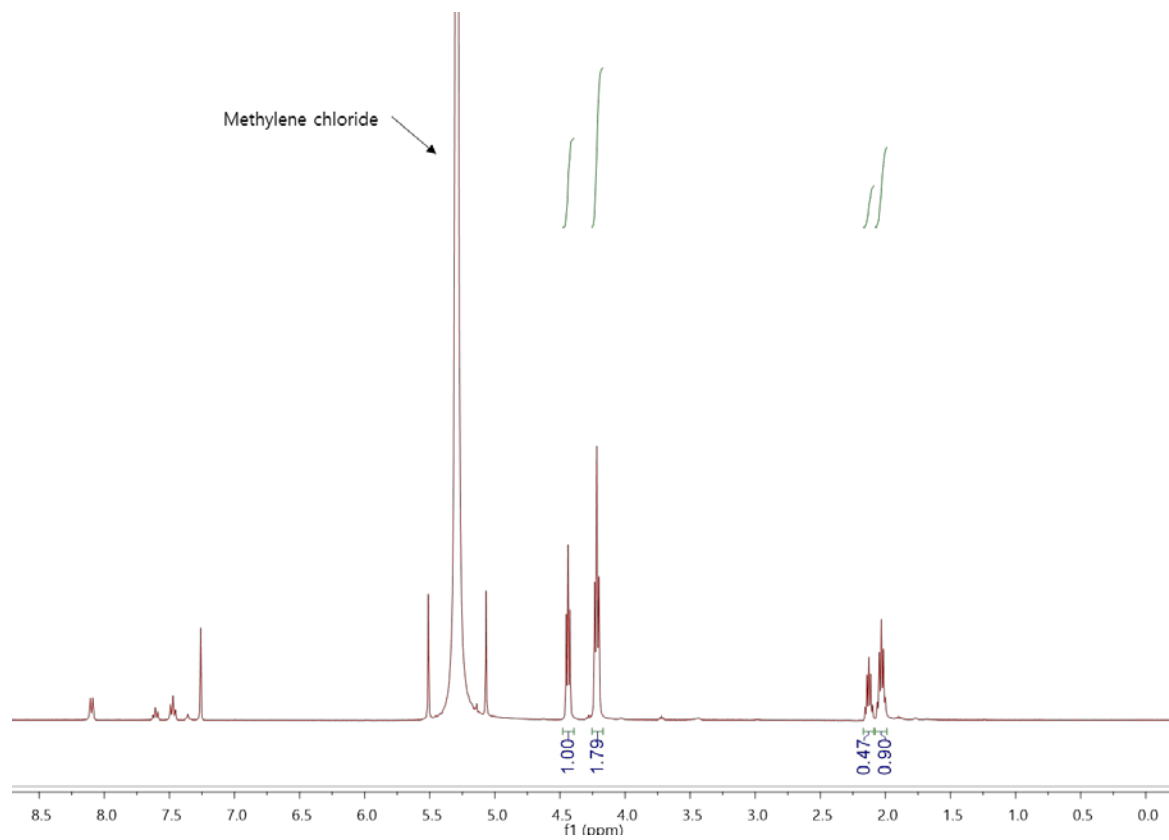
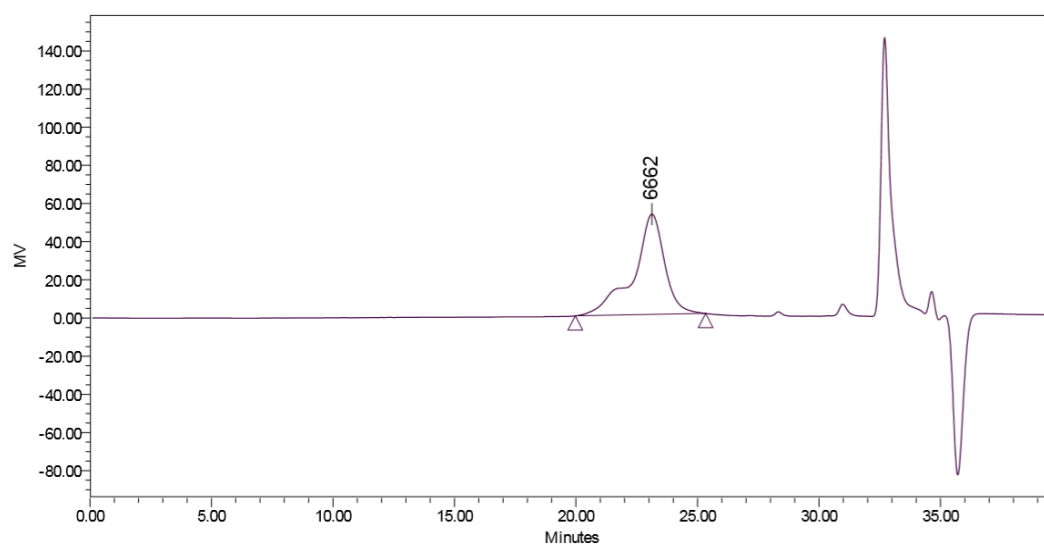


Table 2, entry 4 (Table S2, entry 4-1)



Broad Unknown Relative Peak Table

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 7120         | 8152         | 6662         | 9586         | 11401          | 1.144941       | 1.175849 | 1.398497 |

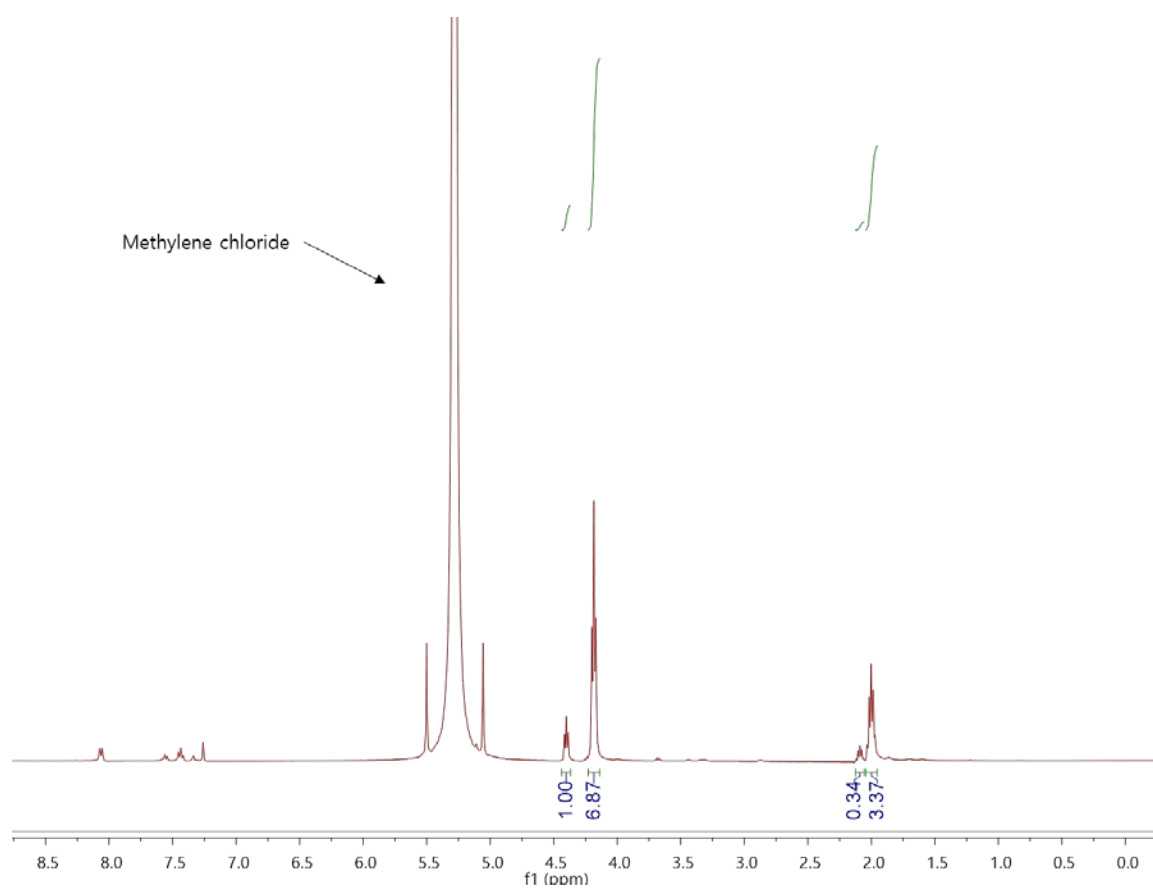
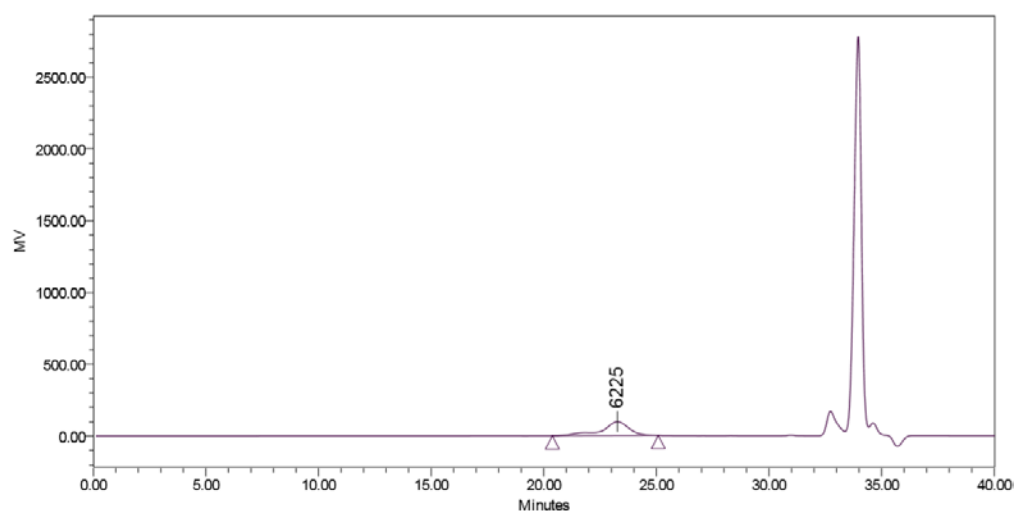


Table 2, entry 5 (Table S2, entry 5-1)



Broad Unknown Relative Peak Table

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 6614         | 7420         | 6225         | 8562         | 10033          | 1.121987       | 1.153844 | 1.352092 |

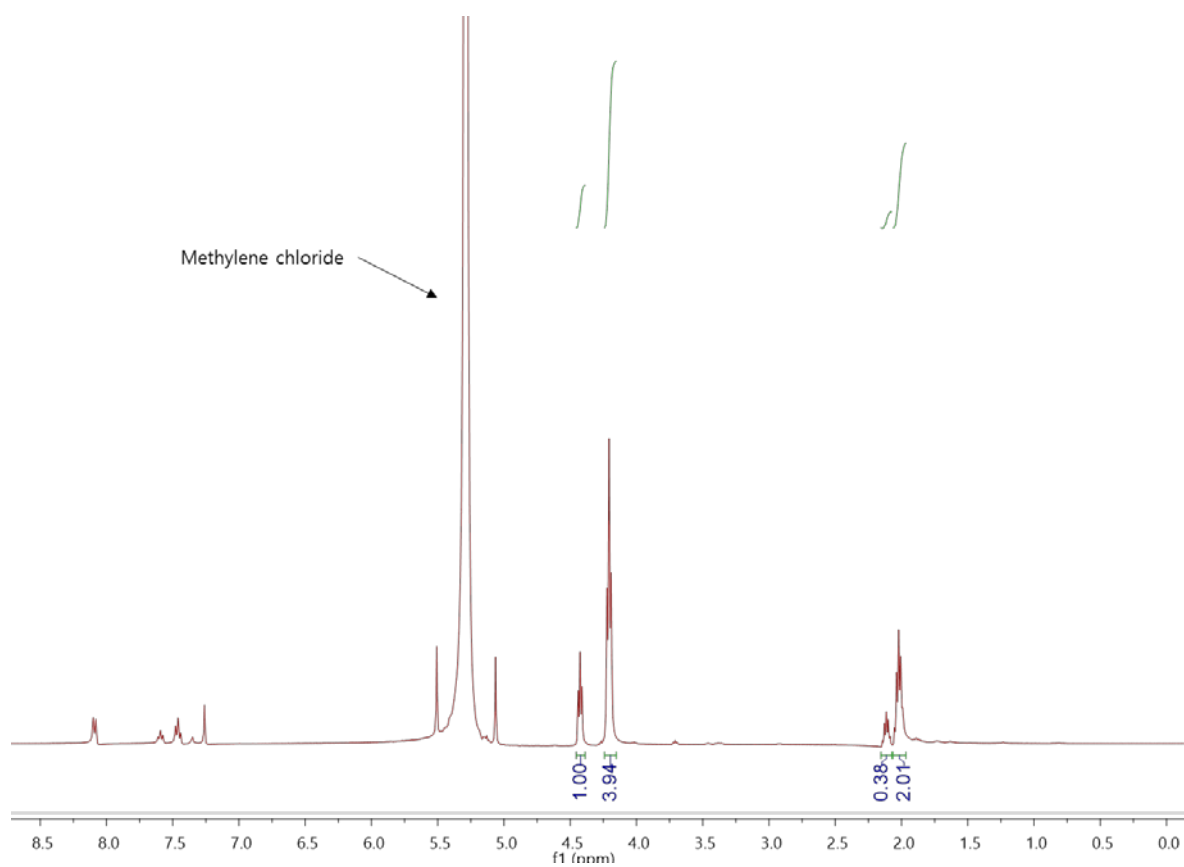




Table 3, entry 1

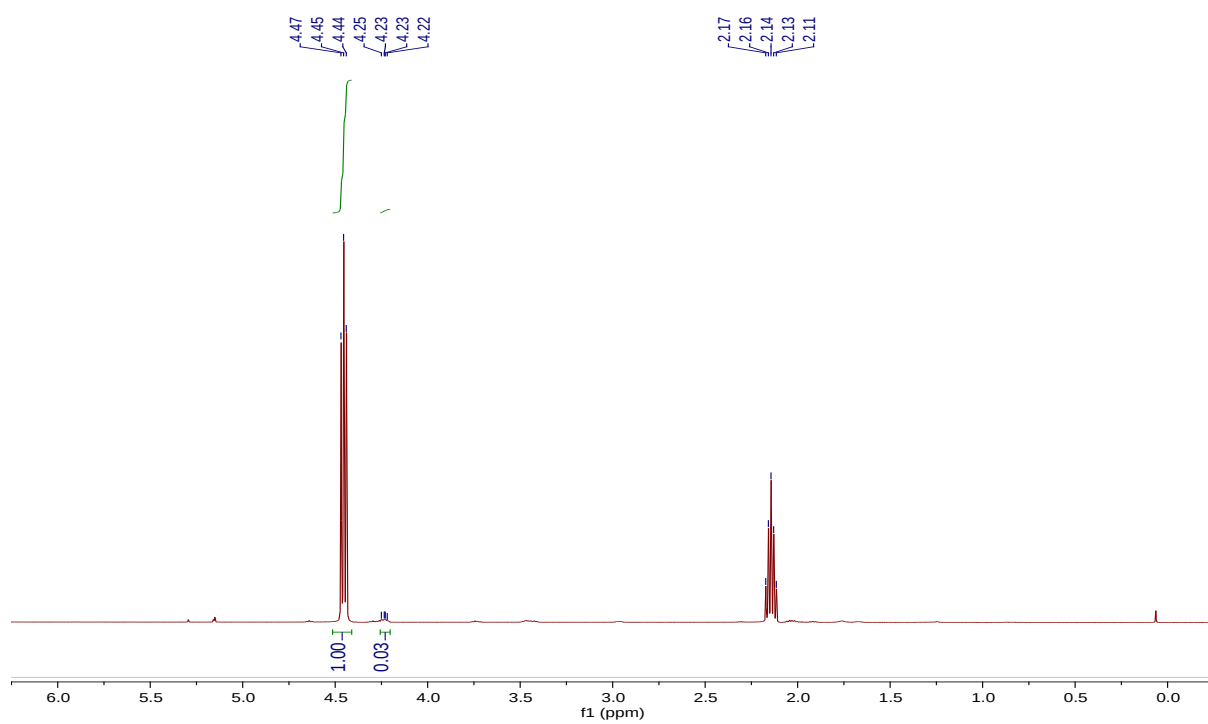
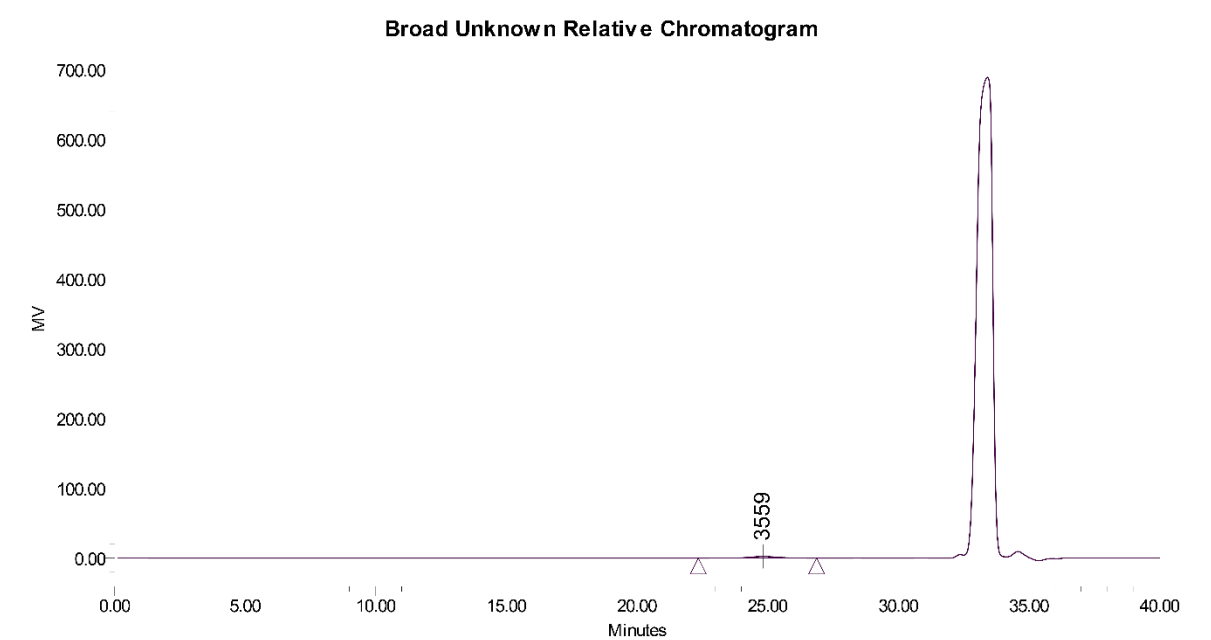


Table 3, entry 2



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 3495         | 3775         | 3559         | 4137         | 4612           | 1.080123       | 1.095893 | 1.221949 |

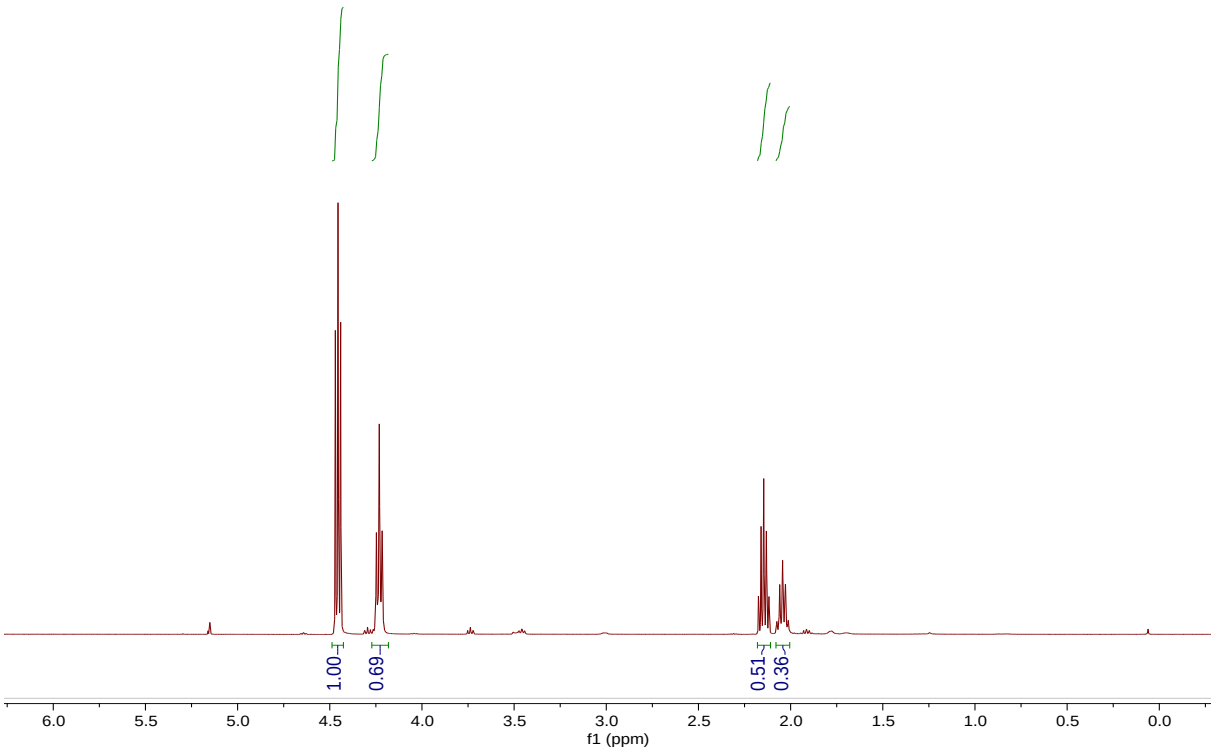


Table 3, entry 3

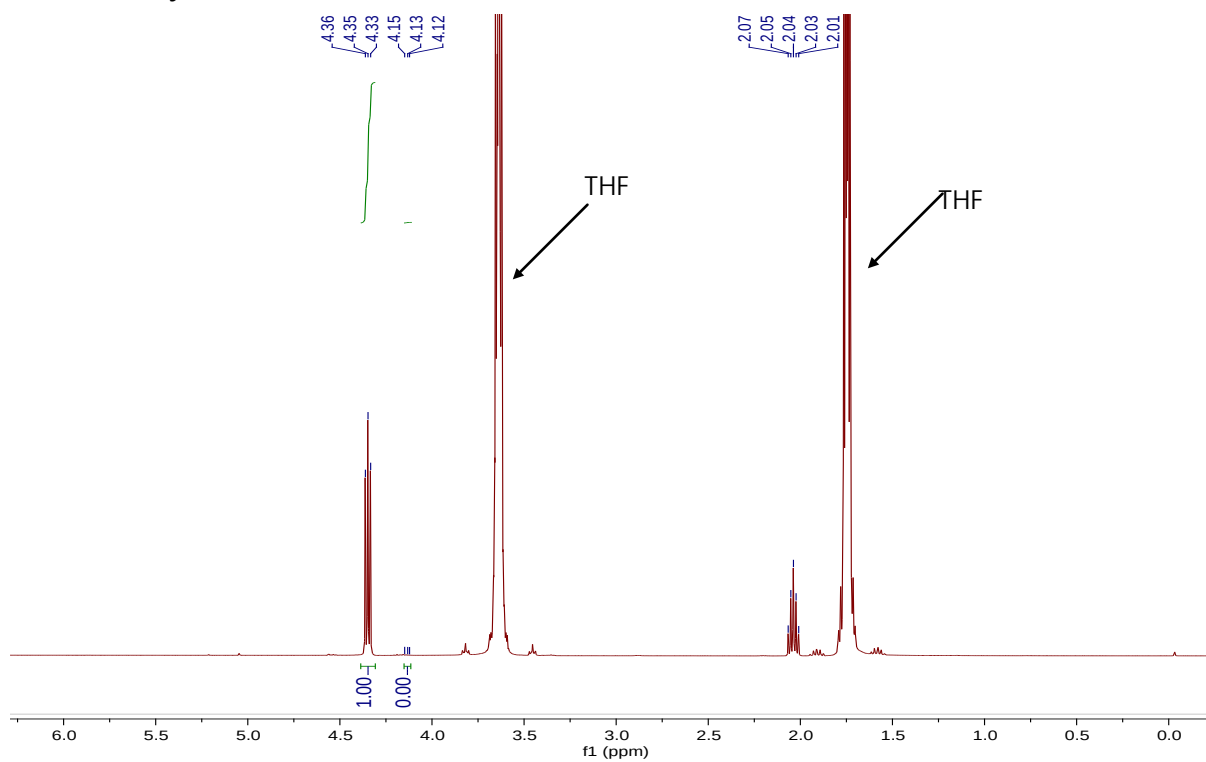


Table 3, entry 4

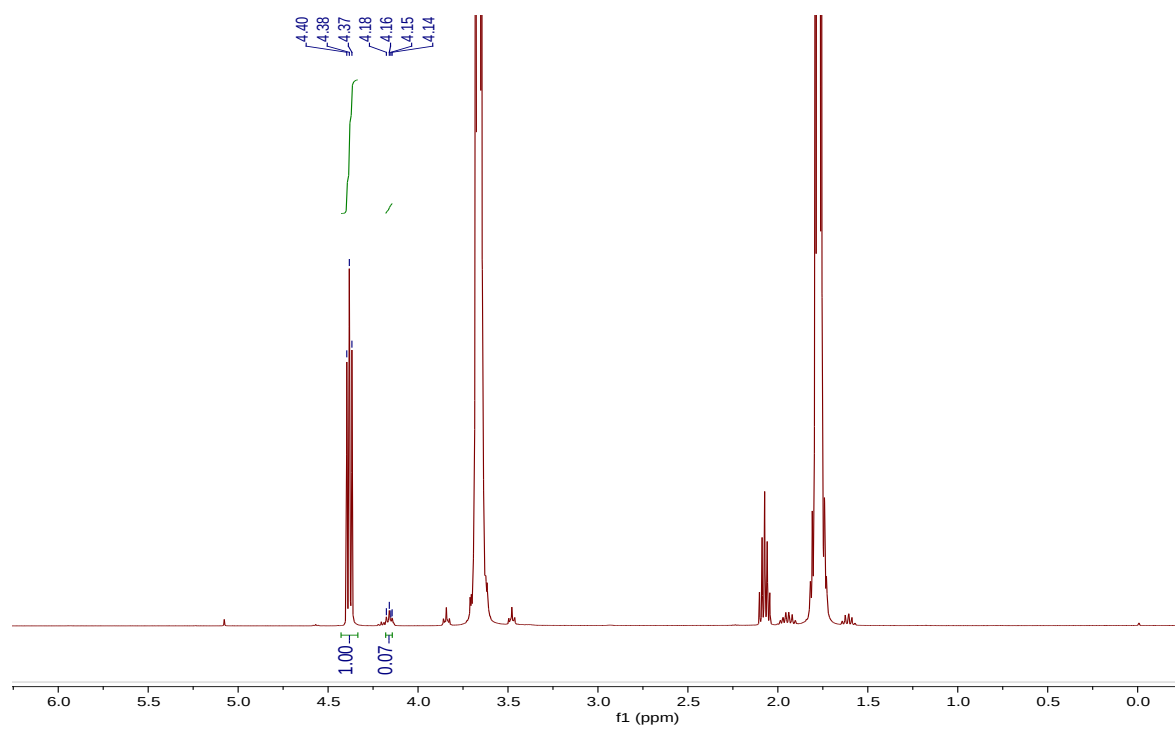


Table 3, entry 5

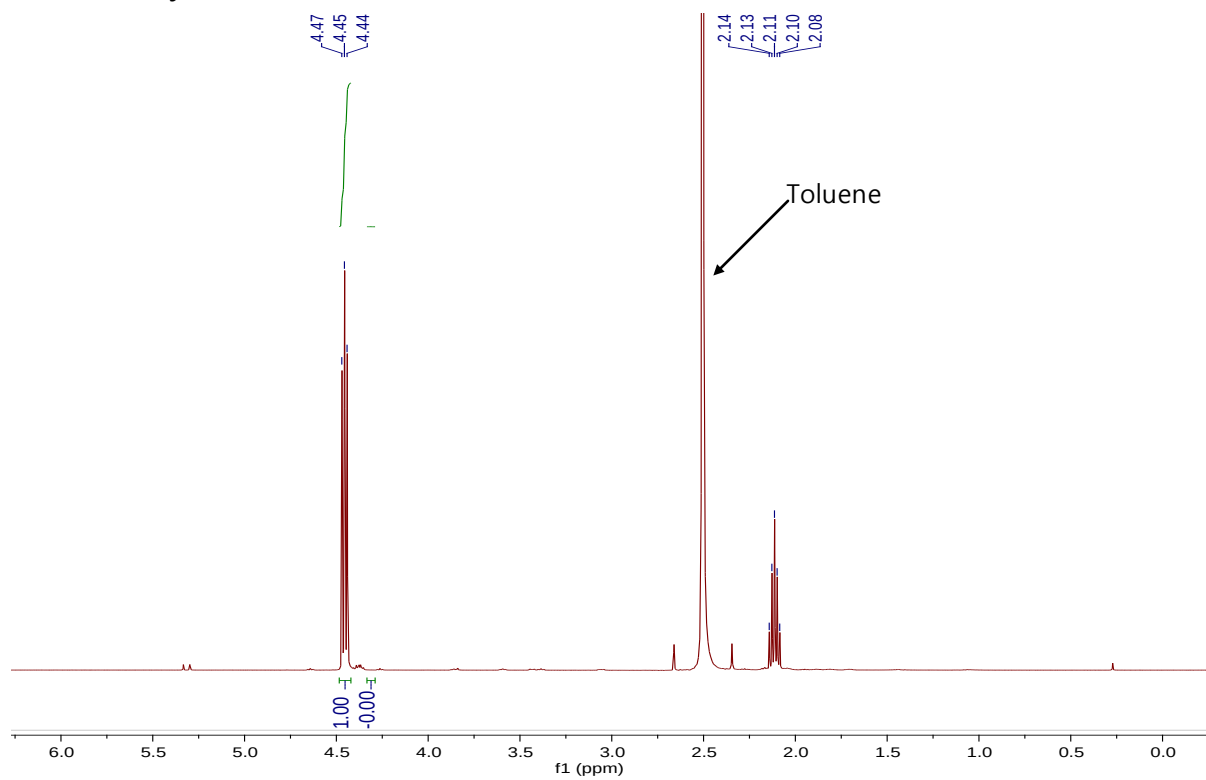
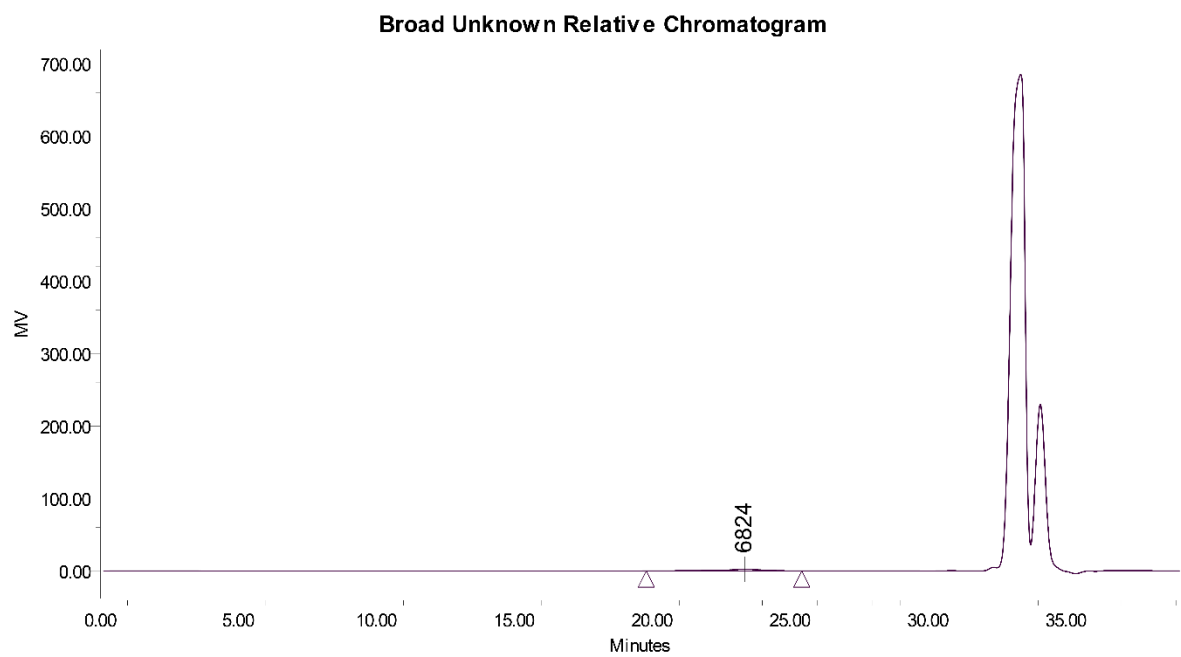


Table 3, entry 6



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 7126         | 8376         | 6824         | 10337        | 13059          | 1.175459       | 1.234084 | 1.559024 |

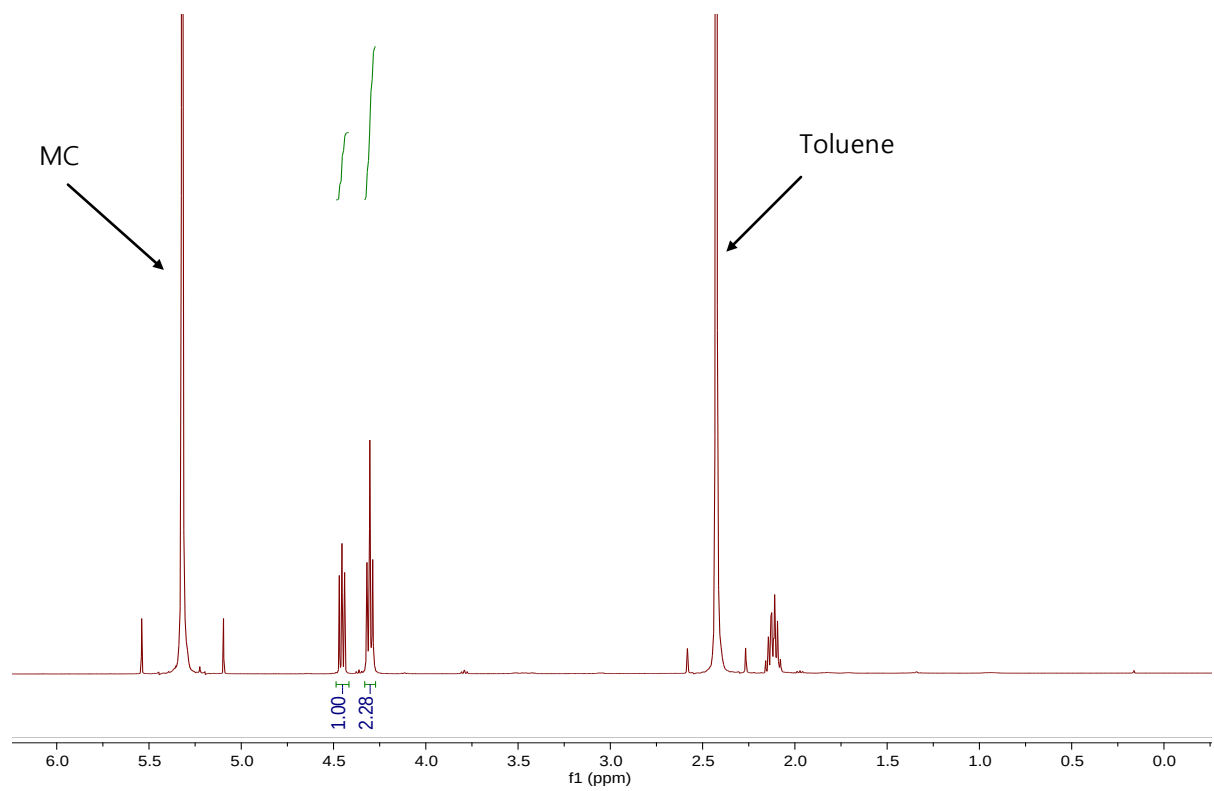


Table 3, entry 7

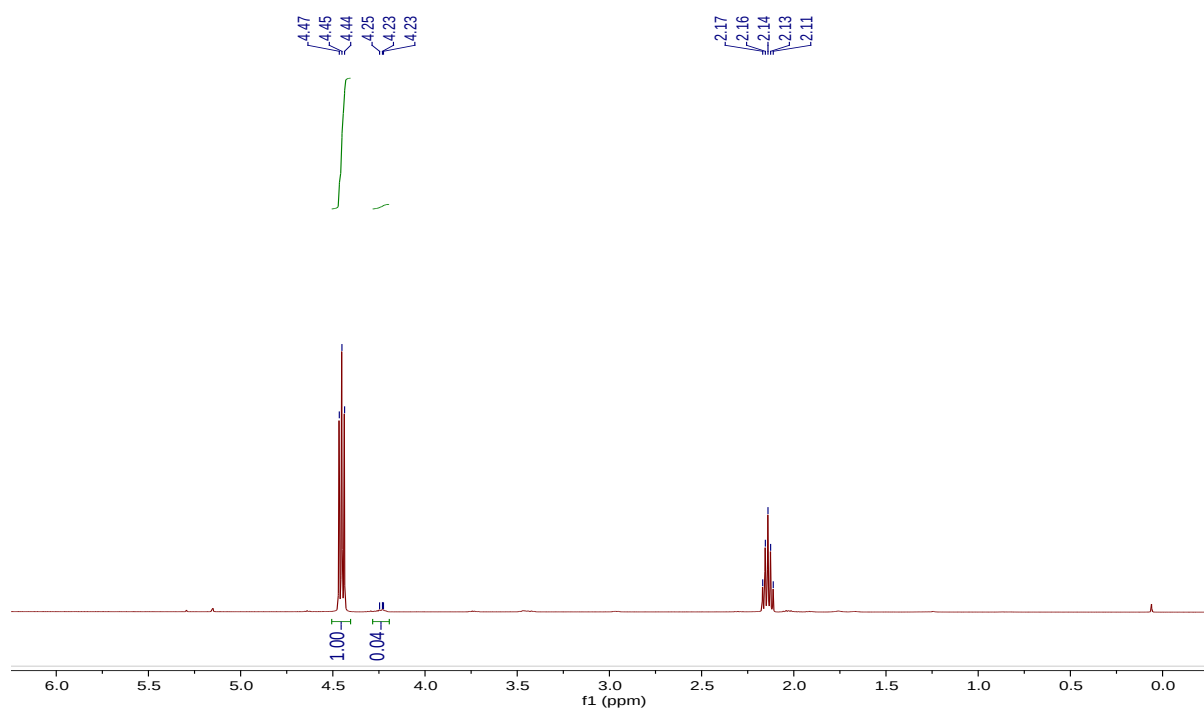
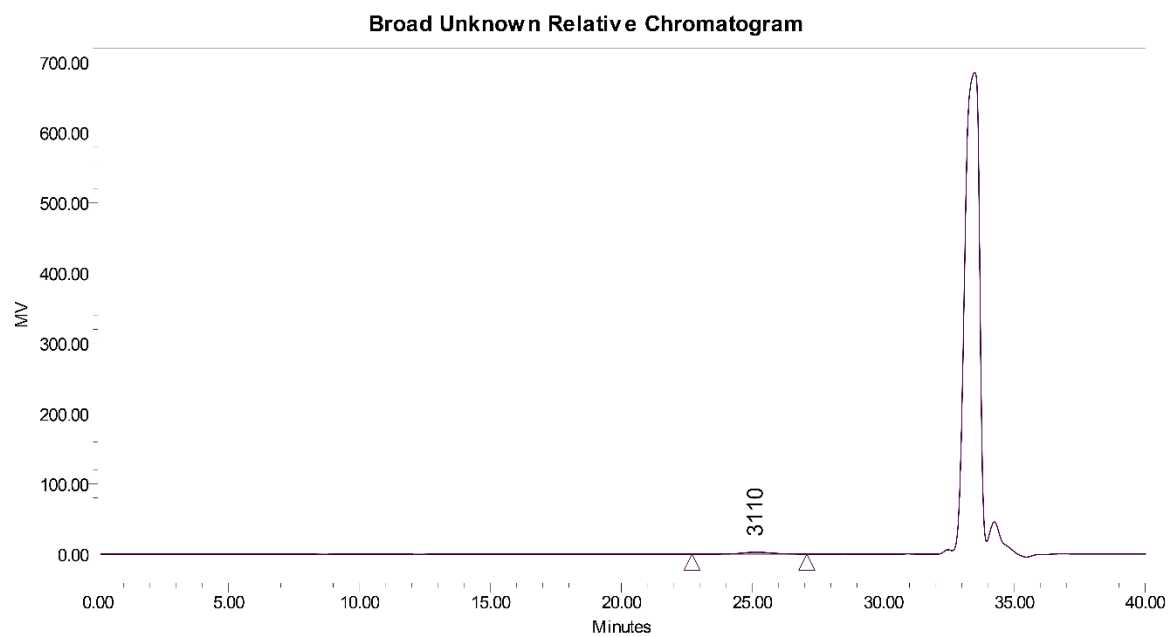


Table 3, entry 8



| Broad Unknown Relative Peak Table |                   |              |              |              |              |                |                |          |          |
|-----------------------------------|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
|                                   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
| 1                                 |                   | 3001         | 3209         | 3110         | 3468         | 3807           | 1.069408       | 1.080702 | 1.186363 |

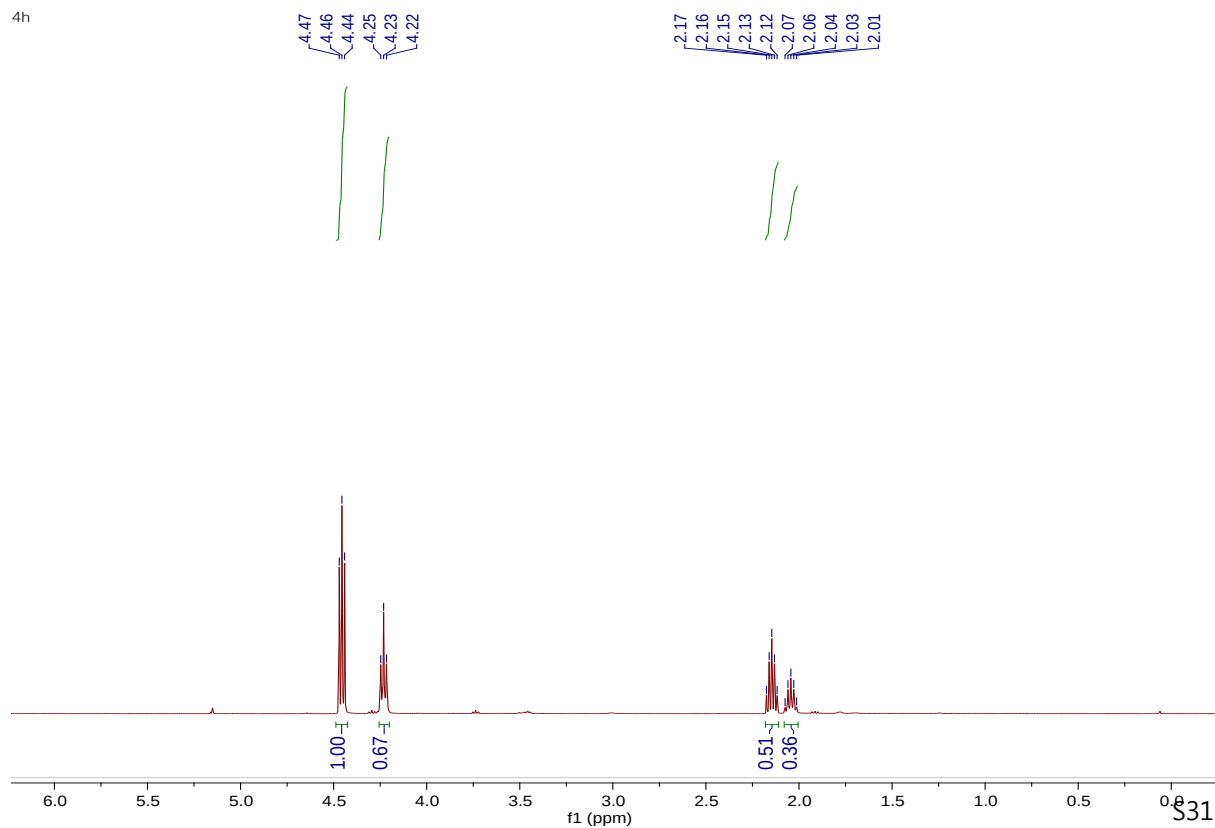
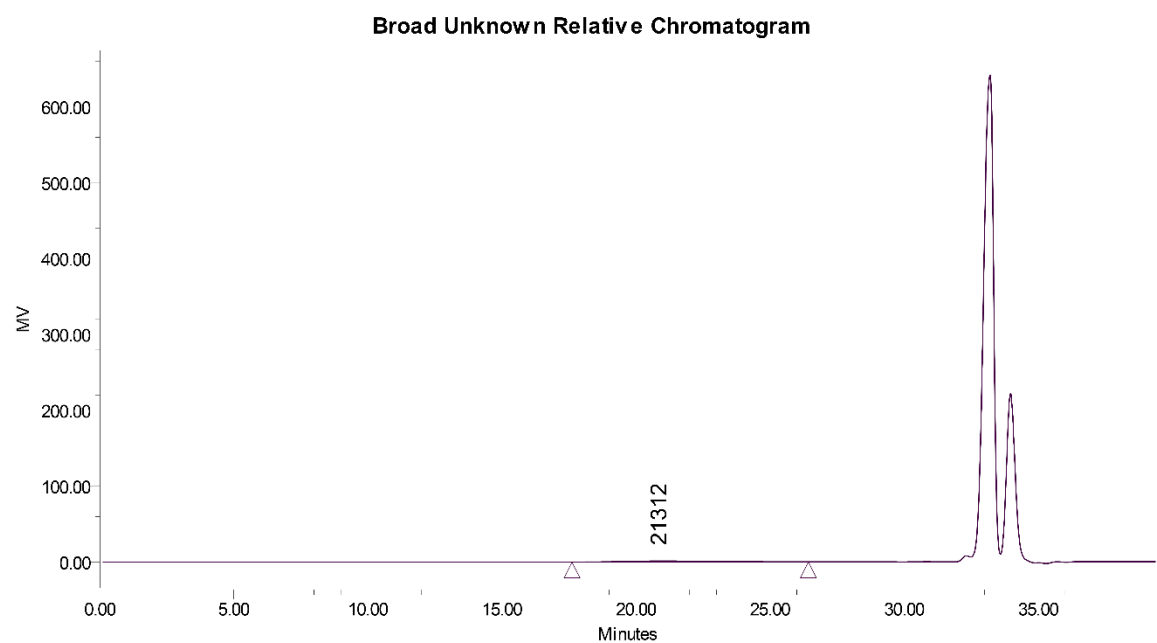




Table 4, entry 1



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 12305        | 19975        | 21312        | 28465        | 36641          | 1.623306       | 1.425024 | 1.834316 |

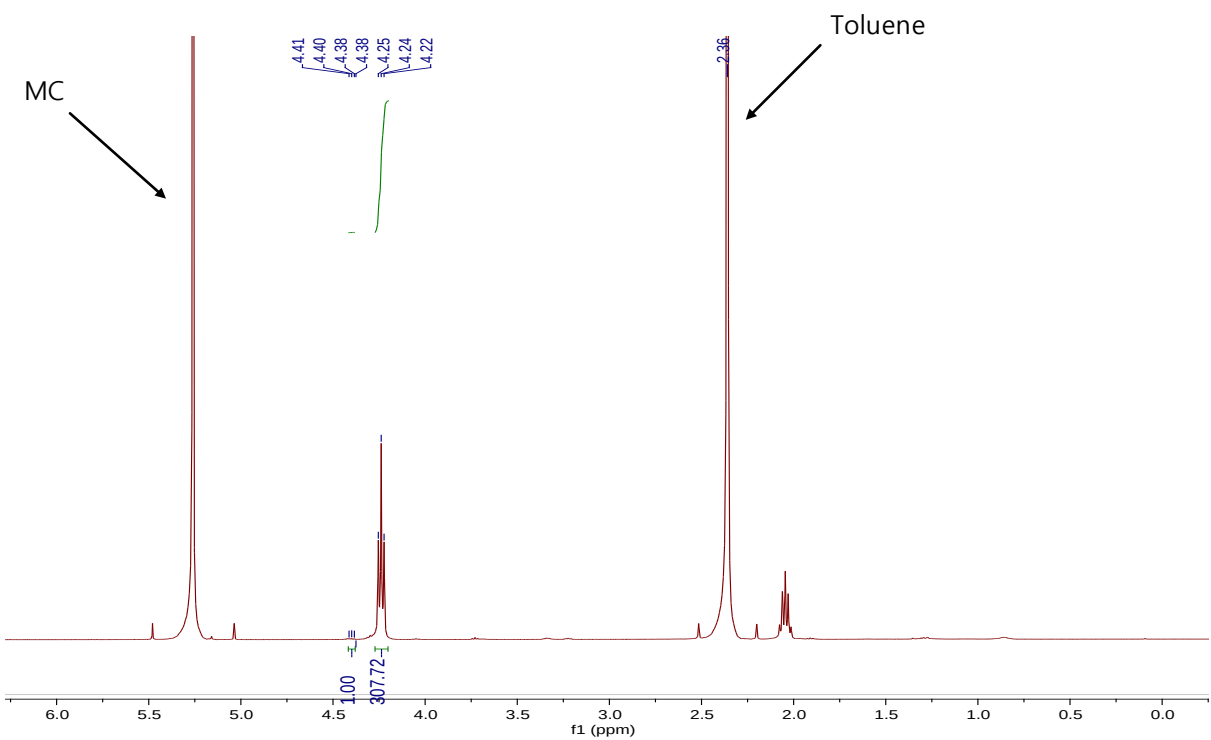
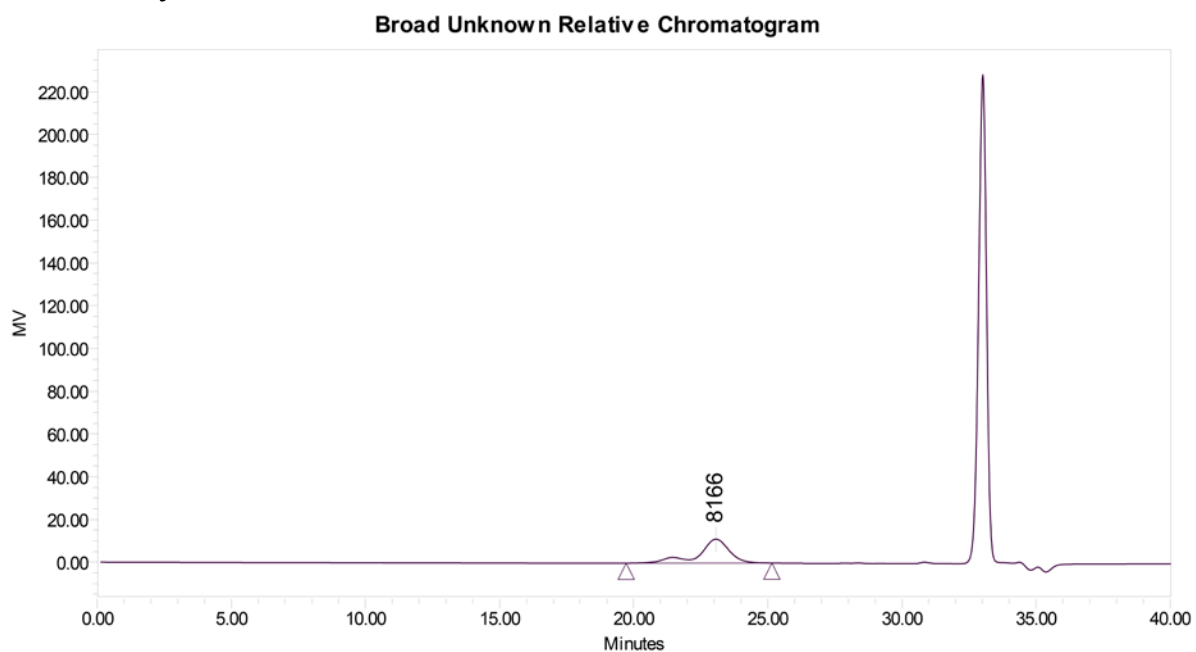


Table 4, entry 2



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 8649         | 9808         | 8166         | 11507        | 13734          | 1.134113       | 1.173128 | 1.400191 |

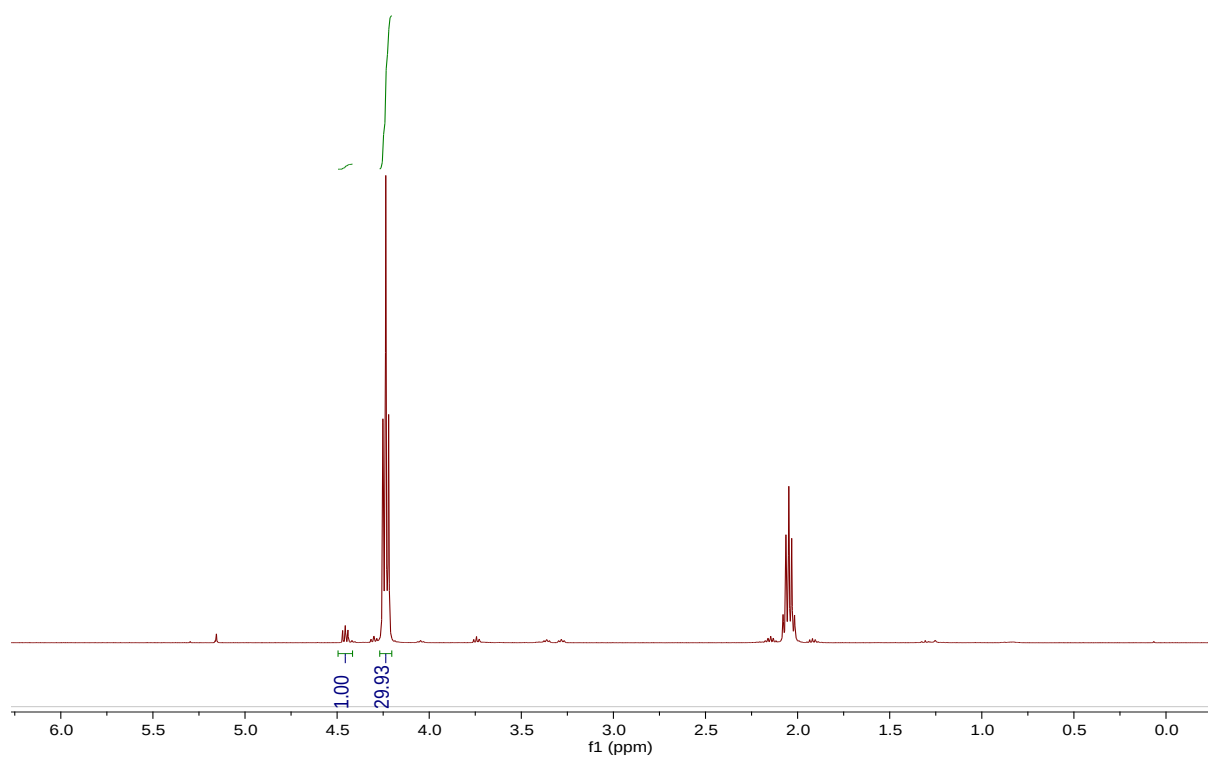
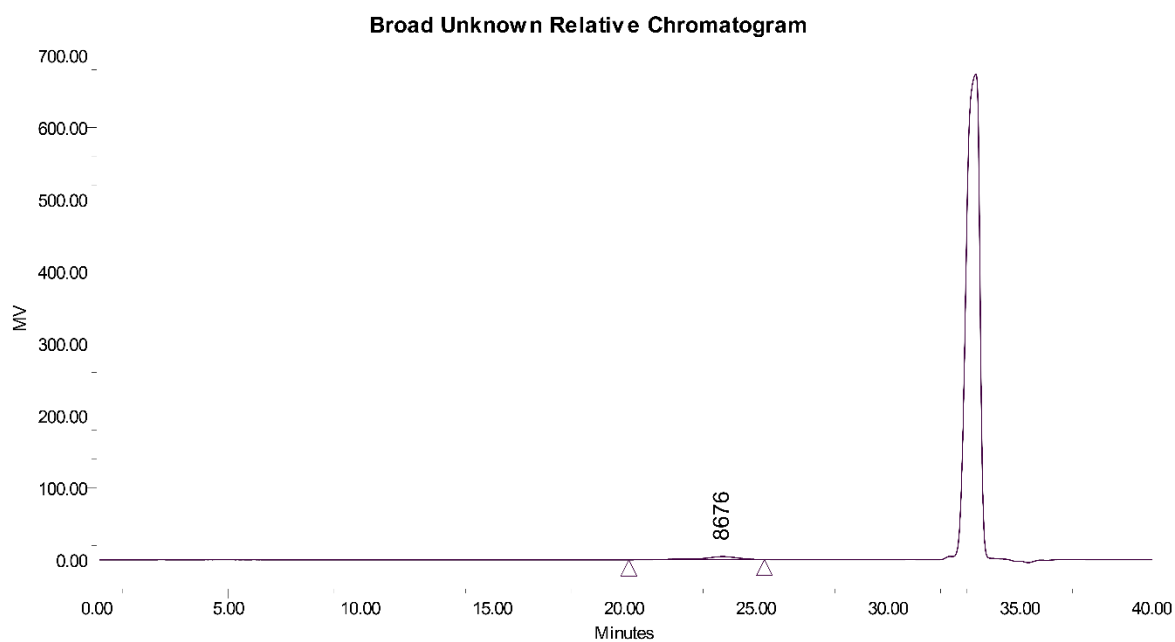


Table 4, entry 3



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 9330         | 10527        | 8676         | 12204        | 14351          | 1.128225       | 1.159347 | 1.363303 |

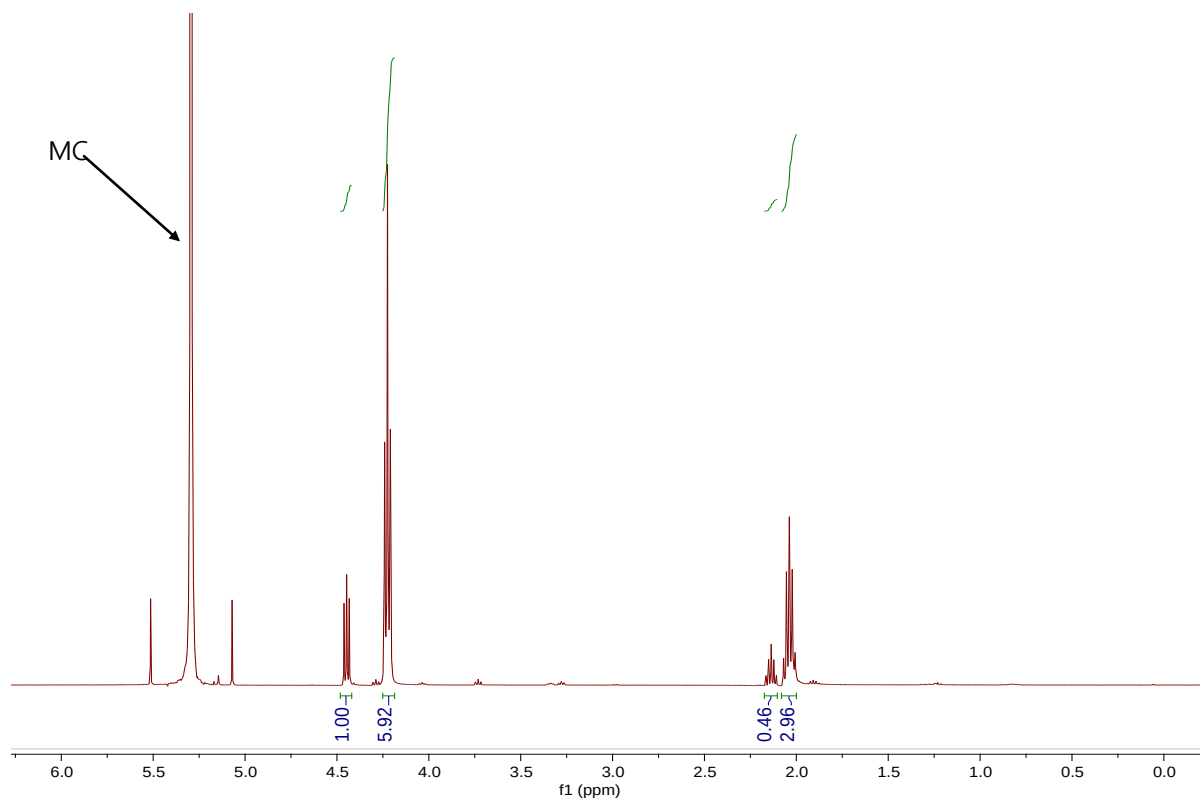
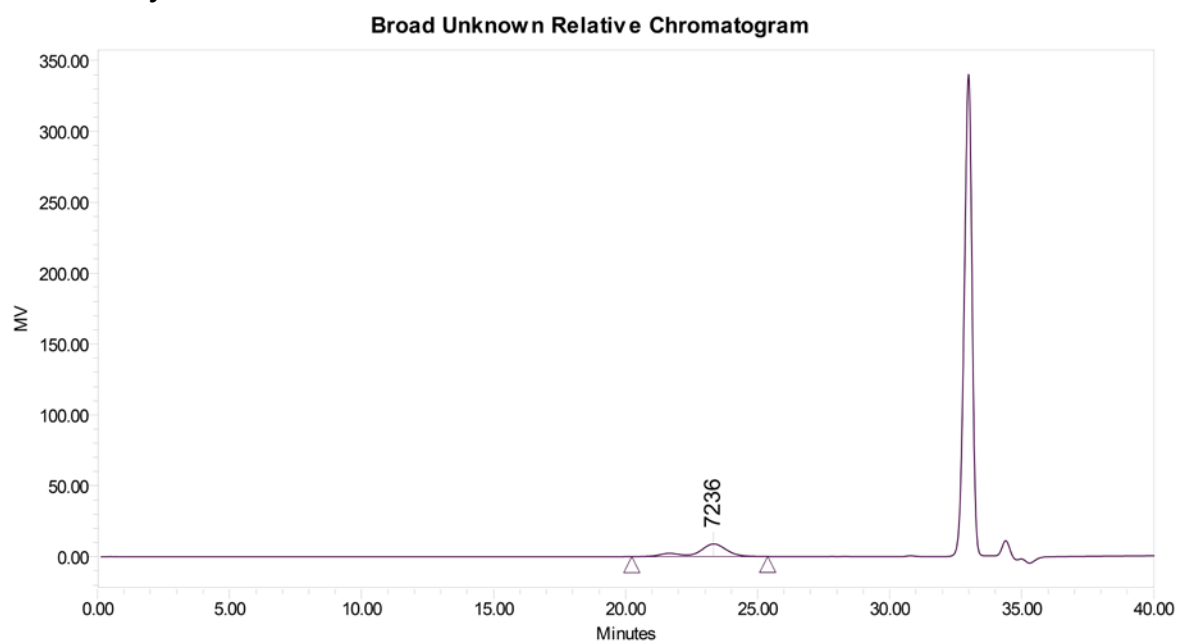


Table 4, entry 4



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 7715         | 8750         | 7236         | 10246        | 12139          | 1.134142       | 1.171043 | 1.387370 |

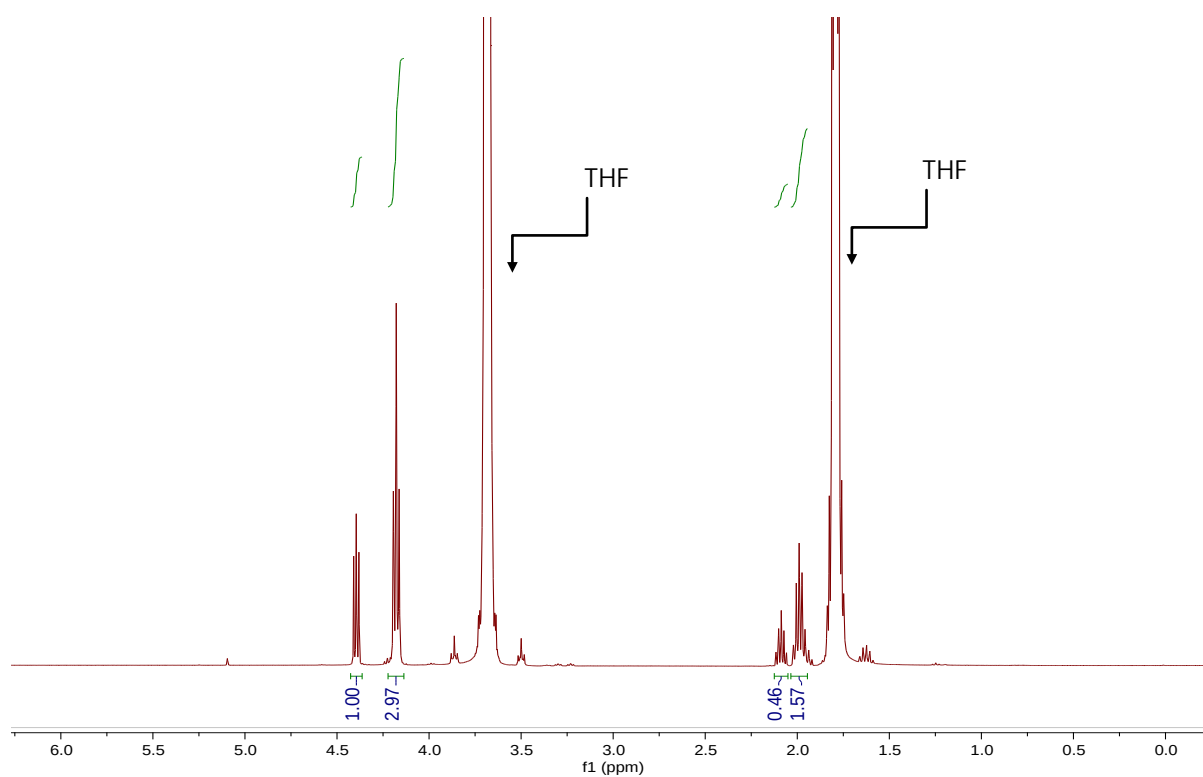
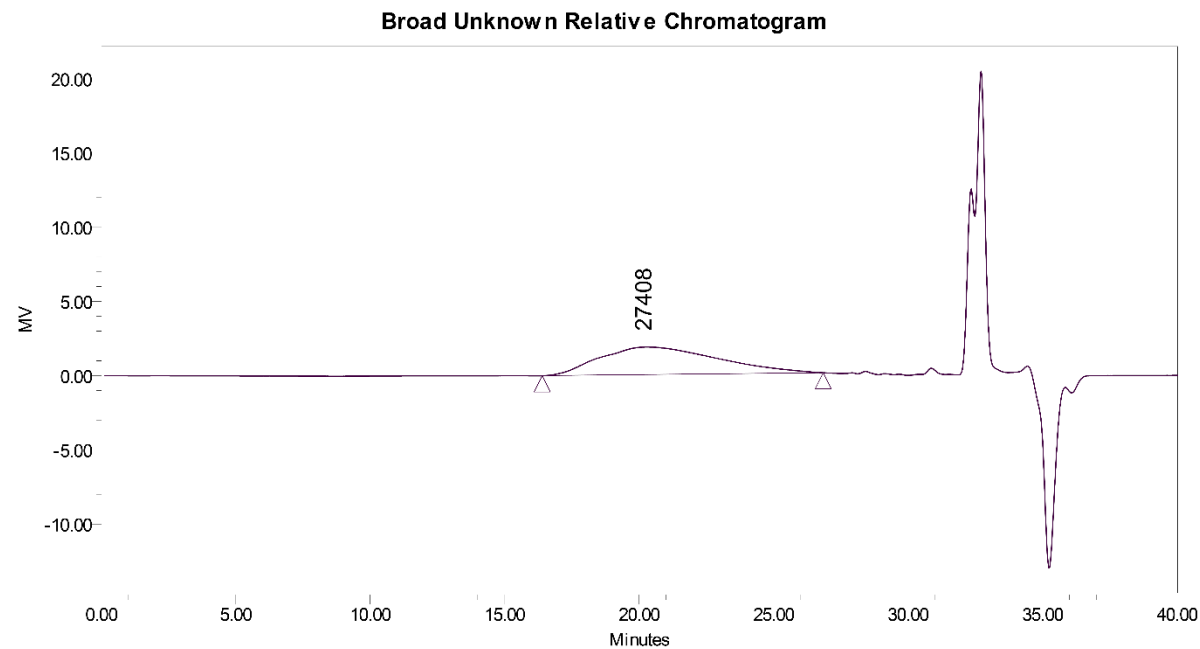


Table 4, entry 5 (Table S4, entry 5-1)



**Broad Unknown n Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 13255        | 28811        | 27408        | 52460        | 80888          | 2.173500       | 1.820847 | 2.807549 |

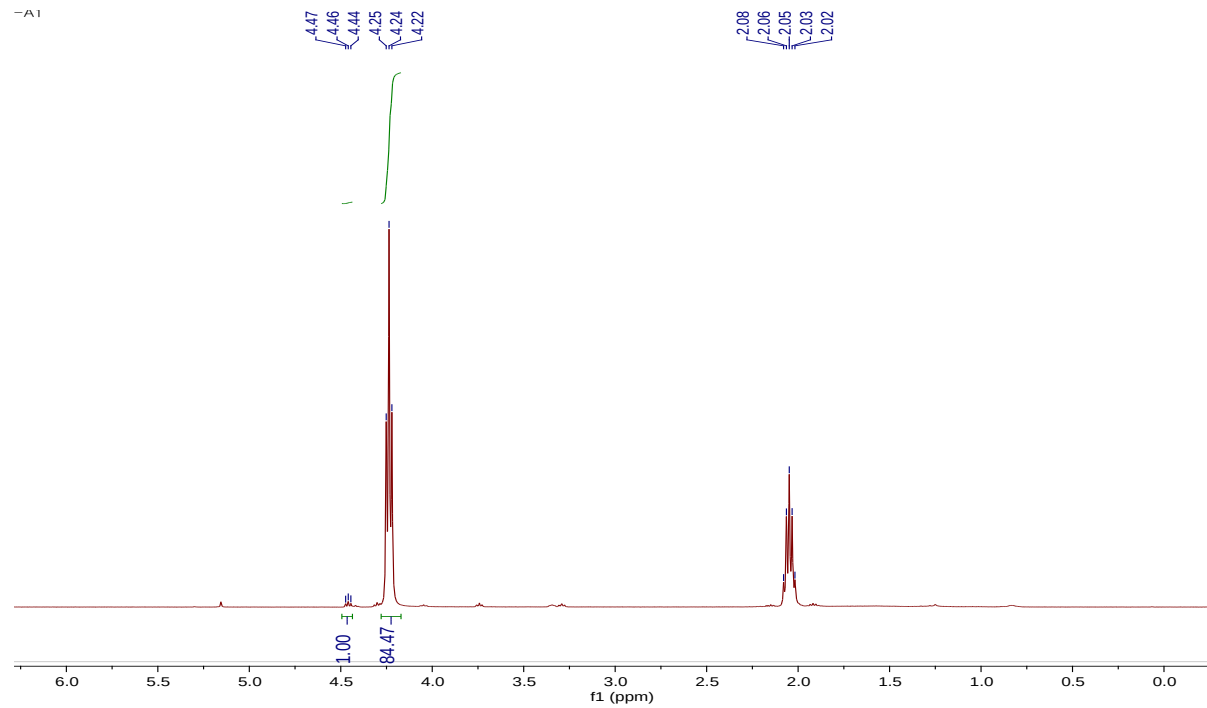
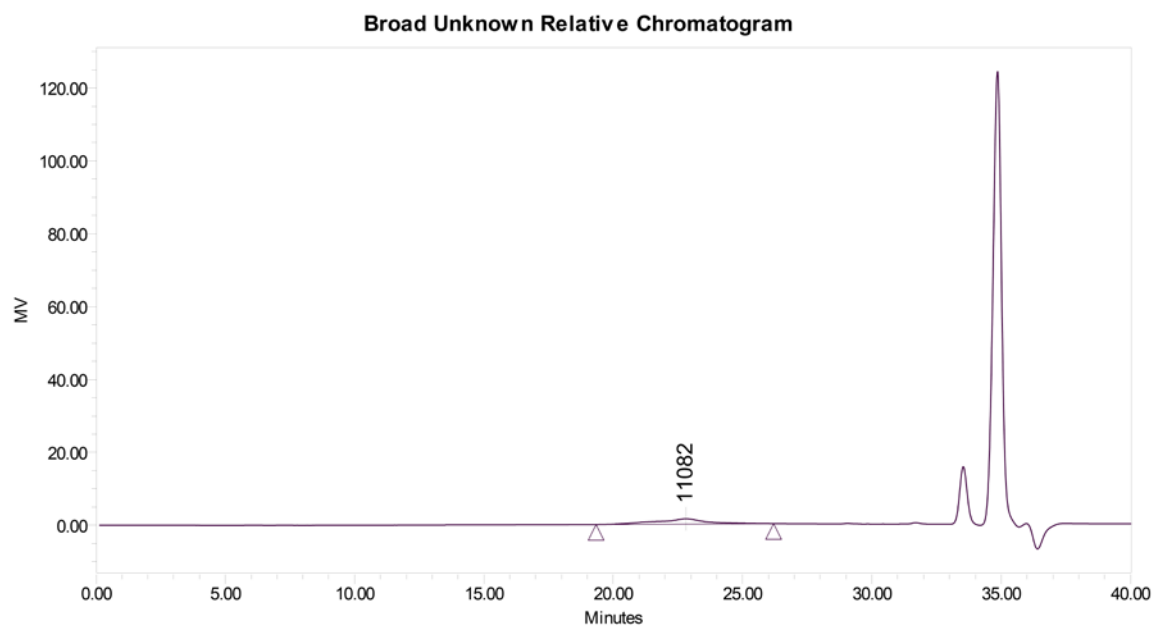


Table 5, entry 1 (Table S5, entry 1-1)



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 10797        | 13691        | 11082        | 16951        | 20383          | 1.268072       | 1.238117 | 1.488795 |

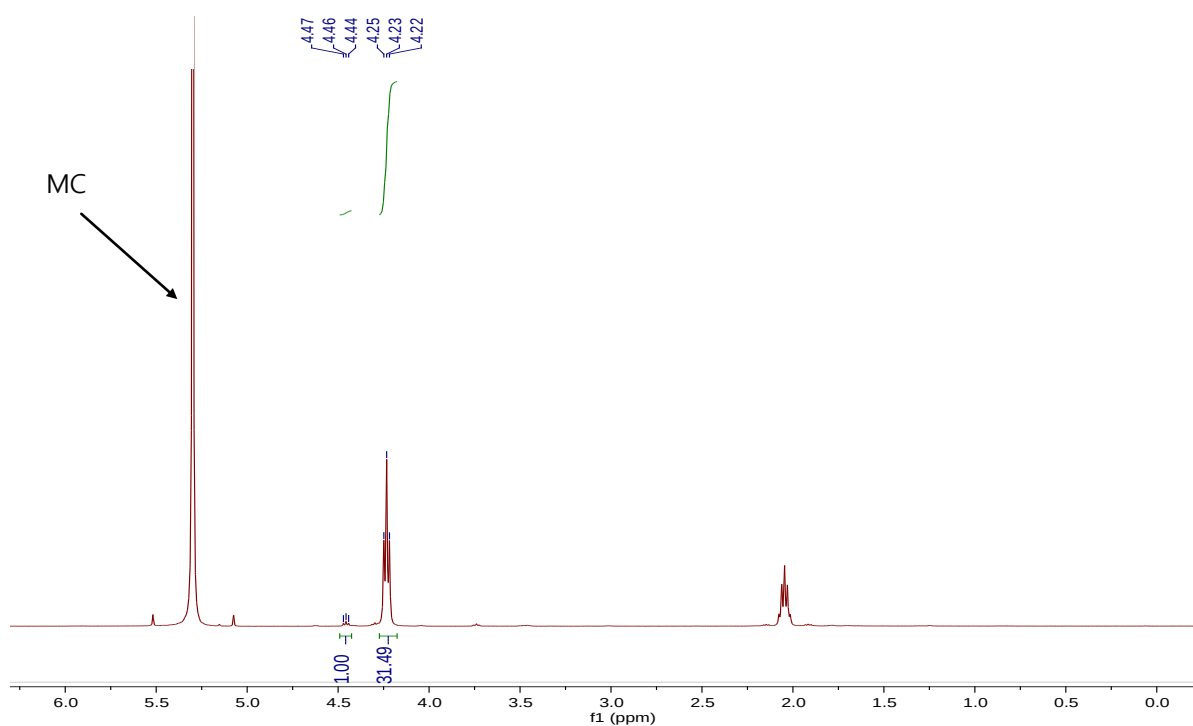
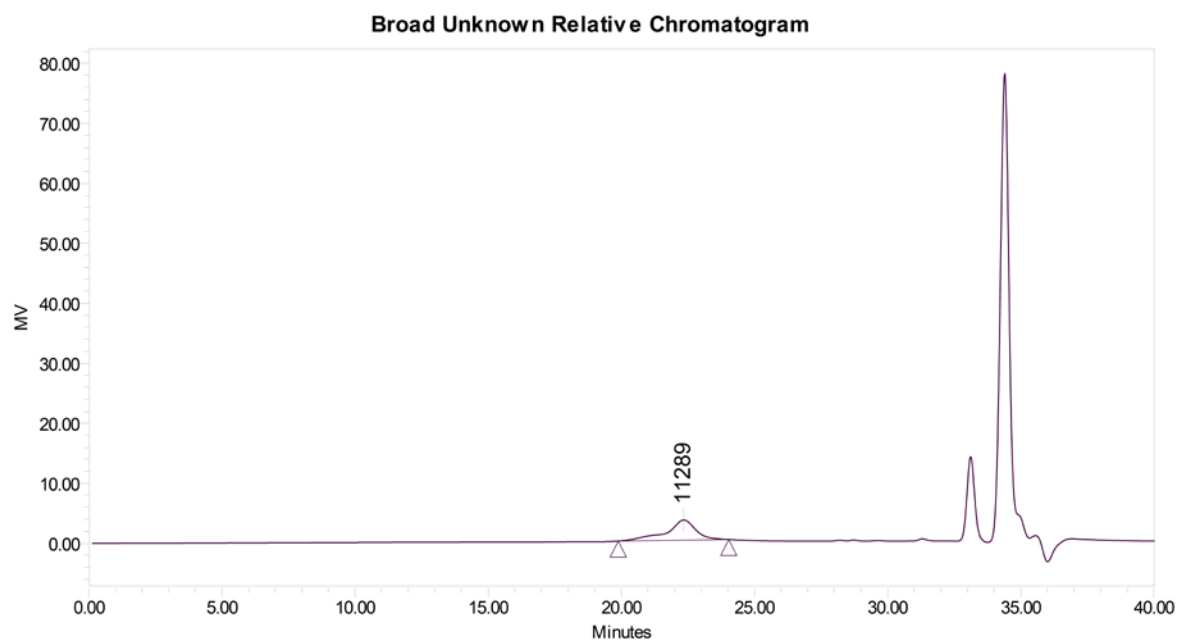


Table 5, entry 2



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 11941        | 13094        | 11289        | 14544        | 16273          | 1.096536       | 1.110743 | 1.242804 |

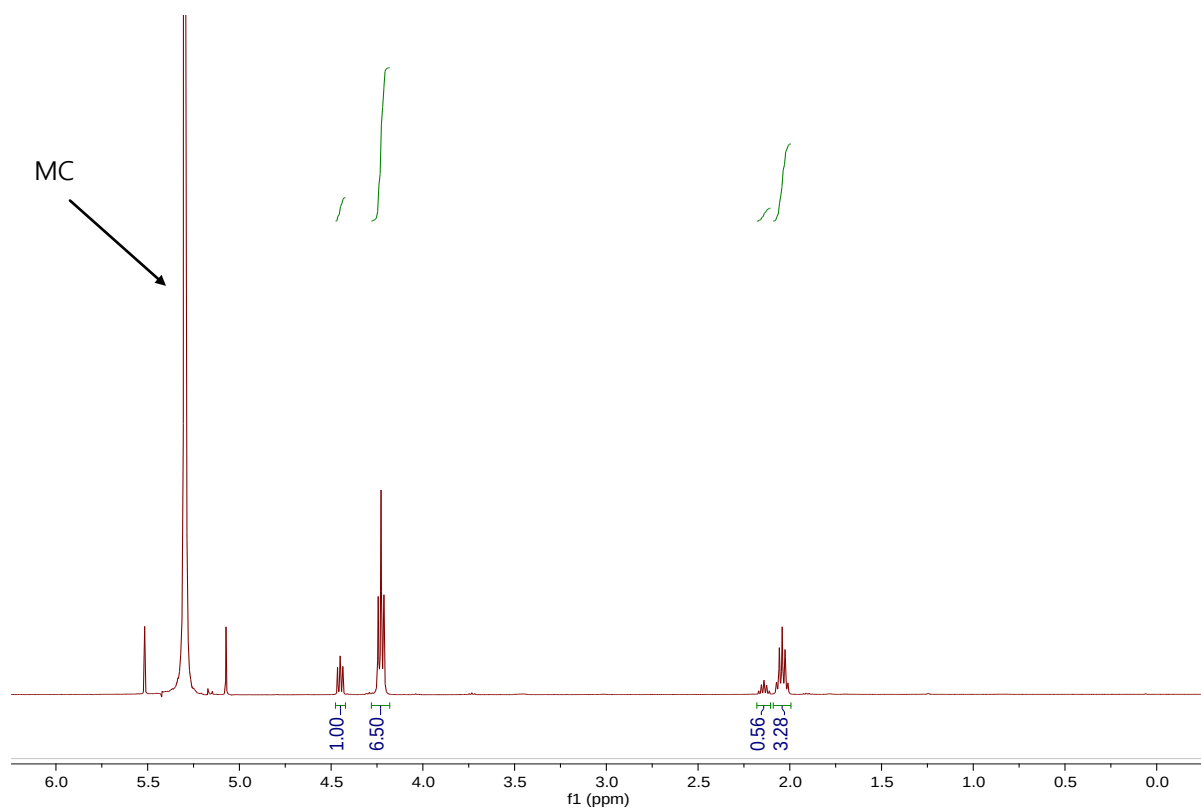
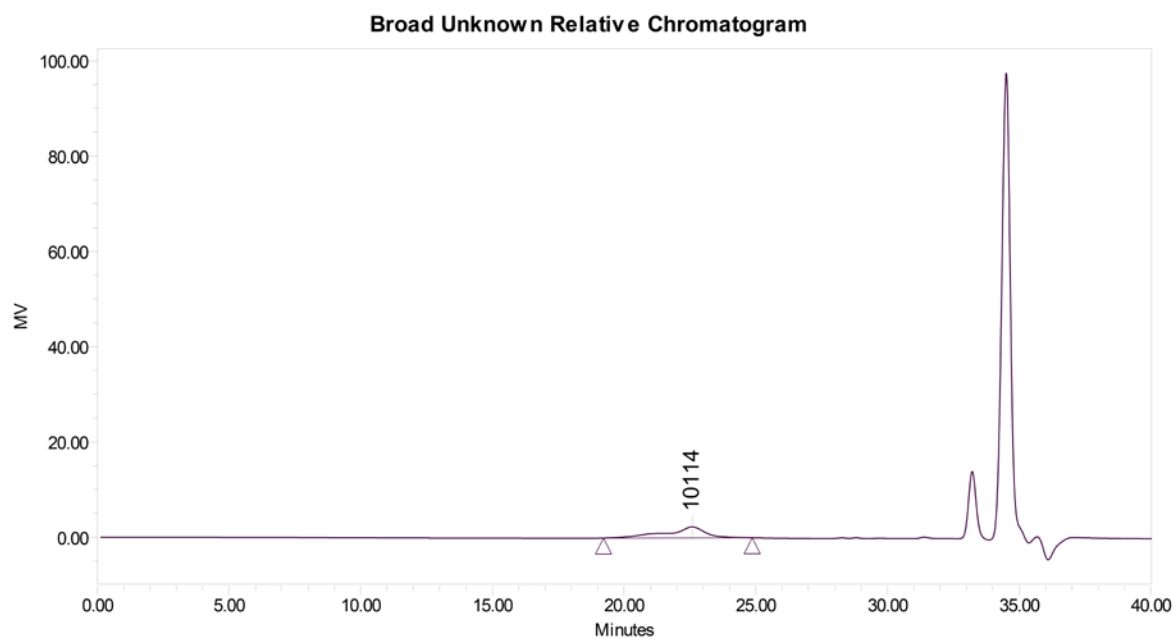


Table 5, entry 3



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 11516        | 13689        | 10114        | 16527        | 19793          | 1.188658       | 1.207383 | 1.445949 |

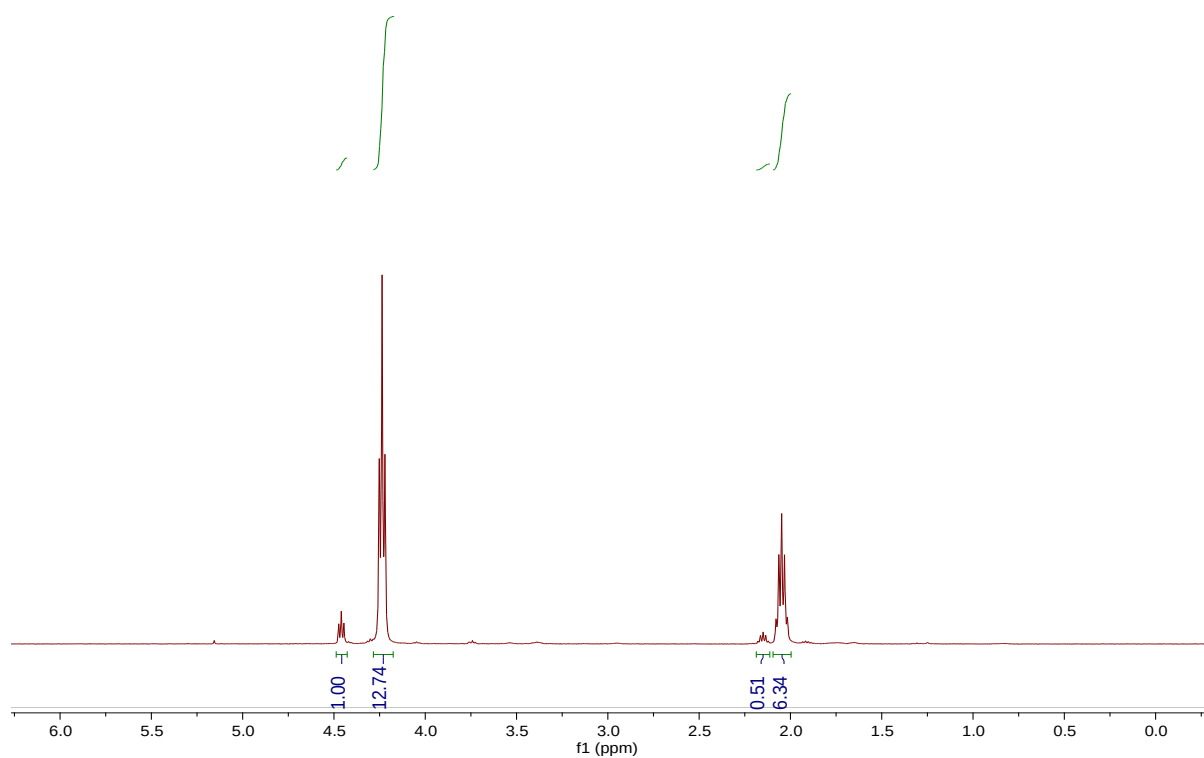
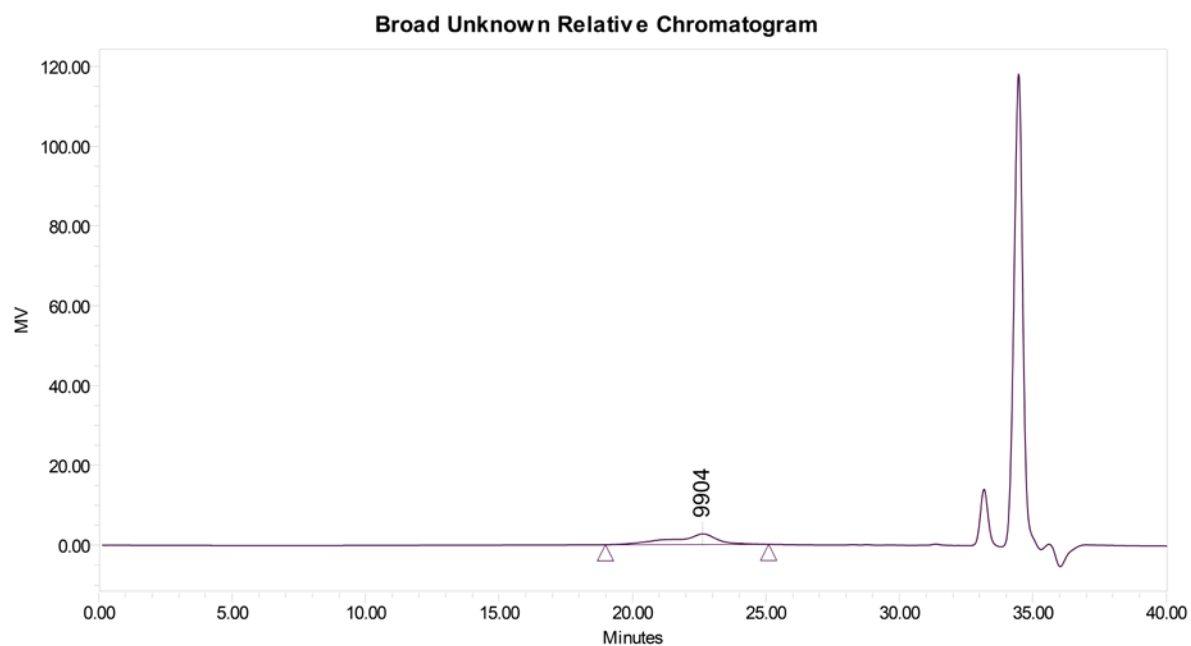




Table 5, entry 4



**Broad Unknown Relative Peak Table**

|   | Distribution Name | Mn (Daltons) | Mw (Daltons) | MP (Daltons) | Mz (Daltons) | Mz+1 (Daltons) | Polydispersity | Mz/Mw    | Mz+1/Mw  |
|---|-------------------|--------------|--------------|--------------|--------------|----------------|----------------|----------|----------|
| 1 |                   | 11396        | 13937        | 9904         | 17233        | 20976          | 1.222729       | 1.236503 | 1.505060 |

