

Supplementary Information for

**Cd<sup>2+</sup>-selective fluorescent response of TQEN (*N,N,N',N'*-tetrakis(2-quinolylmethyl)ethylenediamine) derivatives bearing ether oxygen binding sites**

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**Table S1.** Crystallographic Data for [Cd(8-MOMOTQEN)](ClO<sub>4</sub>)<sub>2</sub> and [Zn(8-OHTQEN)](ClO<sub>4</sub>)<sub>2</sub>·2CH<sub>3</sub>CN

|  | [Cd(8-MOMO-<br>TQEN)](ClO <sub>4</sub> ) <sub>2</sub>                            | [Zn(8-OHTQEN)]-<br>(ClO <sub>4</sub> ) <sub>2</sub> ·2CH <sub>3</sub> CN         |
|--|--|--|
| Formula  | C <sub>44</sub> H <sub>40</sub> CdCl <sub>2</sub> N <sub>6</sub> O <sub>10</sub> | C <sub>46</sub> H <sub>42</sub> Cl <sub>2</sub> N <sub>8</sub> O <sub>9</sub> Zn |
| FW   | 996.15   | 987.17   |
| Crystal system   | monoclinic   | triclinic  |
| Space group  | <i>P</i> 2 <sub>1</sub> / <i>c</i>   | <i>P</i> -1  |
| <i>a</i> , Å   | 12.1523(6)   | 10.352(2)  |
| <i>b</i> , Å   | 16.5107(15)  | 12.177(3)  |
| <i>c</i> , Å   | 20.3375(13)  | 20.024(4)  |
| <i>α</i> , deg   | 90   | 68.874(5)  |
| <i>β</i> , deg   | 94.160(3)  | 71.806(7)  |
| <i>γ</i> , deg   | 90   | 84.582(8)  |
| <i>V</i> , Å <sup>3</sup>                                  | 4069.8(5)  | 2236.3(8)  |
| <i>Z</i>   | 4  | 2  |
| <i>D</i> <sub>calc</sub> , g cm <sup>-3</sup>              | 1.626  | 1.466  |
| <i>μ</i> , mm <sup>-1</sup>                                | 0.7386   | 0.7351   |
| 2 $\theta$ <sub>max</sub> , deg                            | 55   | 55   |
| temp, K  | 153  | 153  |
| no. reflns collected                                       | 30977  | 23466  |
| no. reflns used  | 9310   | 10158  |
| no. of params  | 569  | 601  |
| <i>R</i> <sub>int</sub>                                    | 0.0183   | 0.0354   |
| Final <i>R</i> 1 ( <i>I</i> > 2σ( <i>I</i> )) <sup>a</sup> | 0.0391   | 0.0608   |
| <i>wR</i> 2 (all data) <sup>b</sup>                        | 0.1021   | 0.1959   |
| GOF  | 1.051  | 1.103  |

$$^a R1 = \sum ||F_o| - |F_c|| / \sum |F_o|. \quad ^b wR2 = [\sum w[(F_o^2 - F_c^2)^2] / \sum [w(F_o^2)^2]]^{1/2}.$$

**Table S2.** Interatomic Distances (Å) for [Cd(8-MOMOTQEN)](ClO<sub>4</sub>)<sub>2</sub> and [Zn(8-OHTQEN)](ClO<sub>4</sub>)<sub>2</sub>·2CH<sub>3</sub>CN

|        | [Cd(8-MOMO-<br>TQEN)](ClO <sub>4</sub> ) <sub>2</sub> | [Zn(8-OHTQEN)]-<br>(ClO <sub>4</sub> ) <sub>2</sub> ·2CH <sub>3</sub> CN |
|--------|---|--|
| M-N1   | 2.369(2)  | 2.291(3)   |
| M-N2   | 2.421(2)  | 2.250(3)   |
| M-N3   | 2.359(2)  | 2.078(4)   |
| M-N4   | 2.409(2)  | 2.206(3)   |
| M-N5   | 2.442(2)  | 2.199(3)   |
| M-N6   | 2.363(2)  | 3.580(3)   |
| M-O1   | 3.011(2)  | 2.142(3)   |
| M...O2 | 5.221(2)  | –  |

**Table S3.** Fluorescence Lifetimes for Cd<sup>2+</sup> and Zn<sup>2+</sup> Complexes of 8-MOMOTQEN<sup>a</sup>

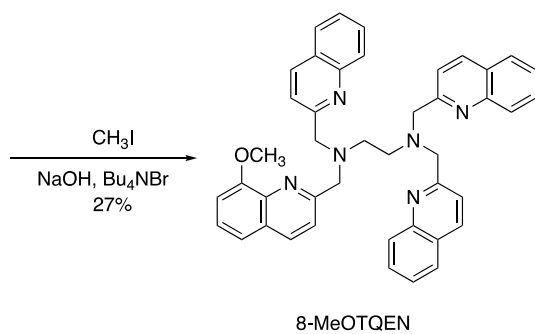
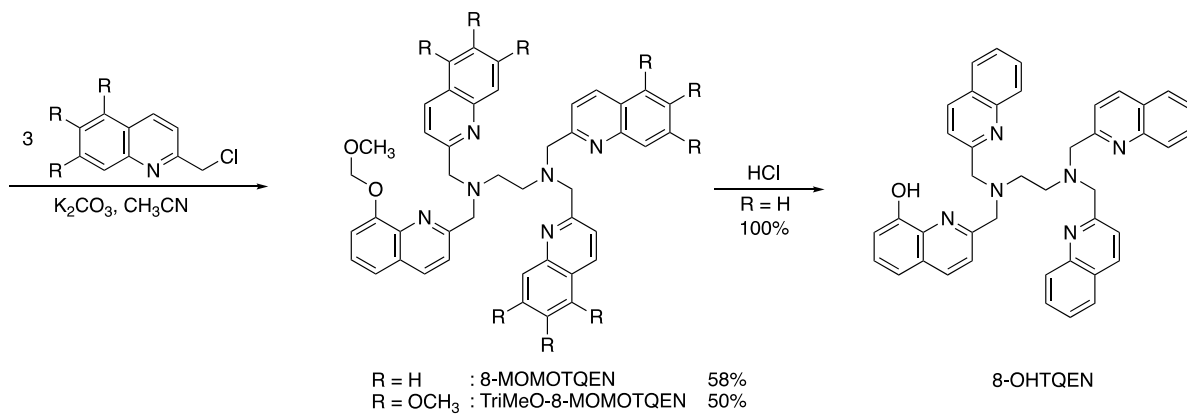
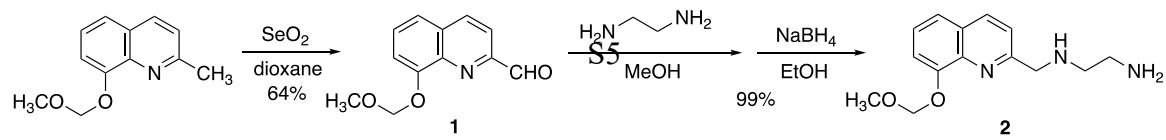
| Metal Ion        | $\lambda_{em}$ (nm) | BPF <sup>b</sup> | $\tau$ (nsec) <sup>c</sup>        |
|------------------|---------------------|------------------|-----------------------------------|
| none             | 434                 | 430              | 4.28 (24%), 19.5 (49%)            |
| Cd <sup>2+</sup> | 436                 | 430              | 1.89 (7%), 9.33 (60%), 15.8 (33%) |
| Zn <sup>2+</sup> | 451                 | 460              | 7.30 (37%), 23.2 (54%)            |

<sup>a</sup> Conditions: 34  $\mu$ M solution in DMF-H<sub>2</sub>O (1:1) at 25 °C in the presence of 1 equiv. of metal ion ( $\lambda_{ex}$  = 331 nm).

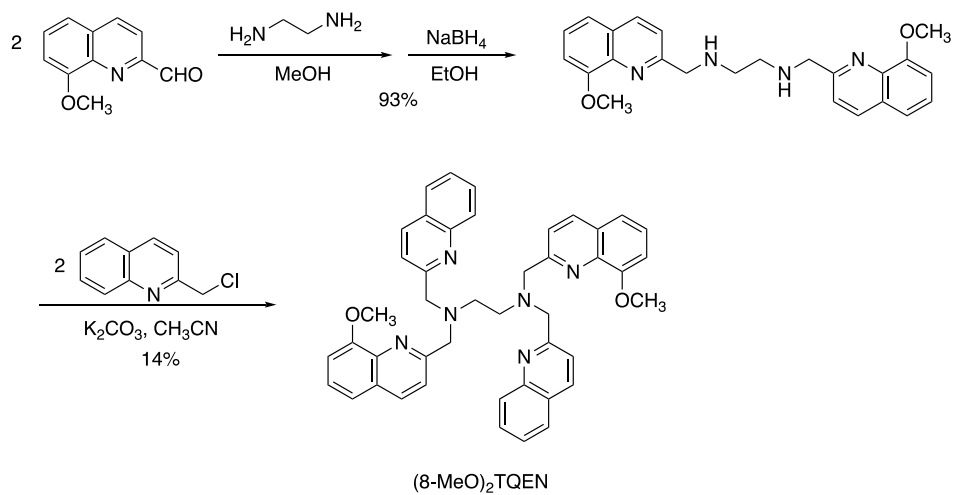
<sup>b</sup> Bandpath filter used ( $\pm$ 10 nm).

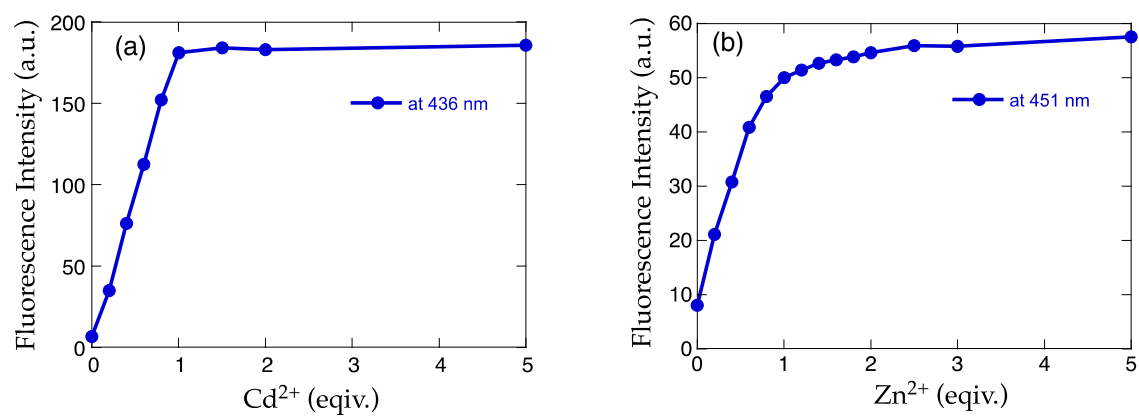
<sup>c</sup> Components with extremely short lifetime (< 1 nsec) were omitted.

Scheme S1

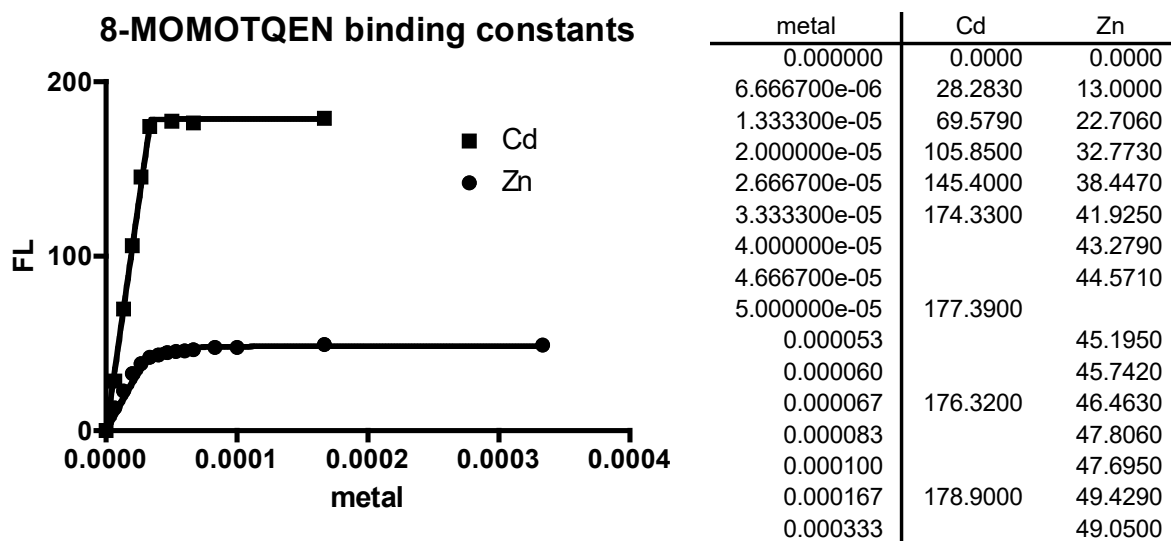


Scheme S2



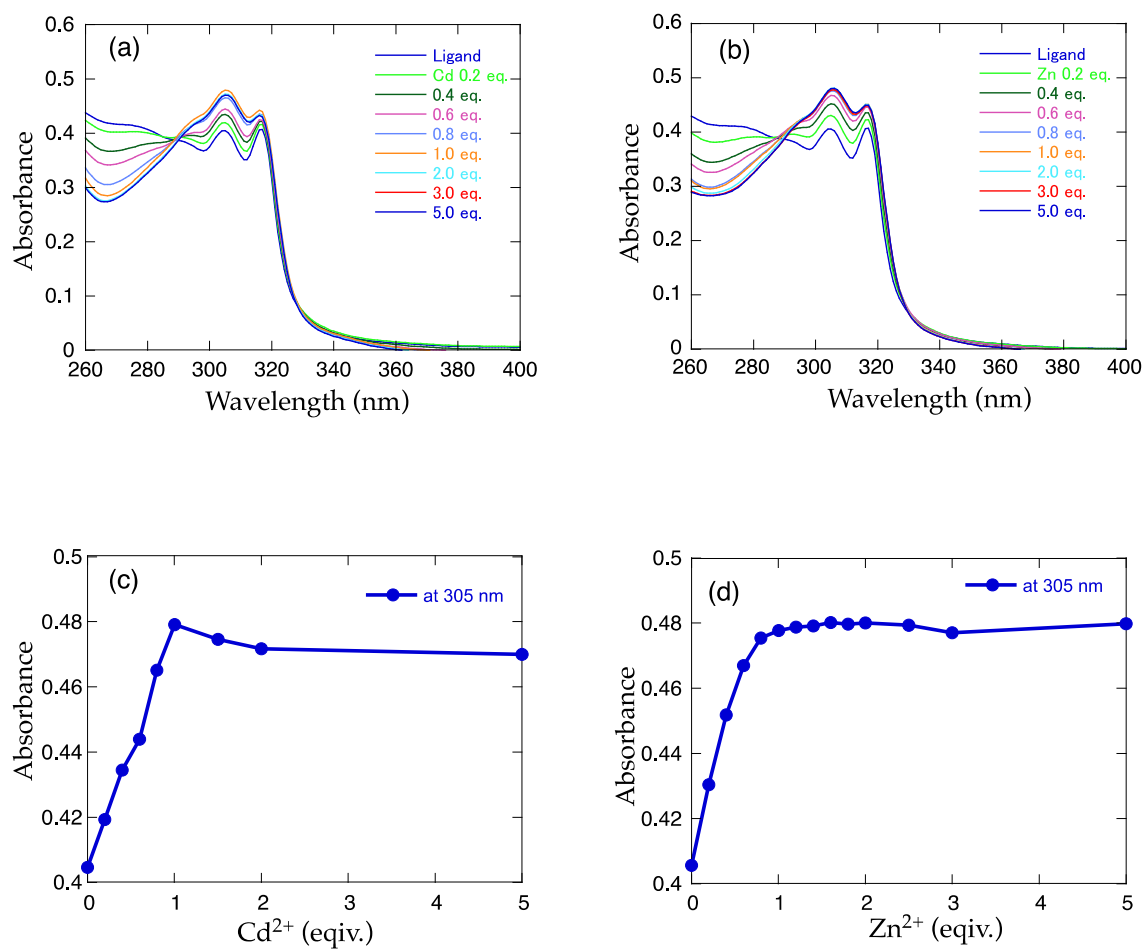


**Fig. S1.** Plot of fluorescence intensity changes of 34  $\mu\text{M}$  8-MOMOTQEN in the presence of 1 equiv. of (a)  $\text{Cd}^{2+}$  and (b)  $\text{Zn}^{2+}$  in DMF- $\text{H}_2\text{O}$  (1:1) at 25  $^\circ\text{C}$  ( $\lambda_{\text{ex}} = 317 \text{ nm}$ ).



|                          | Cd                          | Zn                          |
|--------------------------|-----------------------------|-----------------------------|
| zinc binding 2/7/2008    |                             |                             |
| Best-fit values          |                             |                             |
| BMAX                     | 178.5                       | 48.55                       |
| KD                       | 1.4353e-009                 | 6.0952e-007                 |
| L0                       | 3.4000e-005                 | 3.4000e-005                 |
| Std. Error               |                             |                             |
| BMAX                     | 1.754                       | 1.303                       |
| KD                       | 1.7978e-008                 | 5.0052e-007                 |
| 95% Confidence Intervals |                             |                             |
| BMAX                     | 174.4 to 182.7              | 45.73 to 51.36              |
| KD                       | -4.1082e-008 to 4.3953e-008 | -4.7161e-007 to 1.6906e-006 |
| Goodness of Fit          |                             |                             |
| Degrees of Freedom       | 7                           | 13                          |
| R squared                | 0.9979                      | 0.9720                      |
| Absolute Sum of Squares  | 81.63                       | 85.23                       |
| Sy.x                     | 3.415                       | 2.560                       |
| Constraints              |                             |                             |
| L0                       | L0 = 3.4000e-005            | L0 = 3.4000e-005            |
| Data                     |                             |                             |
| Number of X values       | 15                          | 16                          |
| Number of Y replicates   | 1                           | 1                           |
| Total number of values   | 9                           | 15                          |
| Number of missing values | 6                           | 1                           |

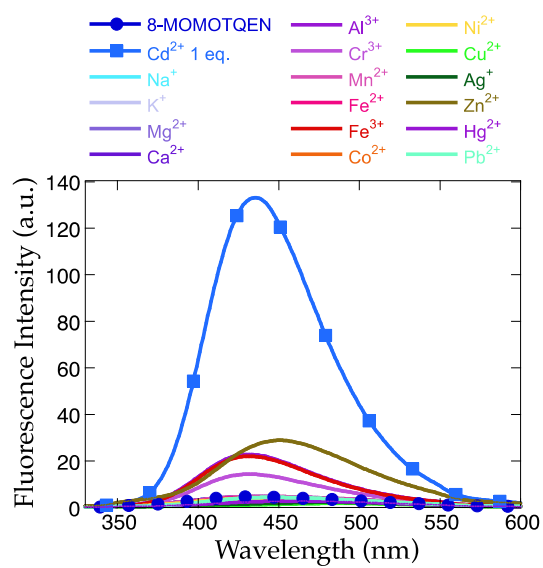
**Fig. S2.** Estimation of dissociation constants ( $K_d$ ) for 8-MOMOTQEN with  $\text{Cd}^{2+}$  and  $\text{Zn}^{2+}$  in DMF- $\text{H}_2\text{O}$  (1:1) at 25°C.



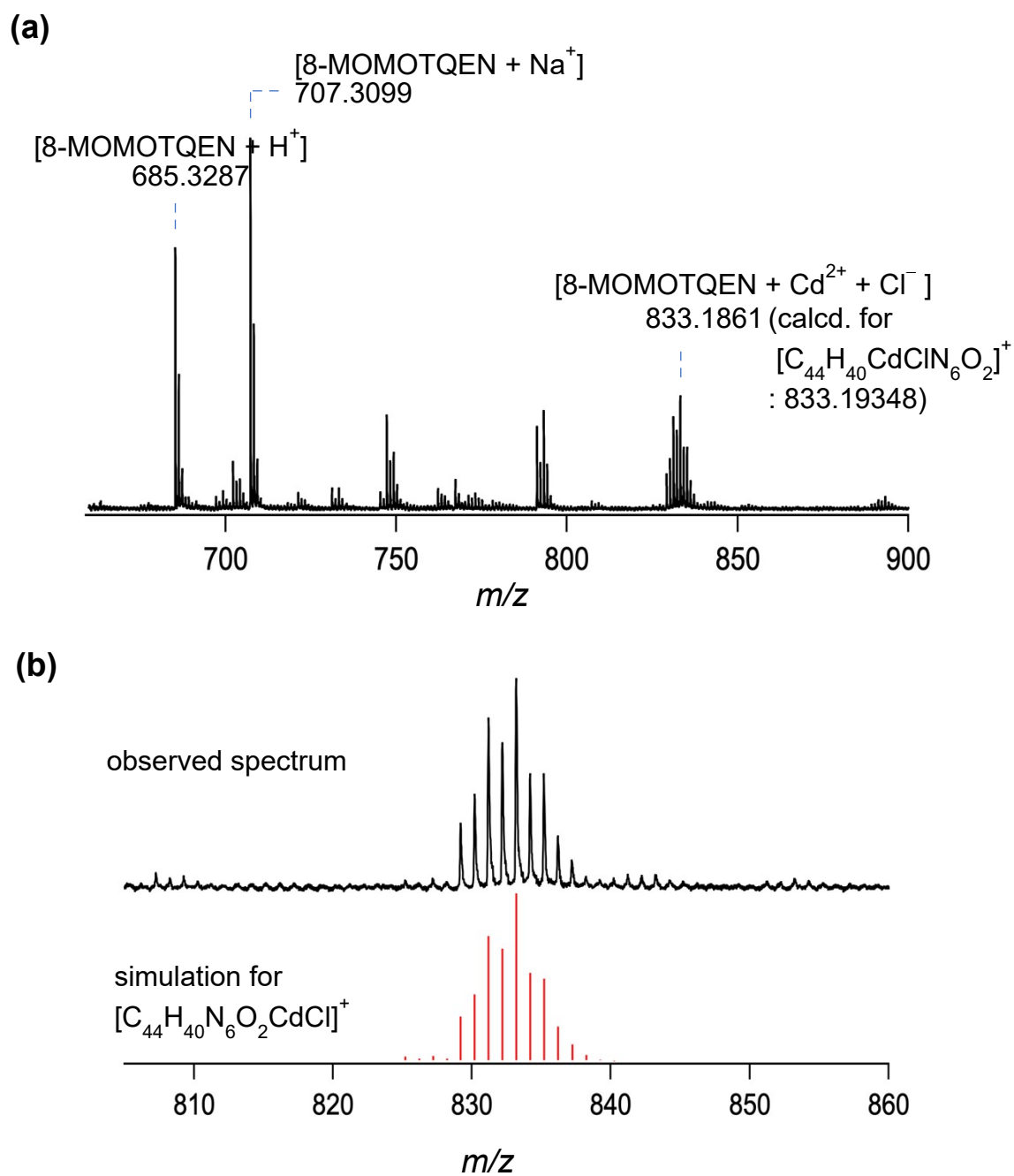
**Fig. S3.** (a,b) UV-vis absorption spectra of 34 μM 8-MOMOTQEN in DMF-H<sub>2</sub>O (1:1) at 25 °C in the presence of increasing amount of (a) Cd<sup>2+</sup> and (b) Zn<sup>2+</sup>. (c,d) Plot of absorbance changes in the presence of increasing amount of (c) Cd<sup>2+</sup> and (d) Zn<sup>2+</sup>.



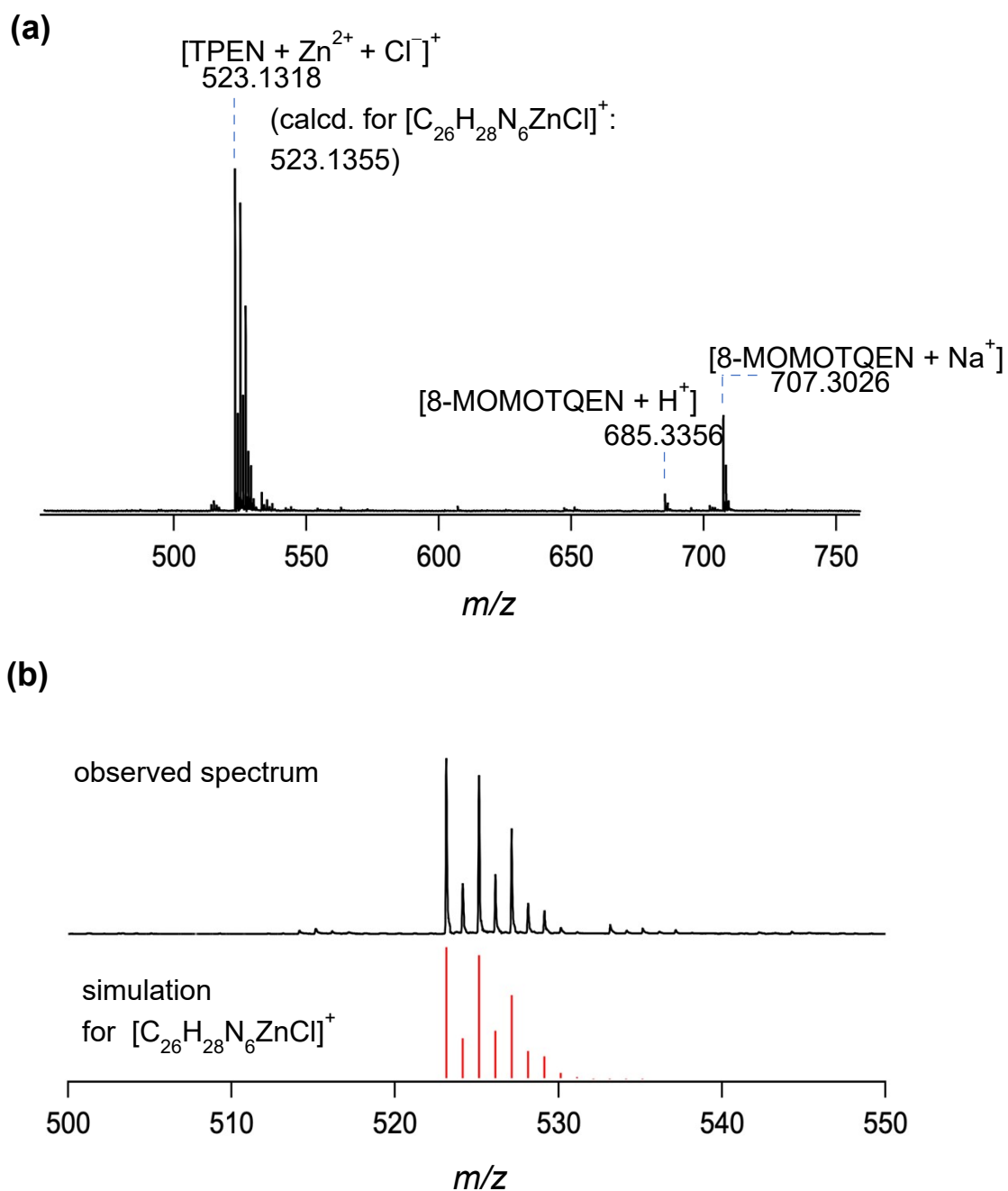




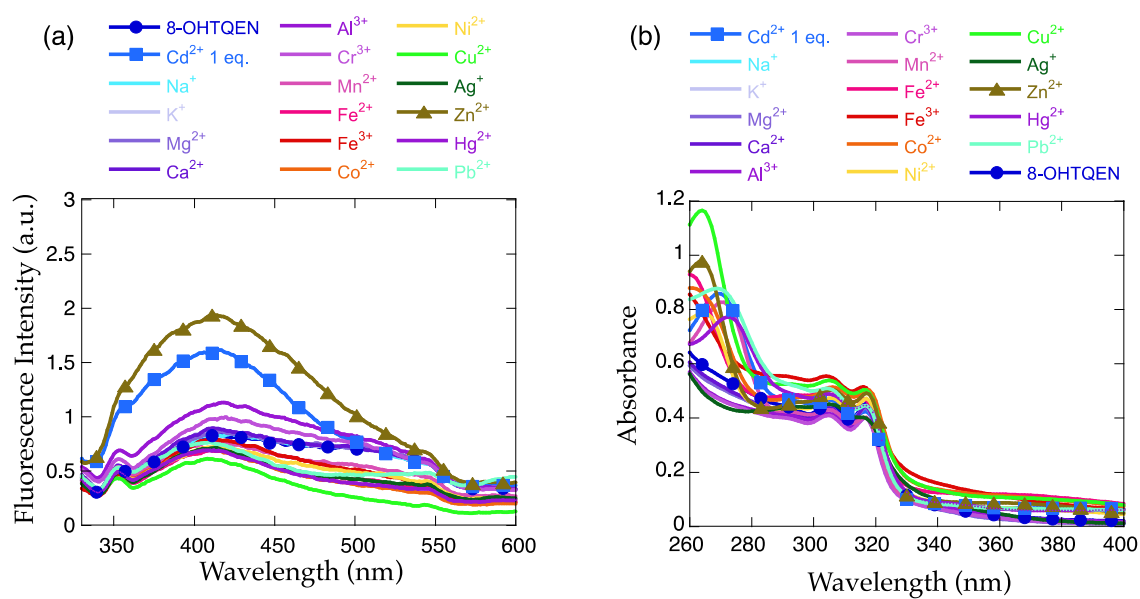
**Fig. S5.** Fluorescence spectra of 34 μM 8-MOMOTQEN in the presence of 1 equiv. of various metal ions in DMF-H<sub>2</sub>O (1:1) at 25 °C ( $\lambda_{\text{ex}} = 317$  nm).



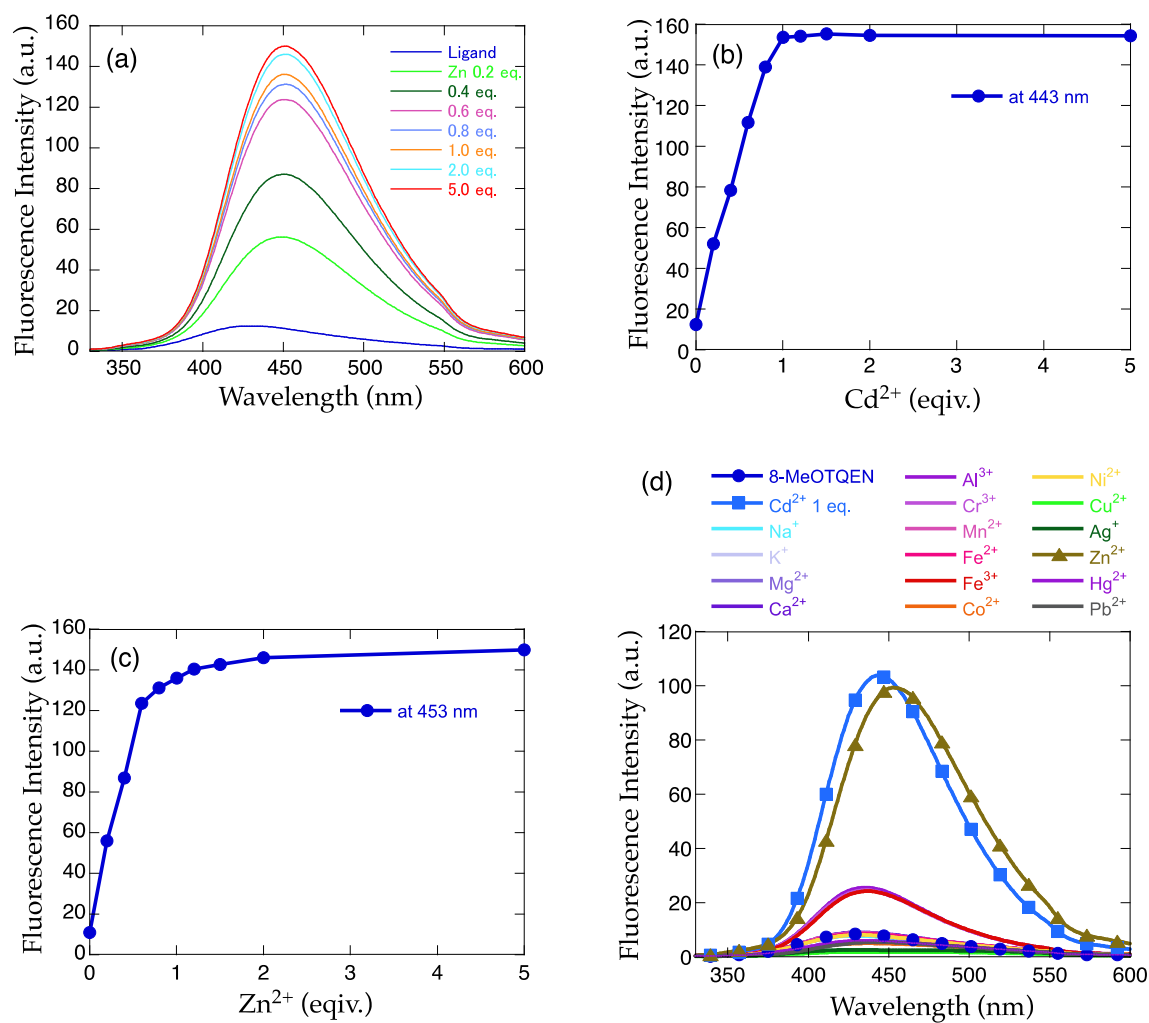
**Fig. S6.** ESI-MS spectrum of 8-MOMOTQEN in methanol solution in the presence of 1 equiv. of Cd<sup>2+</sup>. (a) Observed spectrum. (b) Comparison of observed and simulated spectra for 8-MOMOTQEN-Cd<sup>2+</sup> complex.



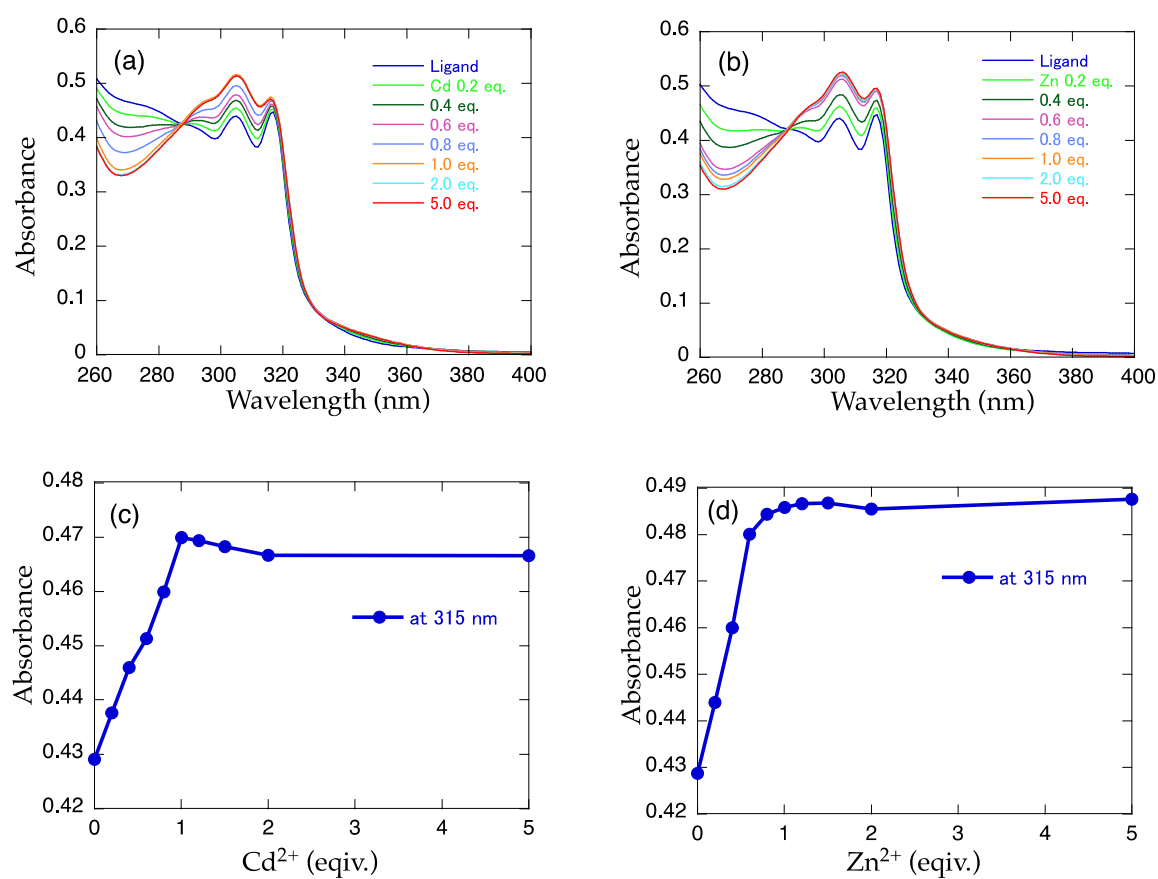
**Fig. S7.** ESI-MS spectrum of 8-MOMOTQEN-Zn<sup>2+</sup> complex in methanol solution in the presence of 1 equiv. of TPEN. (a) Observed spectrum. (b) Comparison of observed and simulated spectra for TPEN-Zn<sup>2+</sup> complex produced by ligand replacement.



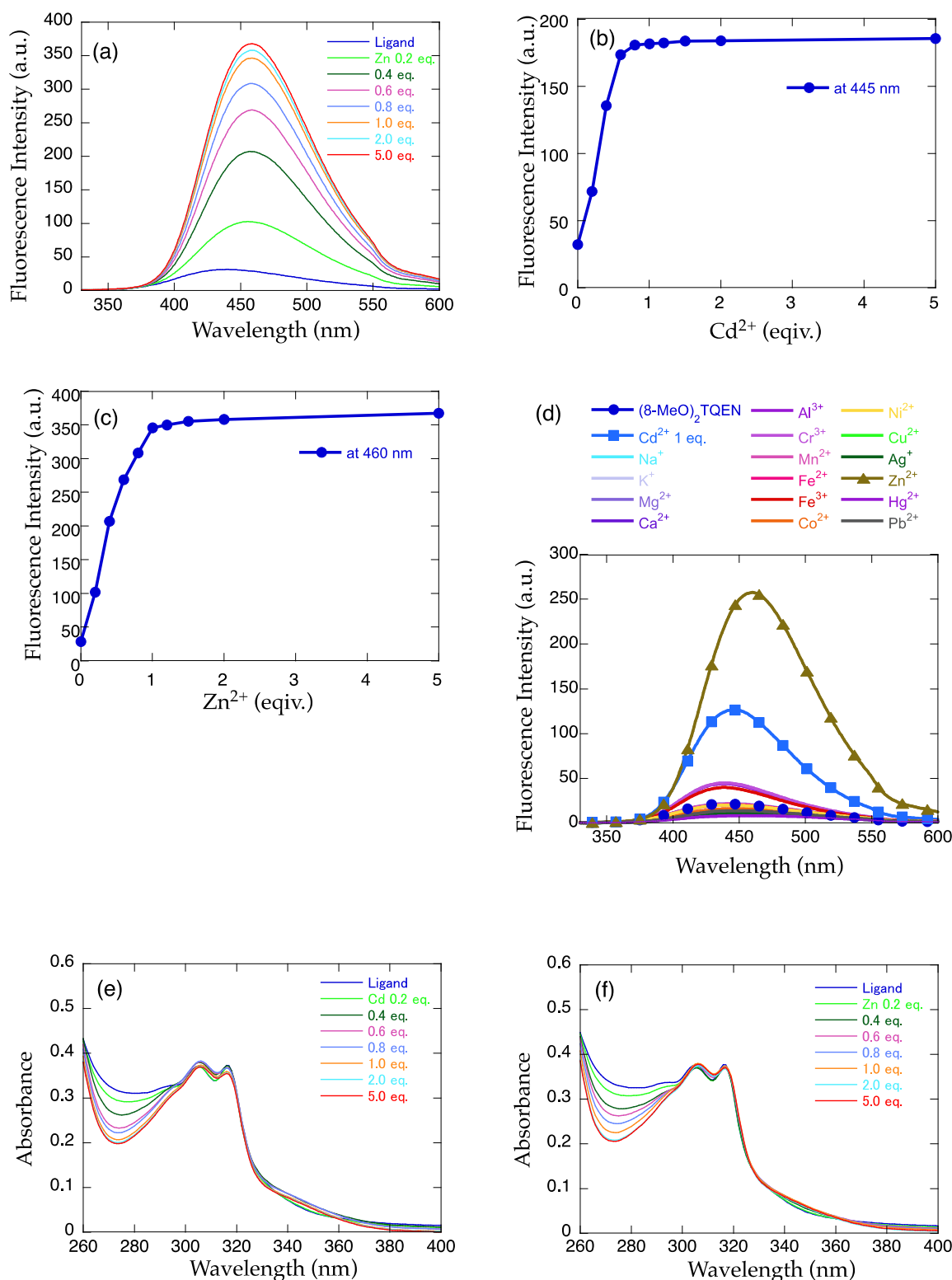
**Fig. S8.** (a) Fluorescence and (b) UV-vis spectra of 34 μM 8-OHTQEN in the presence of 1 equiv. of various metal ions in DMF-H<sub>2</sub>O (1:1) at 25 °C ( $\lambda_{\text{ex}} = 317$  nm).



**Fig. S9.** (a) Fluorescence spectra of 34  $\mu\text{M}$  8-MeOTQEN in DMF-H<sub>2</sub>O (1:1) at 25 °C in the presence of increasing amount of Zn<sup>2+</sup> ( $\lambda_{\text{ex}} = 317$  nm). (b,c) Plot of fluorescence intensity changes for (b) Cd<sup>2+</sup> and (c) Zn<sup>2+</sup> titration. (d) Fluorescence spectra in the presence of 1 equiv. of various metal ions.



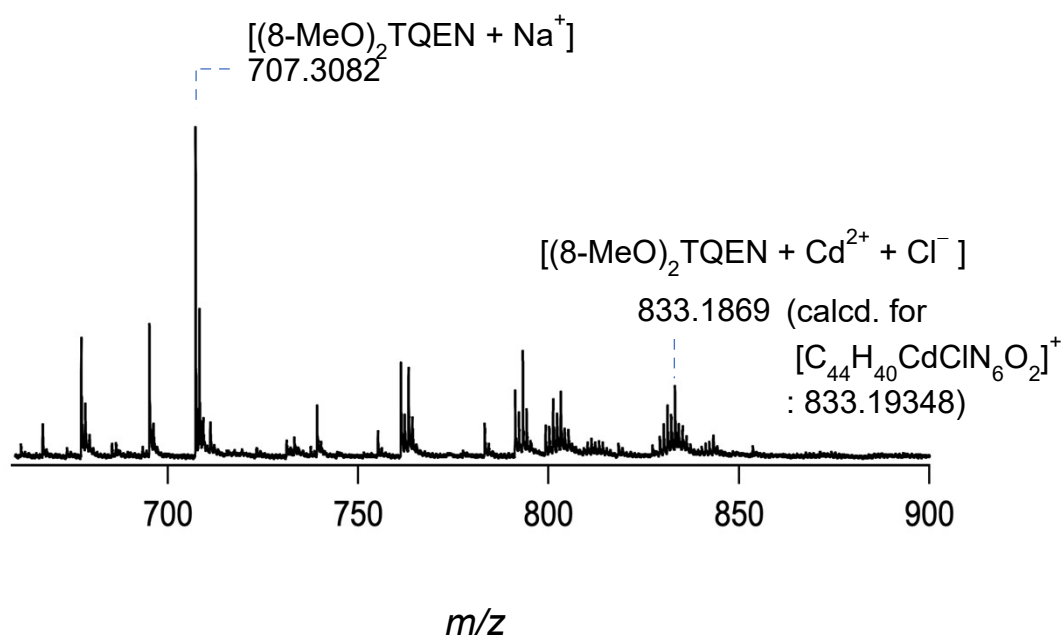
**Fig. S10.** (a,b) UV-vis absorption spectra of 34  $\mu\text{M}$  8-MeOTQEN in DMF-H<sub>2</sub>O (1:1) at 25  $^{\circ}\text{C}$  in the presence of increasing amount of (a) Cd<sup>2+</sup> and (b) Zn<sup>2+</sup>. (c,d) Plot of absorbance changes in the presence of increasing amount of (c) Cd<sup>2+</sup> and (d) Zn<sup>2+</sup>.



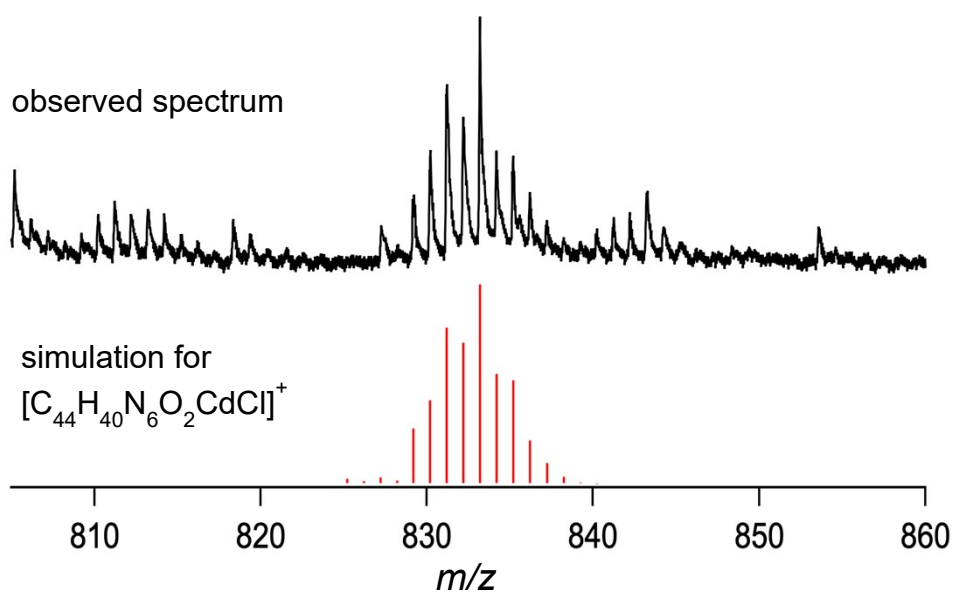
**Fig. S11.** (a) Fluorescence spectra of 34 μM (8-MeO)<sub>2</sub>TQEN in DMF-H<sub>2</sub>O (1:1) at 25 °C in the presence of increasing amount of Zn<sup>2+</sup> (λ<sub>ex</sub> = 317 nm). (b,c) Plot of fluorescence intensity changes for (b) Cd<sup>2+</sup> and (c) Zn<sup>2+</sup> titration. (d) Fluorescence spectra in the presence of 1 equiv. of various metal ions. (e,f) UV-vis absorption spectra in the presence of increasing amount of (e) Cd<sup>2+</sup> and (f) Zn<sup>2+</sup>.



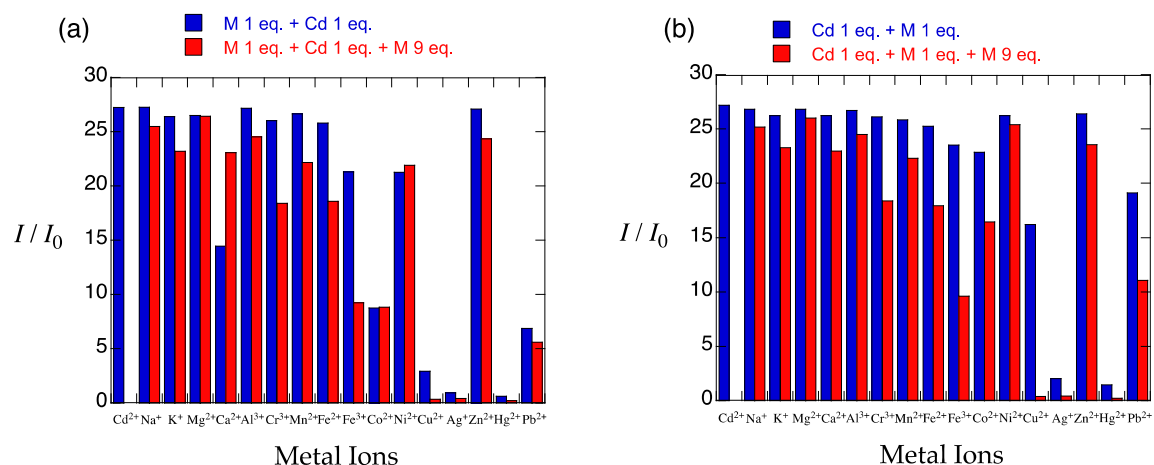
(a)



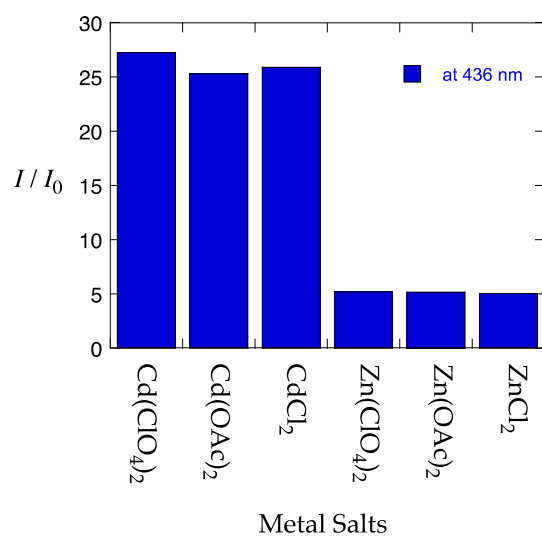
(b)



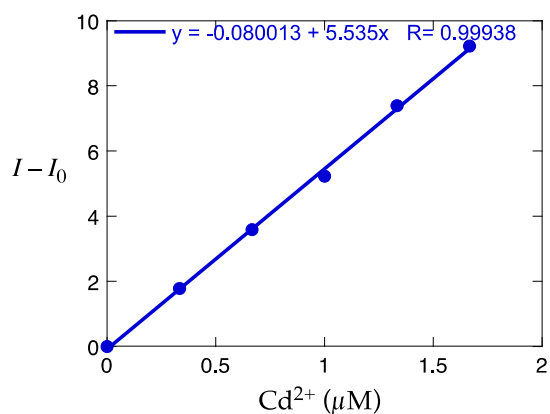
**Fig. S12.** ESI-MS spectrum of  $(8\text{-MeO})_2\text{TQEN}$  in methanol solution in the presence of 1 equiv. of  $\text{Cd}^{2+}$ . (a) Observed spectrum. (b) Comparison of observed and simulated spectra for  $(8\text{-MeO})_2\text{TQEN}\text{-Cd}^{2+}$  complex.



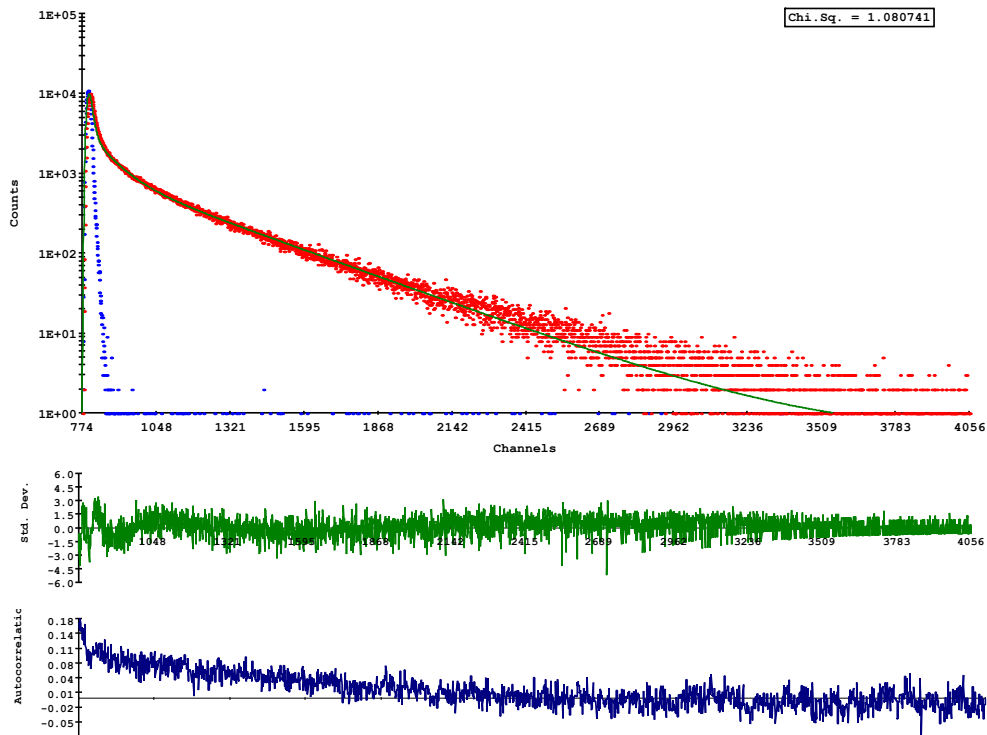
**Fig. S13.** The relative fluorescence intensity of 8-MOMOTQEN at 436 nm in the presence of (a) 1 equiv. of metal ions followed by addition of 1 equiv. of  $\text{Cd}^{2+}$  (blue) and further addition of 9 equiv. of metal ions (total 10 equiv. of metal ions and 1 equiv. of  $\text{Cd}^{2+}$ ) (red) and (b) 1 equiv. of  $\text{Cd}^{2+}$  followed by addition of 1 equiv. of metal ions (blue) and further addition of 9 equiv. of metal ions (total 10 equiv. of metal ions and 1 equiv. of  $\text{Cd}^{2+}$ ) (red) in DMF- $\text{H}_2\text{O}$  (1:1) at 25 °C ( $\lambda_{\text{ex}} = 317$  nm).  $I_0$  is the emission intensity of free ligand.



**Fig. S14.** Effect of counter anions on the relative fluorescence intensity of 8-MOMOTQEN at 436 nm in the presence of 1 equiv. of  $\text{Cd}^{2+}$  and  $\text{Zn}^{2+}$  in DMF- $\text{H}_2\text{O}$  (1:1) at 25 °C ( $\lambda_{\text{ex}} = 317$  nm).  $I_0$  is the emission intensity of free ligand.



**Fig. S15.** Estimation of LOD (limit of detection) for Cd<sup>2+</sup> with 8-MOMOTQEN in DMF-H<sub>2</sub>O (1:1) at 25 °C ( $\lambda_{\text{ex}} = 317$  nm). The  $3\sigma$  value ( $\sigma$  corresponds to standard deviation from 7 measurements) of blank solution (34  $\mu\text{M}$  8-MOMOTQEN) is 0.103 in fluorescence intensity unit, which corresponds to 18.5 nM from the slope of the linear dynamic fluorescence intensity plot ( $k$ ) shown above ( $\text{LOD} = 3\sigma/k$ ).



Calculated using 3 exponentials

Prompt data : Prompt  
Decay data : Decay

The initial paramters are:

|                        |     |              |     |
|------------------------|-----|--------------|-----|
| Shift Value = 0        | ch; | 0            | sec |
| Shift Limit = 40       | ch; | 2.194787E-09 | sec |
| T1 Estimate = 102.6277 | ch; | 5.631151E-09 | sec |
| T2 Estimate = 205.2554 | ch; | 1.12623E-08  | sec |
| T3 Estimate = 410.5109 | ch; | 2.25246E-08  | sec |

A Free  
B1 Free  
B2 Free  
B3 Free

|                            |     |              |     |
|----------------------------|-----|--------------|-----|
| Prompt and decay LO = 774  | ch; | 4.246914E-08 | sec |
| Prompt and decay HI = 4096 | ch; | 2.247462E-07 | sec |

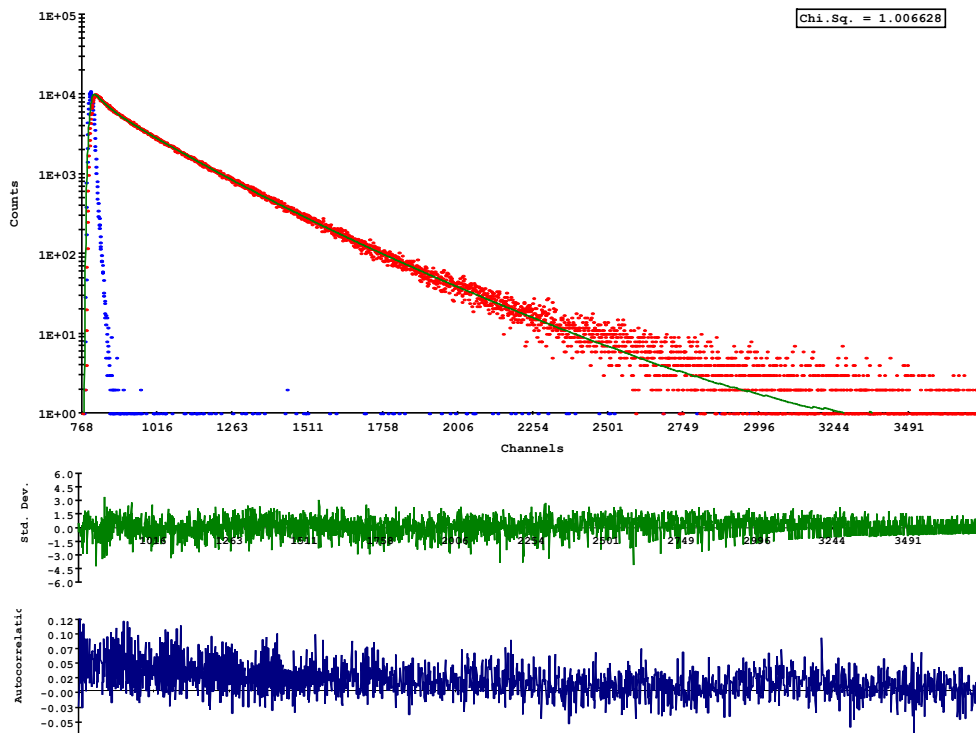
Background on prompt = 2  
Time calibration = 5.486969E-11 sec/ch

The fitted parameters are:

Hi reduced to: 4056 ch

|                                      |                                |              |     |                      |     |
|--------------------------------------|--------------------------------|--------------|-----|----------------------|-----|
| SHIFT = 0.3367705                    | ch;                            | 1.847849E-11 | sec | S.Dev = 1.450421E-12 | sec |
| T1 = 78.00881                        | ch;                            | 4.280319E-09 | sec | S.Dev = 8.732682E-11 | sec |
| T2 = 356.2304                        | ch;                            | 1.954625E-08 | sec | S.Dev = 5.988601E-11 | sec |
| T3 = 9.182409                        | ch;                            | 5.038359E-10 | sec | S.Dev = 5.686153E-12 | sec |
| A = 0.5486421                        |                                |              |     | S.Dev = 0.0337956    |     |
| B1 = 1.117342E-02                    | [ 23.87 Rel.Ampl][ 0.09 Alpha] |              |     | S.Dev = 6.379103E-05 |     |
| B2 = 4.996874E-03                    | [ 48.74 Rel.Ampl][ 0.04 Alpha] |              |     | S.Dev = 1.221991E-05 |     |
| B3 = 0.1089253                       | [ 27.39 Rel.Ampl][ 0.87 Alpha] |              |     | S.Dev = 3.921117E-04 |     |
| Average Life Time = 1.601786E-09     | sec                            |              |     |                      |     |
| CHISQ = 1.080741                     | [ 3275 degrees of freedom ]    |              |     |                      |     |
| Chi-squared Probability = 7.0898E-02 | percent                        |              |     |                      |     |
| Durbin-Watson Parameter = 1.660464   |                                |              |     |                      |     |
| Negative residuals = 41.60828        | percent                        |              |     |                      |     |
| Residuals < 1 s.dev = 67.10326       | percent                        |              |     |                      |     |
| Residuals < 2 s.dev = 94.97411       | percent                        |              |     |                      |     |
| Residuals < 3 s.dev = 99.48218       | percent                        |              |     |                      |     |
| Residuals < 4 s.dev = 99.90862       | percent                        |              |     |                      |     |

**Fig. S16.** Fluorescence lifetime measurement of 34  $\mu\text{M}$  8-MOMOTQEN in DMF- $\text{H}_2\text{O}$  (1:1) with 430 nm bandpath filter (BPF) at 25  $^\circ\text{C}$  ( $\lambda_{\text{ex}} = 331 \text{ nm}$ ).



Calculated using 3 exponentials

Prompt data : Prompt  
Decay data : Decay

The initial parameters are:

|                        |     |              |     |
|------------------------|-----|--------------|-----|
| Shift Value = 0        | ch; | 0            | sec |
| Shift Limit = 40       | ch; | 2.194787E-09 | sec |
| T1 Estimate = 101.1862 | ch; | 5.552054E-09 | sec |
| T2 Estimate = 202.3724 | ch; | 1.110411E-08 | sec |
| T3 Estimate = 404.7448 | ch; | 2.220822E-08 | sec |

A Free  
B1 Free  
B2 Free  
B3 Free

|                            |     |              |     |
|----------------------------|-----|--------------|-----|
| Prompt and decay LO = 768  | ch; | 4.213992E-08 | sec |
| Prompt and decay HI = 3779 | ch; | 2.073525E-07 | sec |

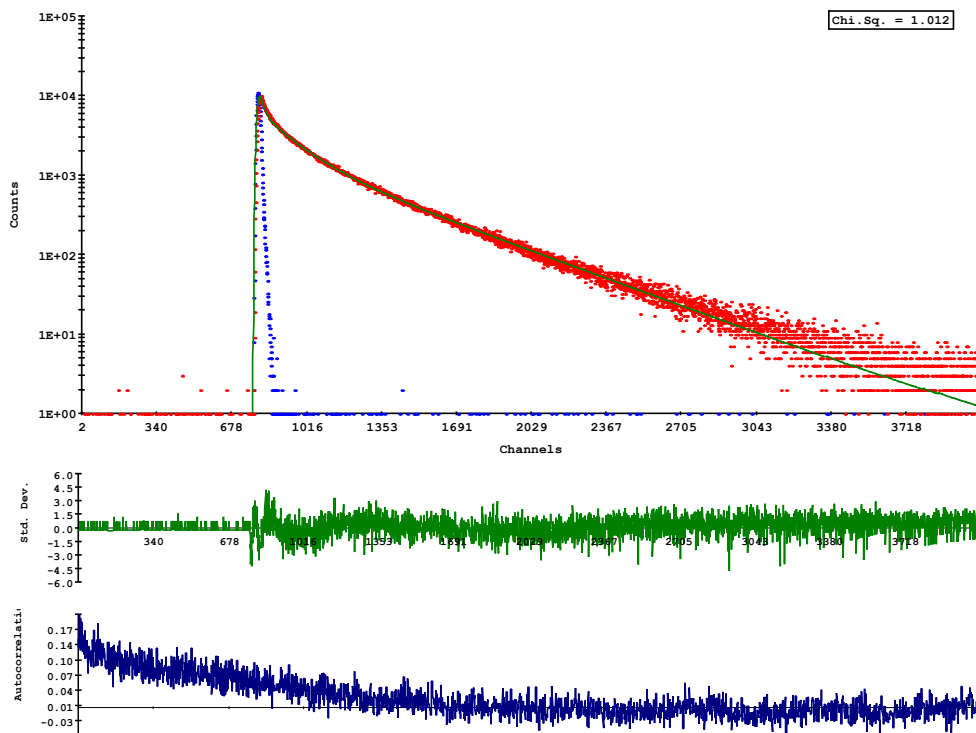
Background on prompt = 0  
Time calibration = 5.486969E-11 sec/ch

The fitted parameters are:

Hi reduced to: 3739 ch

|                                  |                                |              |     |                      |     |
|----------------------------------|--------------------------------|--------------|-----|----------------------|-----|
| SHIFT = 0.3940113                | ch;                            | 2.161928E-11 | sec | S.Dev = 1.695074E-12 | sec |
| T1 = 170.0448                    | ch;                            | 9.330304E-09 | sec | S.Dev = 2.133591E-10 | sec |
| T2 = 34.44391                    | ch;                            | 1.889926E-09 | sec | S.Dev = 5.123025E-11 | sec |
| T3 = 288.4471                    | ch;                            | 1.5827E-08   | sec | S.Dev = 8.887465E-11 | sec |
| A = 0.4992222                    |                                |              |     | S.Dev = 3.682719E-02 |     |
| B1 = 3.126452E-02                | [ 59.58 Rel.Ampl][ 0.52 Alpha] |              |     | S.Dev = 1.112371E-04 |     |
| B2 = 0.0184192                   | [ 7.11 Rel.Ampl][ 0.31 Alpha]  |              |     | S.Dev = 1.926485E-04 |     |
| B3 = 1.030305E-02                | [ 33.31 Rel.Ampl][ 0.17 Alpha] |              |     | S.Dev = 5.115841E-05 |     |
| Average Life Time = 8.161546E-09 | sec                            |              |     |                      |     |
| CHISQ = 1.006628                 | [ 2964 degrees of freedom ]    |              |     |                      |     |
| Chi-squared Probability =        | 39.61739                       | percent      |     |                      |     |
| Durbin-Watson Parameter =        | 2.054597                       |              |     |                      |     |
| Negative residuals =             | 40.88156                       | percent      |     |                      |     |
| Residuals < 1 s.dev =            | 69.27995                       | percent      |     |                      |     |
| Residuals < 2 s.dev =            | 95.72678                       | percent      |     |                      |     |
| Residuals < 3 s.dev =            | 99.59623                       | percent      |     |                      |     |
| Residuals < 4 s.dev =            | 99.93271                       | percent      |     |                      |     |

**Fig. S17.** Fluorescence lifetime measurement of 34  $\mu\text{M}$  8-MOMOTQEN in the presence of 1 equiv. of  $\text{Cd}^{2+}$  in DMF- $\text{H}_2\text{O}$  (1:1) with 430 nm bandpath filter (BPF) at 25  $^\circ\text{C}$  ( $\lambda_{\text{ex}} = 331 \text{ nm}$ ).



Calculated using 3 exponentials

Prompt data : Prompt  
Decay data : Decay

The initial parameters are:

|                        |     |              |     |
|------------------------|-----|--------------|-----|
| Shift Value = 0        | ch; | 0            | sec |
| Shift Limit = 40       | ch; | 2.194787E-09 | sec |
| T1 Estimate = 136.1094 | ch; | 7.468278E-09 | sec |
| T2 Estimate = 272.2188 | ch; | 1.493656E-08 | sec |
| T3 Estimate = 544.4375 | ch; | 2.987311E-08 | sec |

A Free  
B1 Free  
B2 Free  
B3 Free

|                            |     |              |     |
|----------------------------|-----|--------------|-----|
| Prompt and decay LO = 2    | ch; | 1.097394E-10 | sec |
| Prompt and decay HI = 4096 | ch; | 2.247462E-07 | sec |

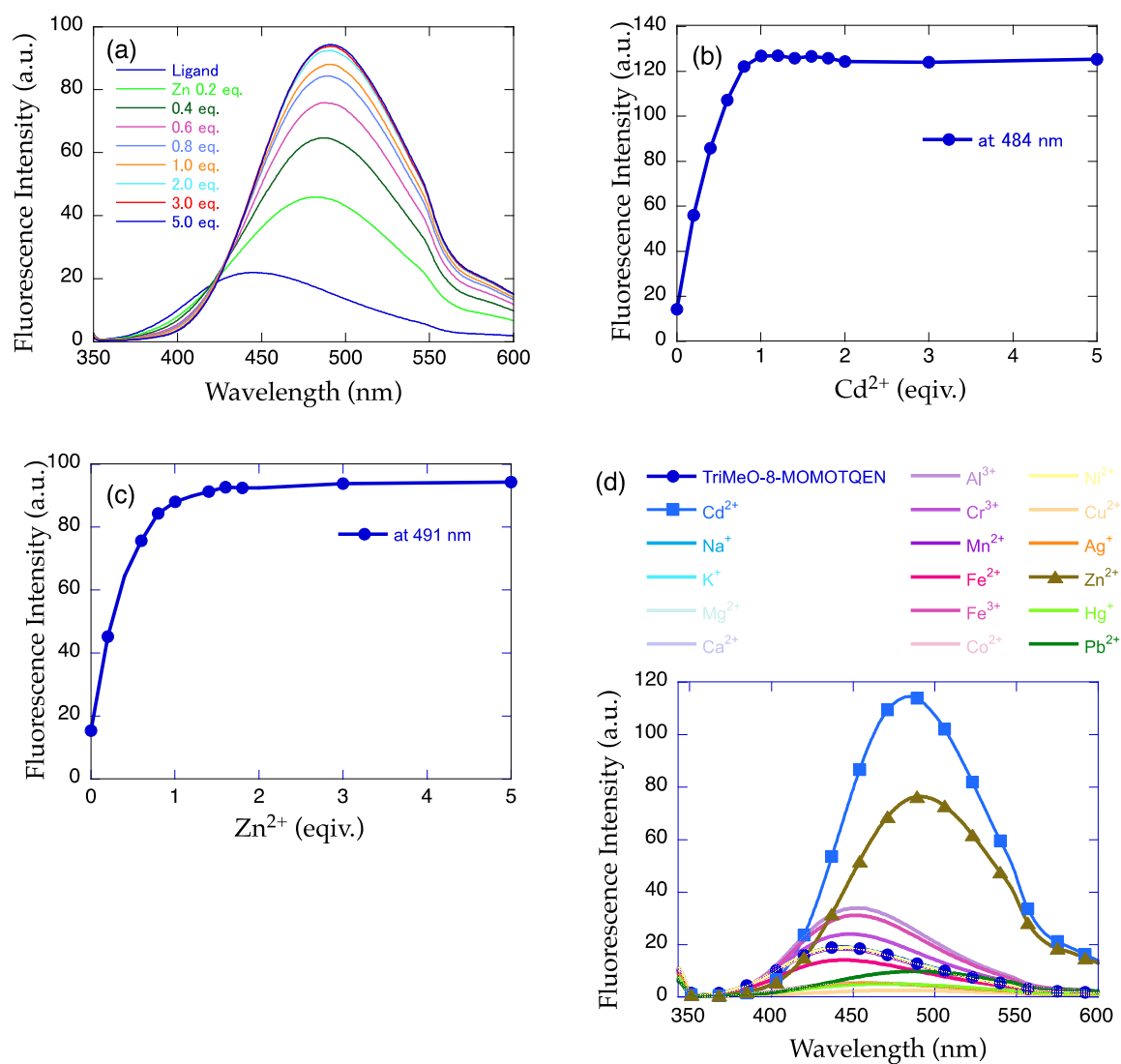
Background on prompt = 1.298701E-03  
Time calibration = 5.486969E-11 sec/ch

The fitted parameters are:

Hi reduced to: 4056 ch

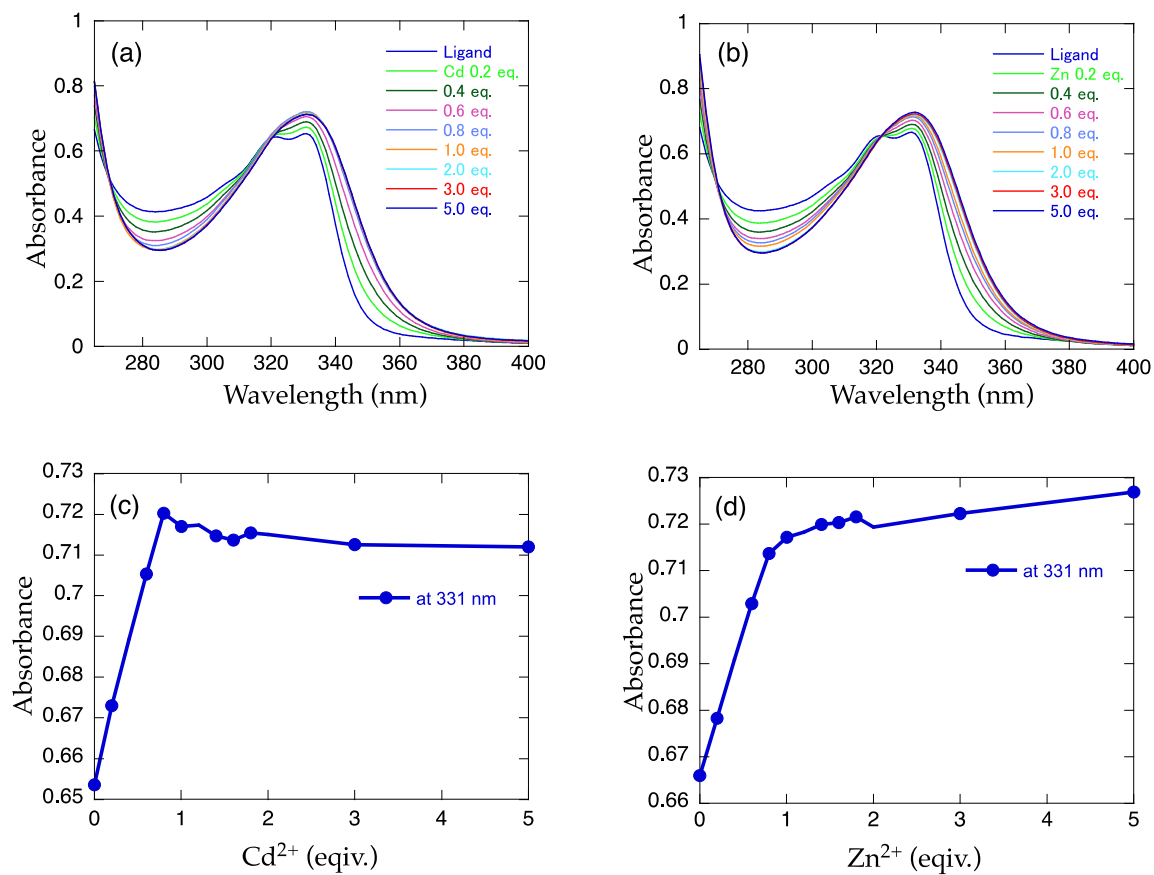
|                                  |                                |               |     |                      |     |
|----------------------------------|--------------------------------|---------------|-----|----------------------|-----|
| SHIFT = -0.6275116               | ch;                            | -3.443136E-11 | sec | S.Dev = 1.626076E-12 | sec |
| T1 = 132.9919                    | ch;                            | 7.297223E-09  | sec | S.Dev = 8.768965E-11 | sec |
| T2 = 422.5615                    | ch;                            | 2.318581E-08  | sec | S.Dev = 5.026067E-11 | sec |
| T3 = 17.25595                    | ch;                            | 9.468285E-10  | sec | S.Dev = 1.494607E-11 | sec |
| A = 0.2641874                    |                                |               |     | S.Dev = 3.049571E-02 |     |
| B1 = 2.158815E-02                | [ 36.68 Rel.Ampl][ 0.28 Alpha] |               |     | S.Dev = 7.122554E-05 |     |
| B2 = 9.921385E-03                | [ 53.56 Rel.Ampl][ 0.13 Alpha] |               |     | S.Dev = 1.877861E-05 |     |
| B3 = 4.428618E-02                | [ 9.76 Rel.Ampl][ 0.58 Alpha]  |               |     | S.Dev = 2.573181E-04 |     |
| Average Life Time = 5.666552E-09 | sec                            |               |     |                      |     |
| CHISQ = 1.012                    | [ 4047 degrees of freedom ]    |               |     |                      |     |
| Chi-squared Probability =        | 29.28797                       | percent       |     |                      |     |
| Durbin-Watson Parameter =        | 1.704501                       |               |     |                      |     |
| Negative residuals =             | 49.76572                       | percent       |     |                      |     |
| Residuals < 1 s.dev =            | 69.86436                       | percent       |     |                      |     |
| Residuals < 2 s.dev =            | 95.16646                       | percent       |     |                      |     |
| Residuals < 3 s.dev =            | 99.23551                       | percent       |     |                      |     |
| Residuals < 4 s.dev =            | 99.80271                       | percent       |     |                      |     |

**Fig. S18.** Fluorescence lifetime measurement of 34  $\mu\text{M}$  8-MOMOTQEN in the presence of 1 equiv. of  $\text{Zn}^{2+}$  in DMF- $\text{H}_2\text{O}$  (1:1) with 460 nm bandpath filter (BPF) at 25  $^\circ\text{C}$  ( $\lambda_{\text{ex}} = 331 \text{ nm}$ ).

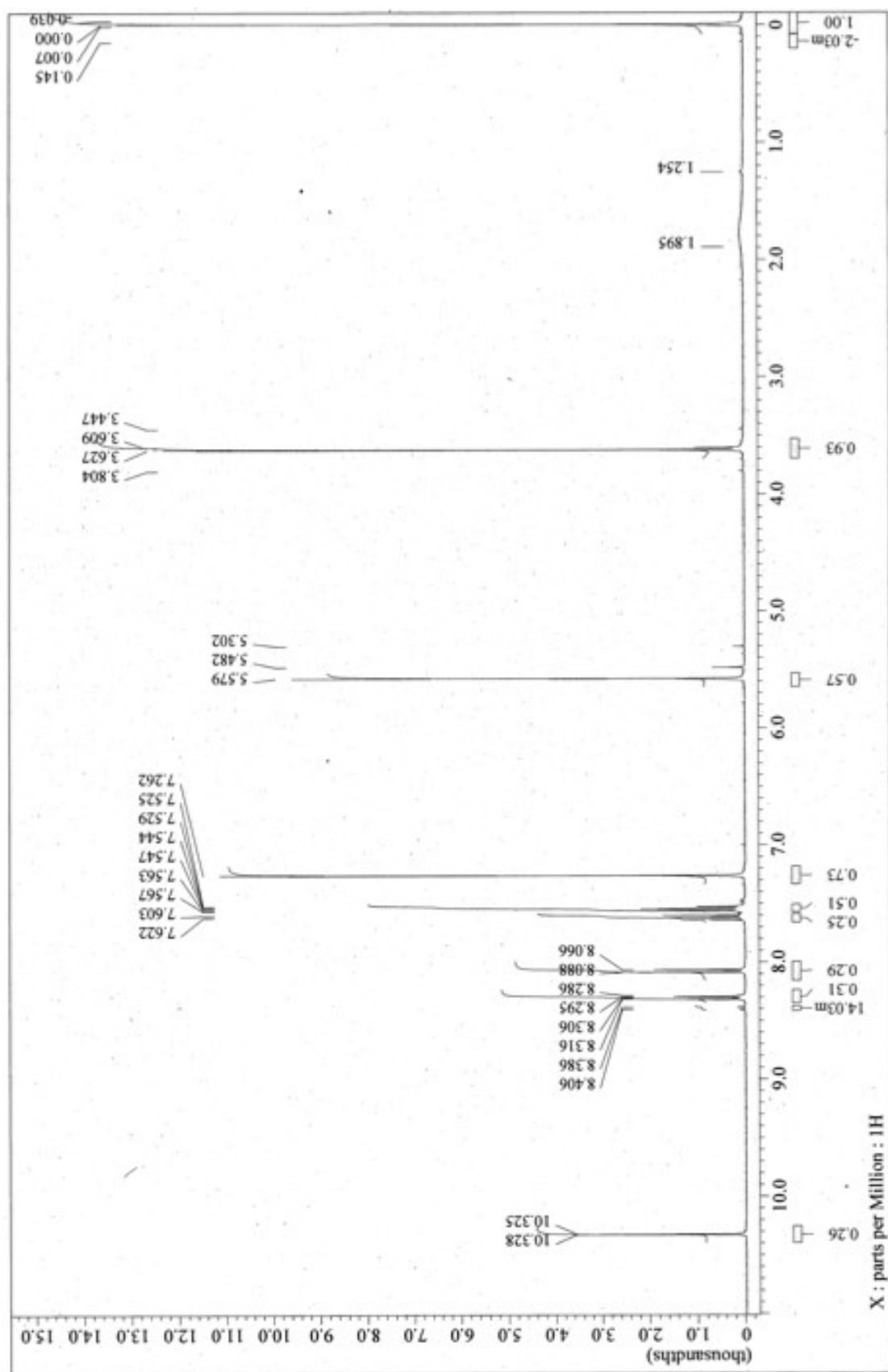


**Fig. S19.** (a) Fluorescence spectra of 34  $\mu\text{M}$  TriMeO-8-MOMOTQEN in DMF- $\text{H}_2\text{O}$  (1:1) at 25  $^\circ\text{C}$  in the presence of increasing amount of  $\text{Zn}^{2+}$  ( $\lambda_{\text{ex}} = 343 \text{ nm}$ ). (b,c) Plot of fluorescence intensity changes for (b)  $\text{Cd}^{2+}$  and (c)  $\text{Zn}^{2+}$  titration. (d) Fluorescence spectra in the presence of 1 equiv. of various metal ions.





**Fig. S20.** (a,b) UV-vis absorption spectra of 34  $\mu\text{M}$  TriMeO-8-MOMOTQEN in DMF-H<sub>2</sub>O (1:1) at 25 °C in the presence of increasing amount of (a) Cd<sup>2+</sup> and (b) Zn<sup>2+</sup>. (c,d) Plot of absorbance changes in the presence of increasing amount of (c) Cd<sup>2+</sup> and (d) Zn<sup>2+</sup>.



**Fig. S21.**  $^1\text{H}$  NMR spectrum for 8-methoxymethoxy-2-quinolinecarbaldehyde (1) in  $\text{CDCl}_3$ .

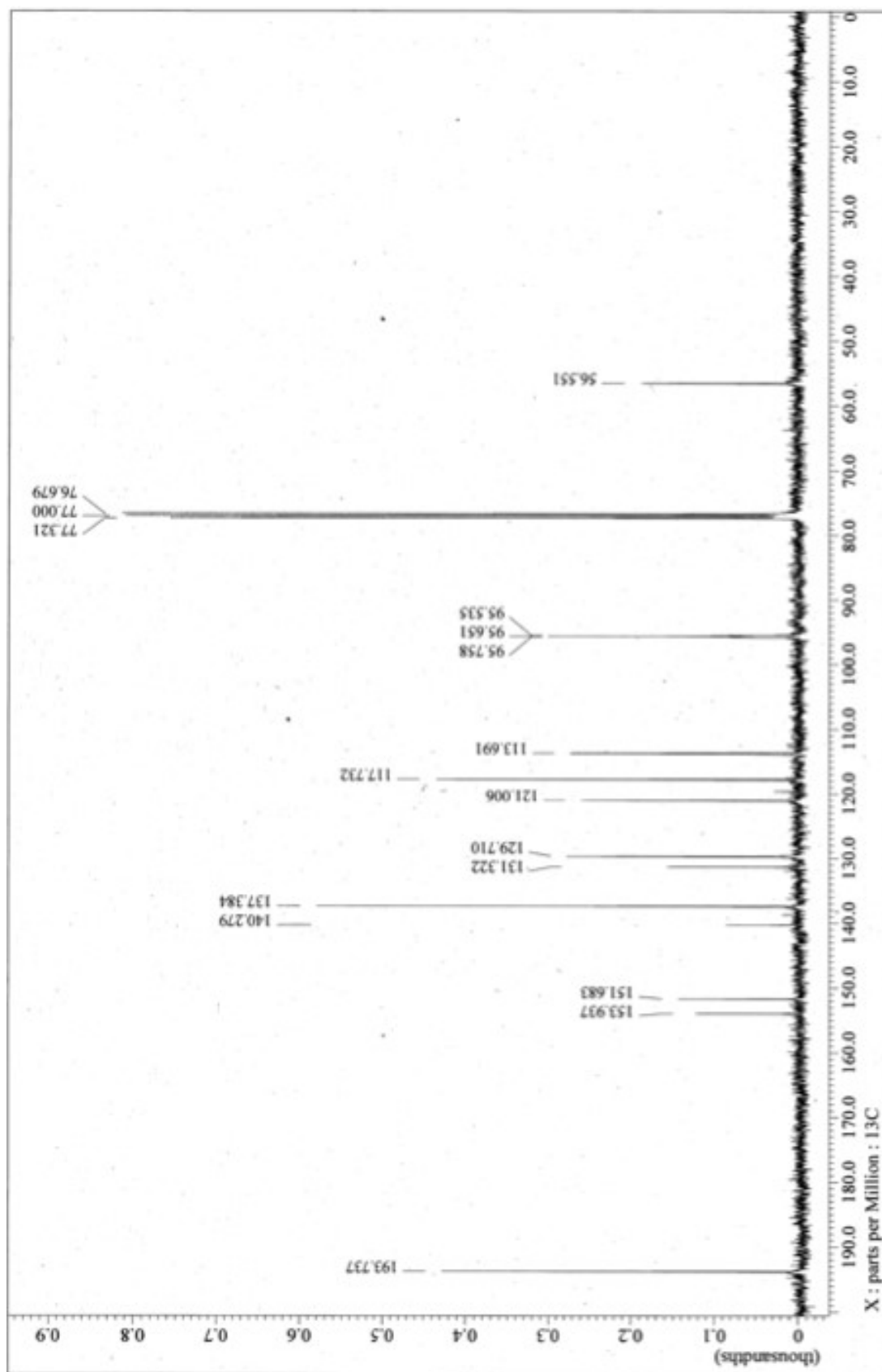


Fig. S22.  $^{13}\text{C}$  NMR spectrum for 8-methoxymethoxy-2-quinolinecarbaldehyde (1) in  $\text{CDCl}_3$ .

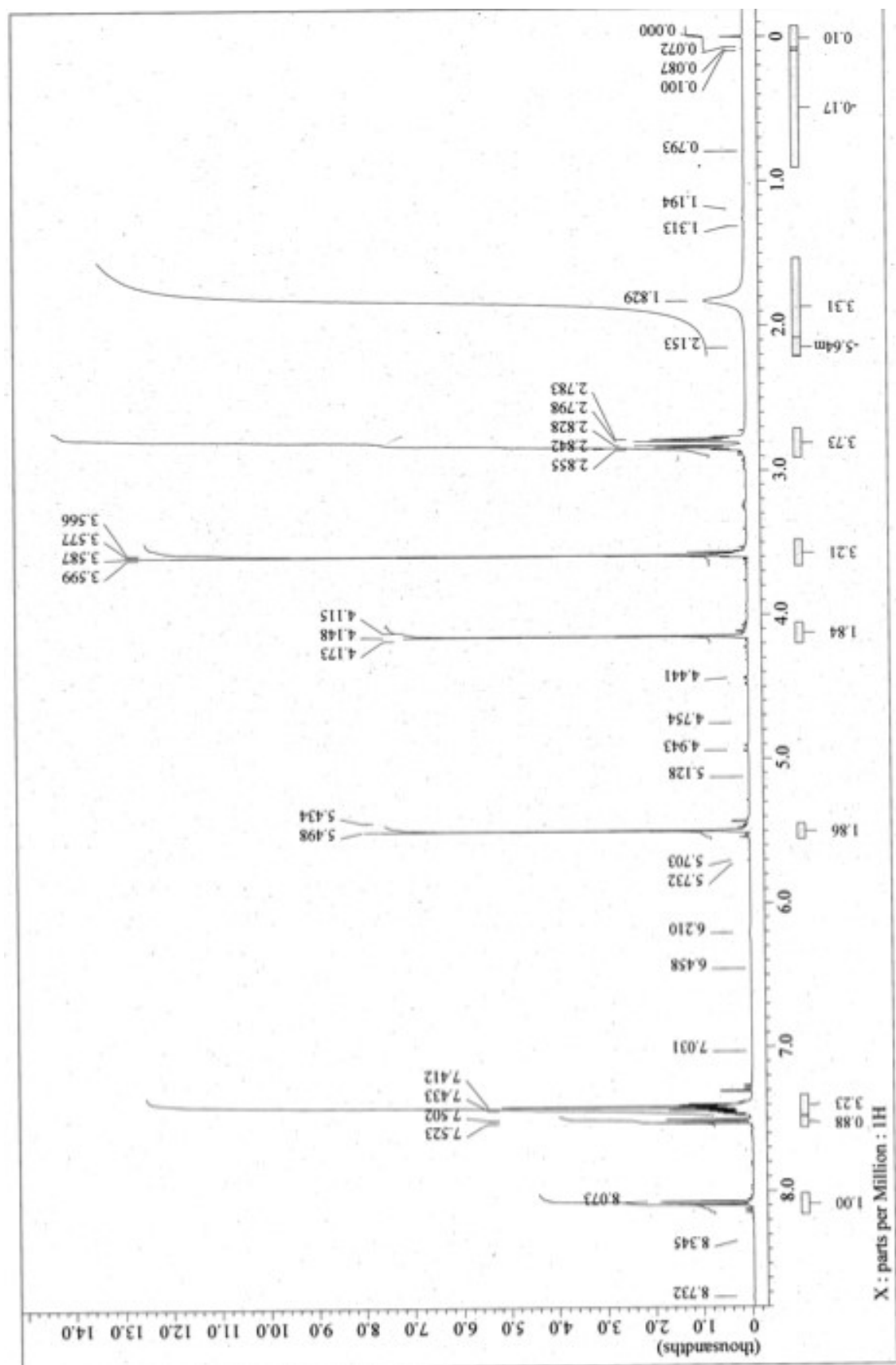


Fig. S23.  $^1\text{H}$  NMR spectrum for *N*-(8-methoxymethoxy-2-quinolylmethyl)-ethylenediamine (**2**) in  $\text{CDCl}_3$ .

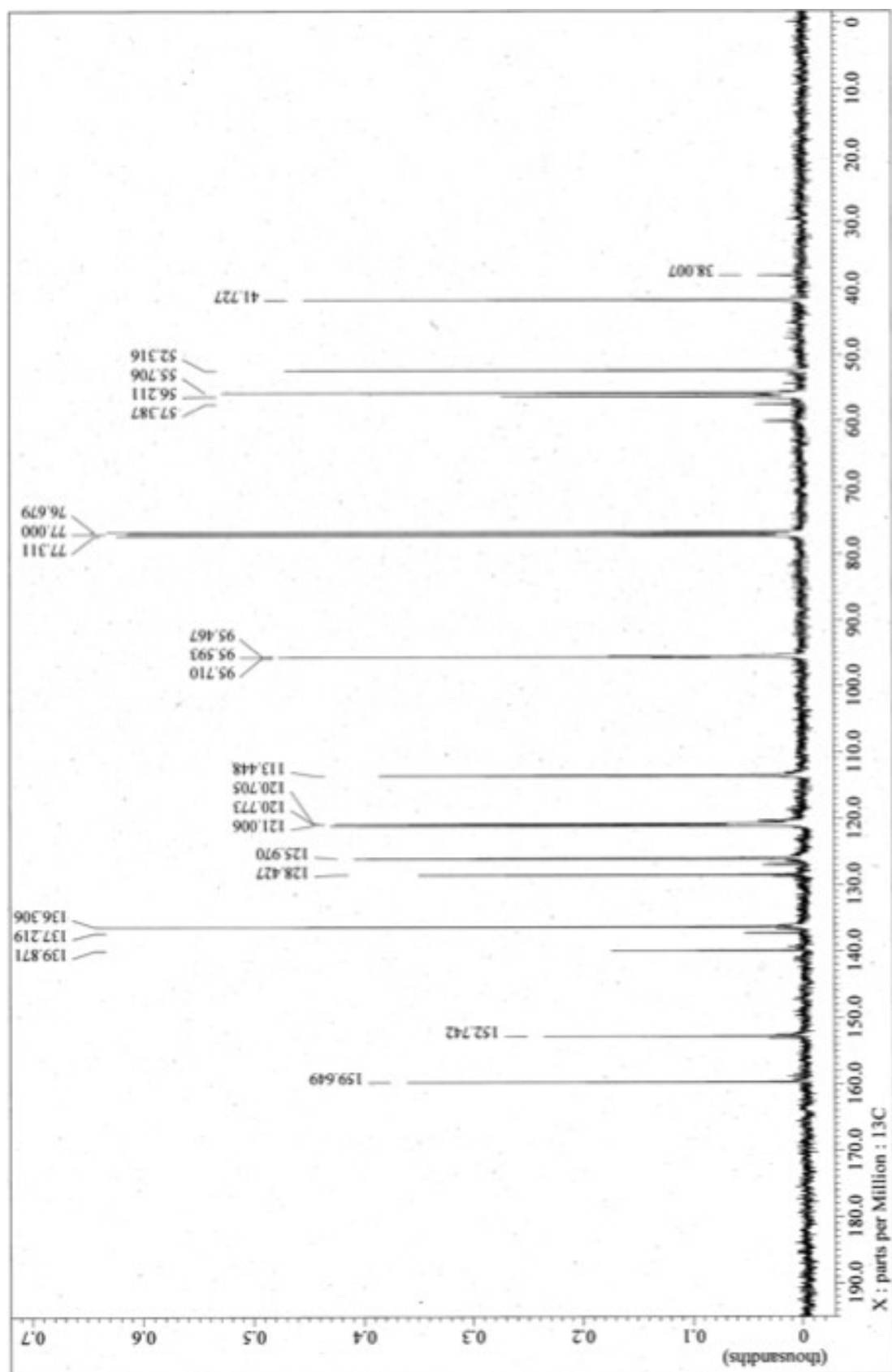


Fig. S24.  $^{13}\text{C}$  NMR spectrum for *N*-(8-methoxymethoxy-2-quinolylmethyl)-ethylenediamine (2) in  $\text{CDCl}_3$ .

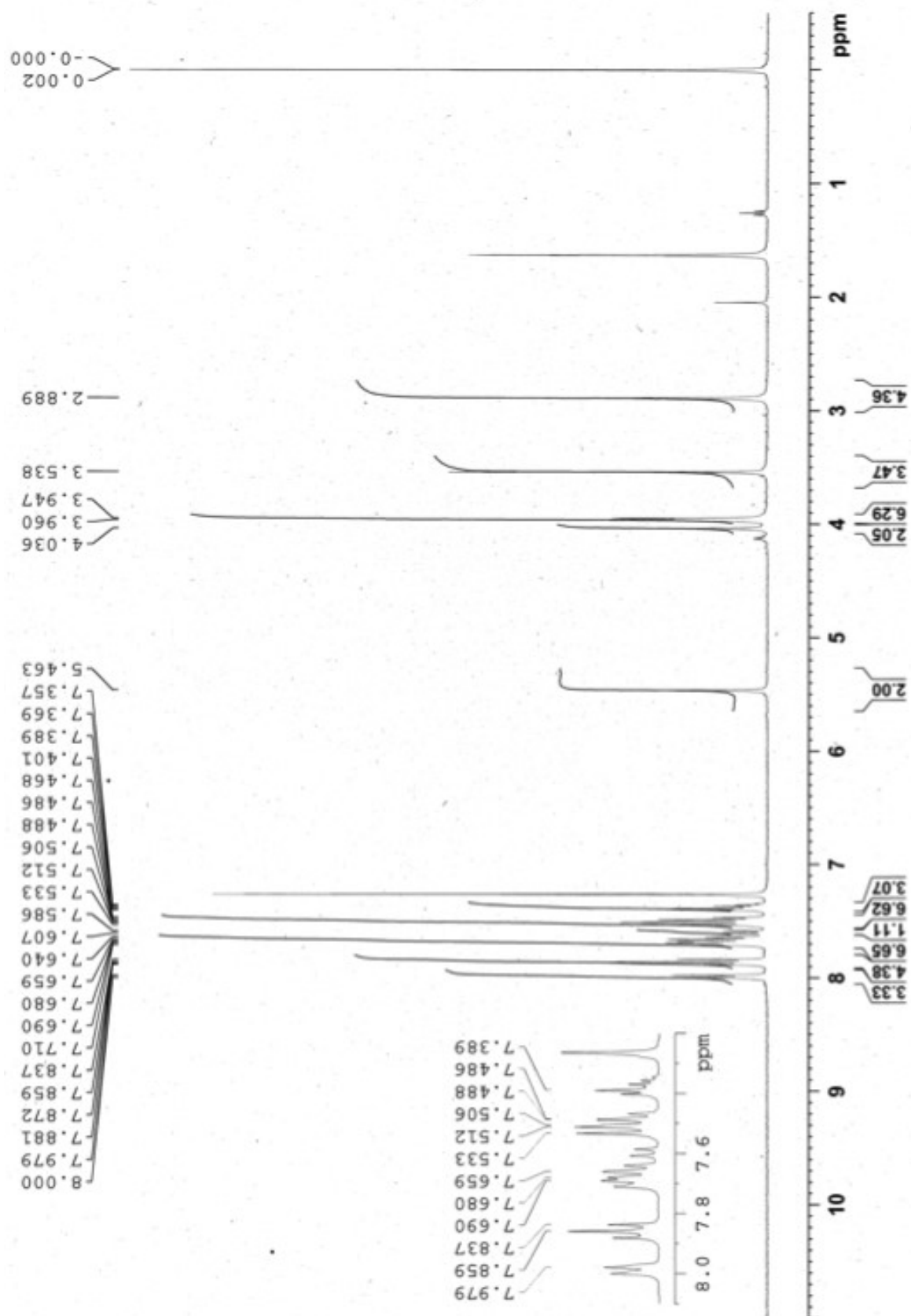


Fig. S25.  $^1\text{H}$  NMR spectrum for 8-MOMOTQEN in  $\text{CDCl}_3$ .

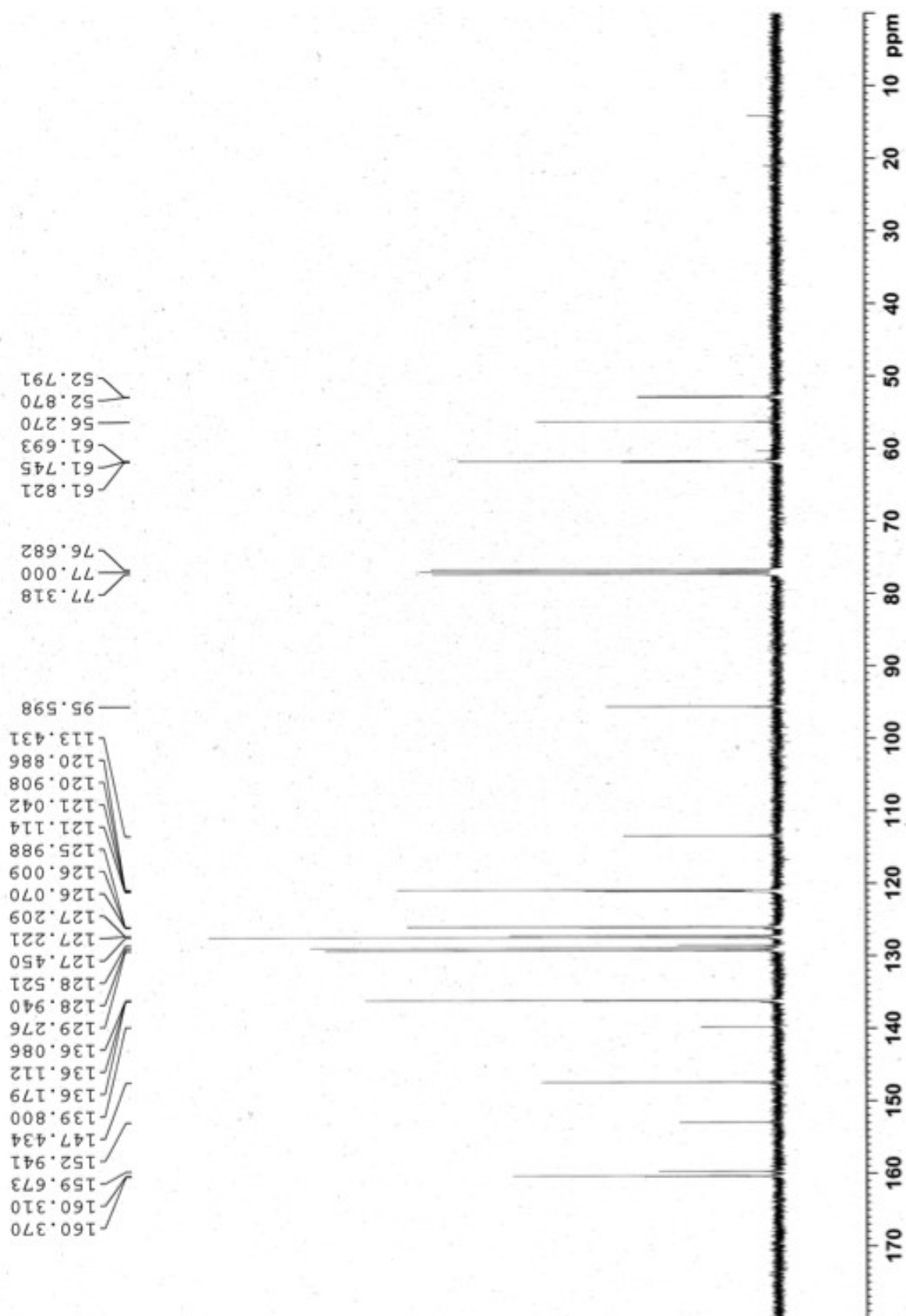


Fig. S26. <sup>13</sup>C NMR spectrum for 8-MOMOTQEN in CDCl<sub>3</sub>.

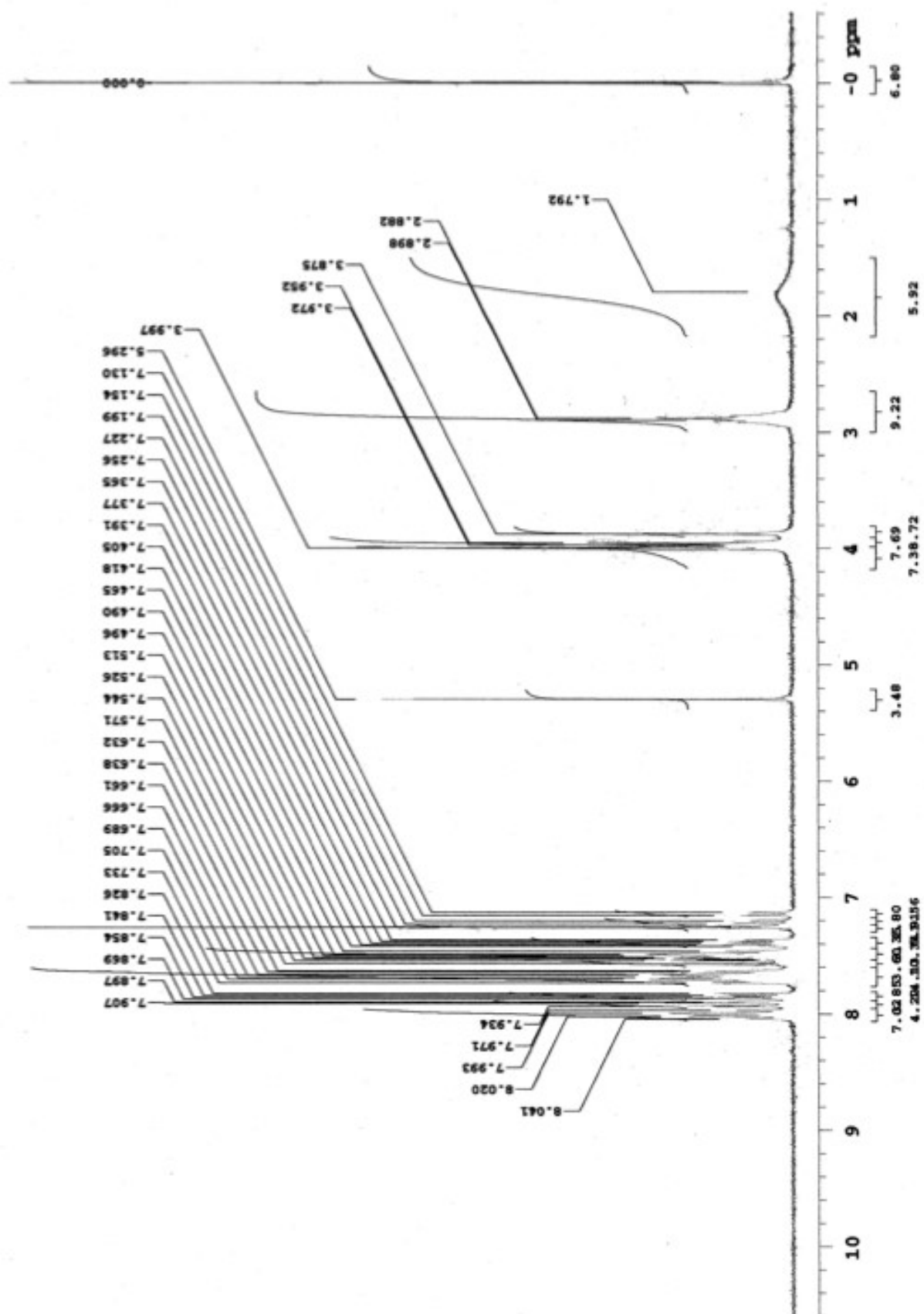


Fig. S27.  $^1\text{H}$  NMR spectrum for 8-OHTQEN in  $\text{CDCl}_3$ .



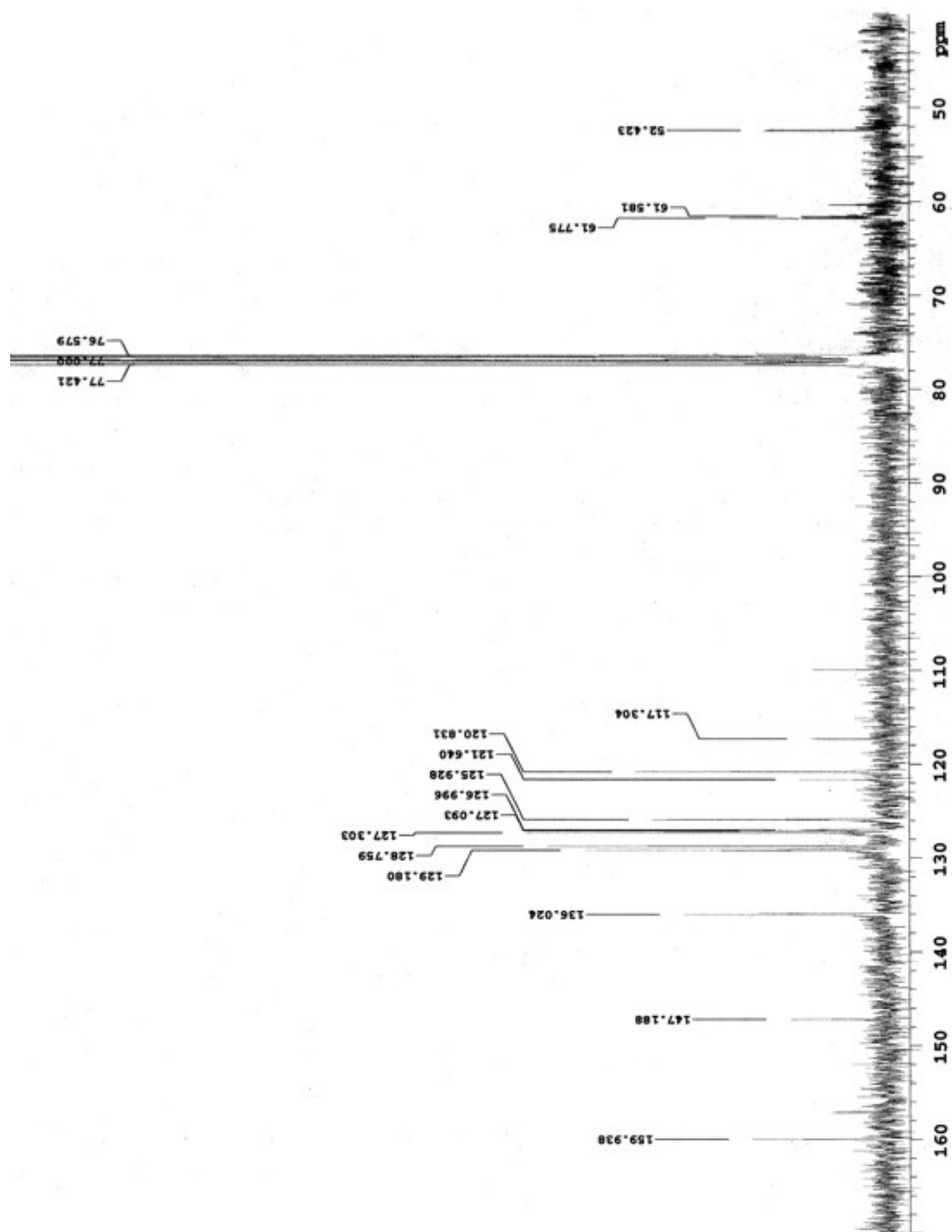


Fig. S28.  $^{13}\text{C}$  NMR spectrum for 8-OHTQEN in  $\text{CDCl}_3$ .

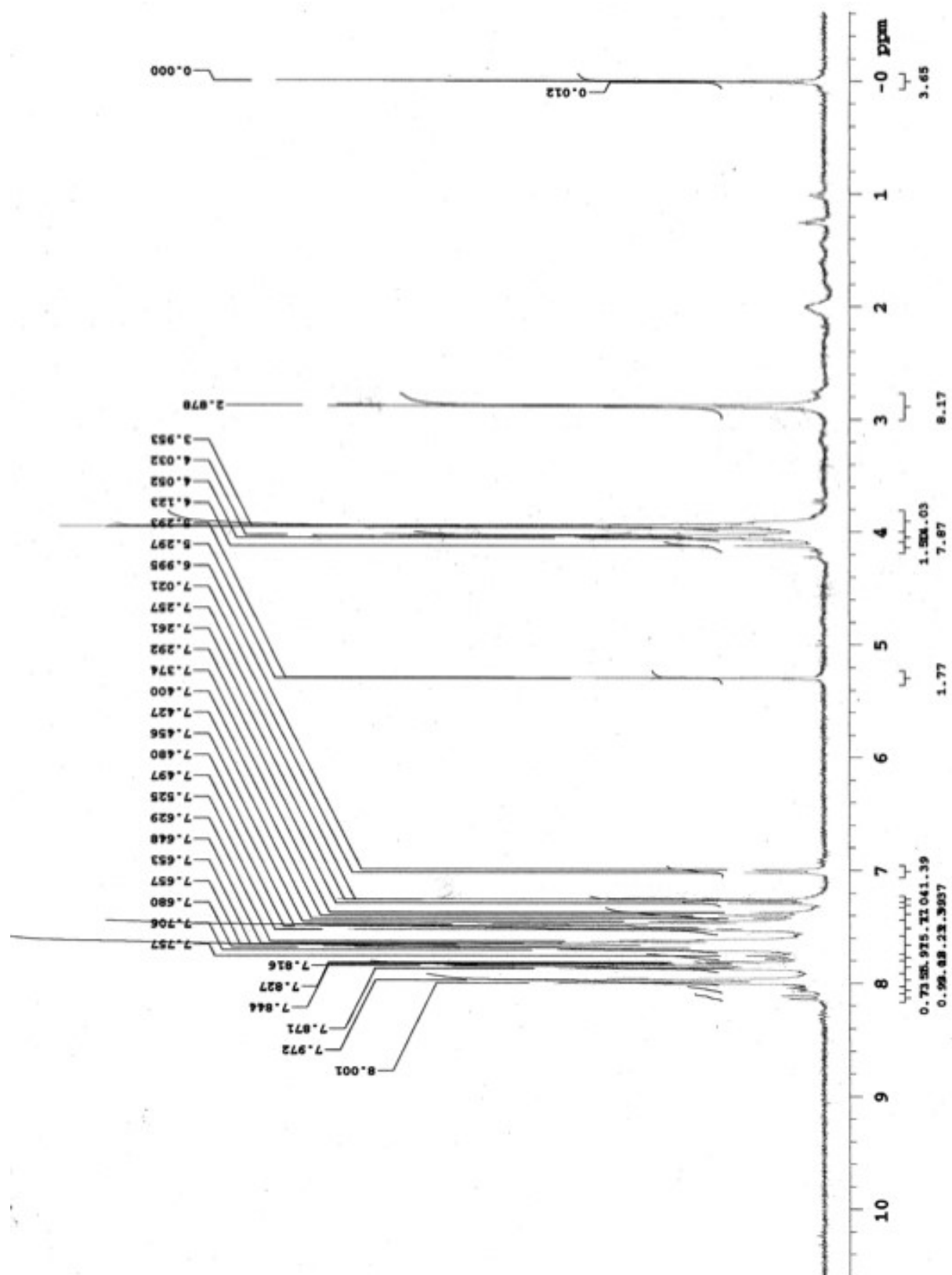


Fig. S29. <sup>1</sup>H NMR spectrum for 8-MeOTQEN in CDCl<sub>3</sub>.

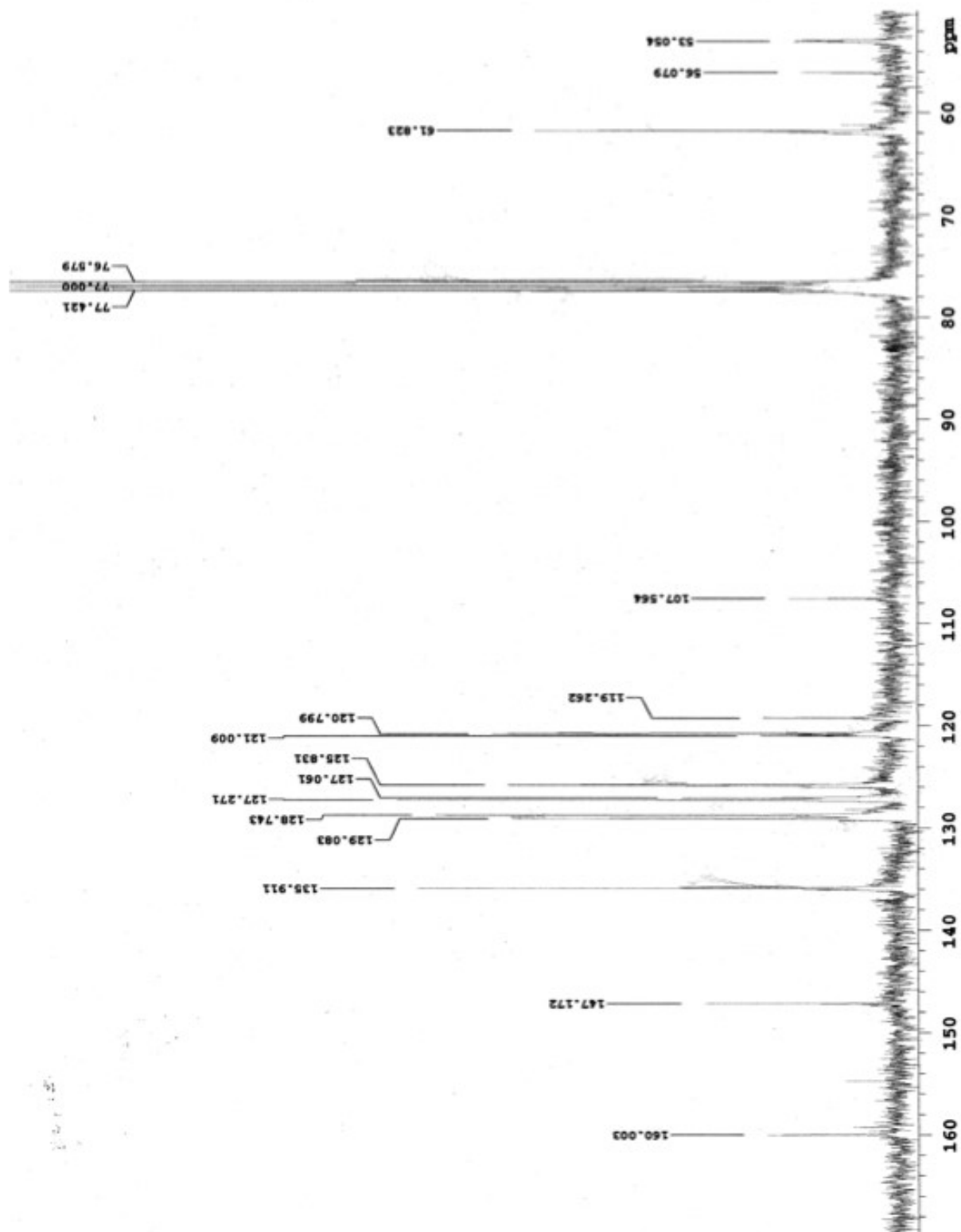


Fig. S30.  $^{13}\text{C}$  NMR spectrum for 8-MeOTQEN in  $\text{CDCl}_3$ .

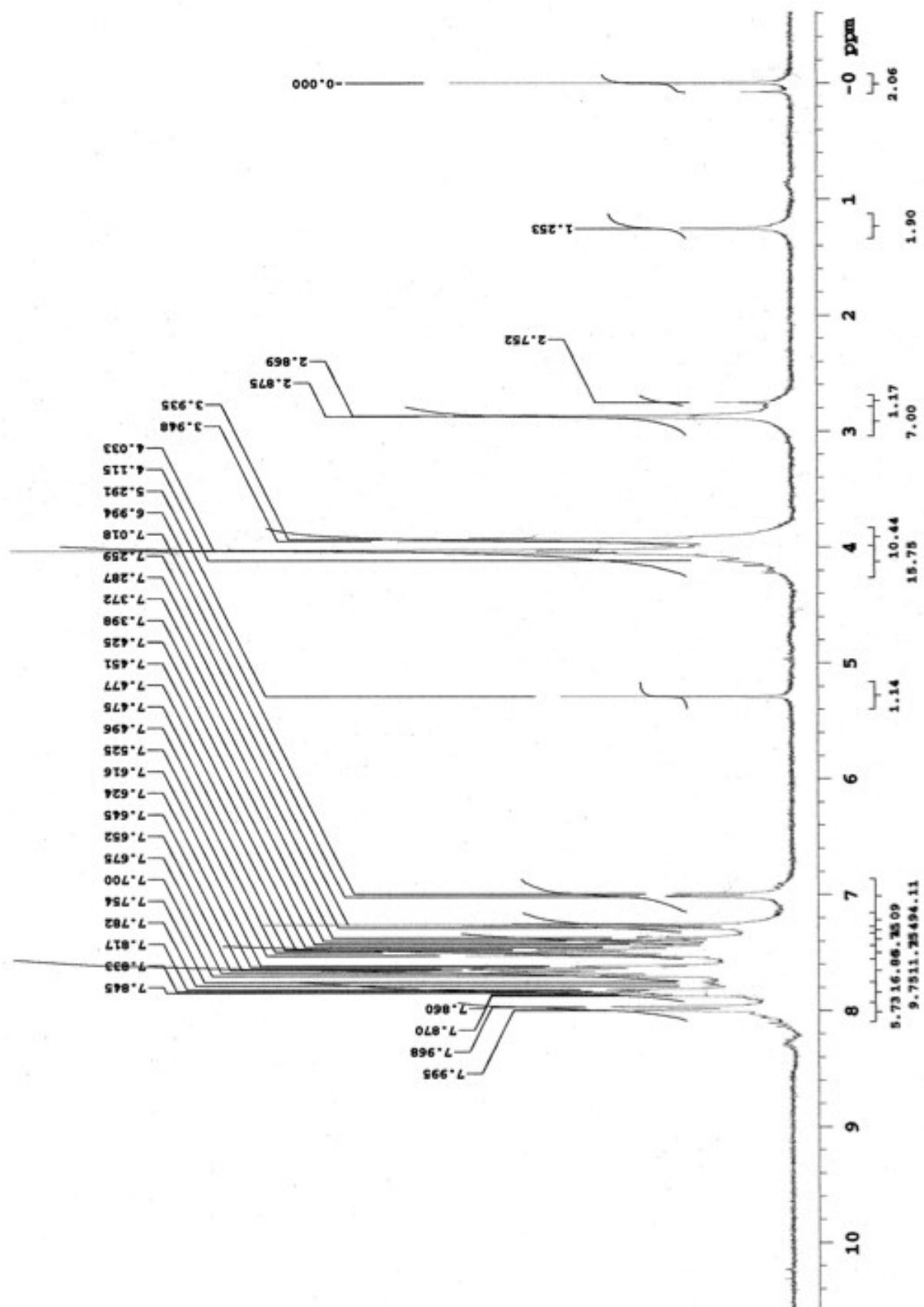


Fig. S31.  $^1\text{H}$  NMR spectrum for  $(8\text{-MeO})_2\text{TQEN}$  in  $\text{CDCl}_3$ .

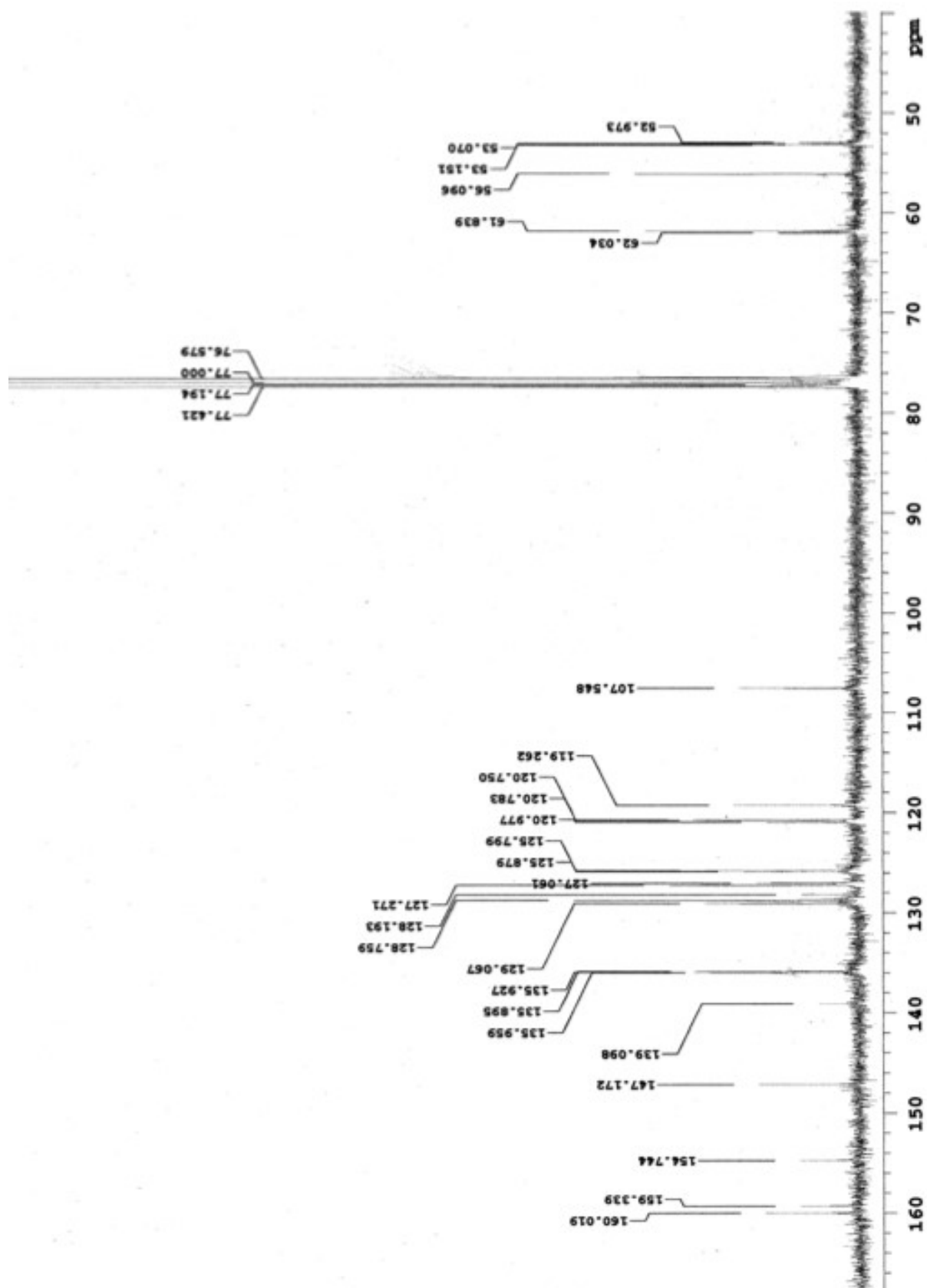


Fig. S32.  $^{13}\text{C}$  NMR spectrum for (8-MeO) $_2$ TQEN in  $\text{CDCl}_3$ .

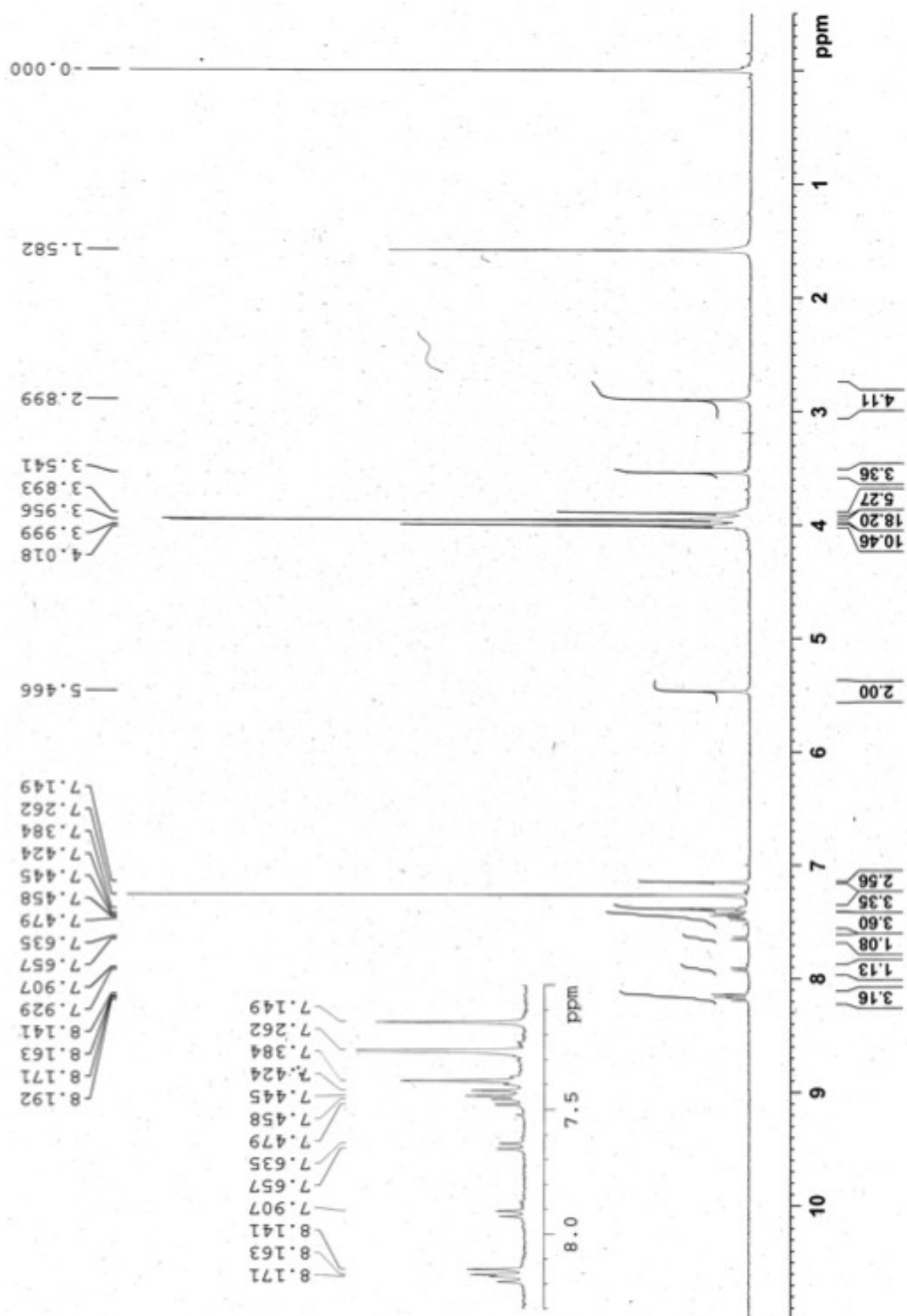


Fig. S33.  $^1\text{H}$  NMR spectrum for TriMeO-8-MOMOTQEN in  $\text{CDCl}_3$ .

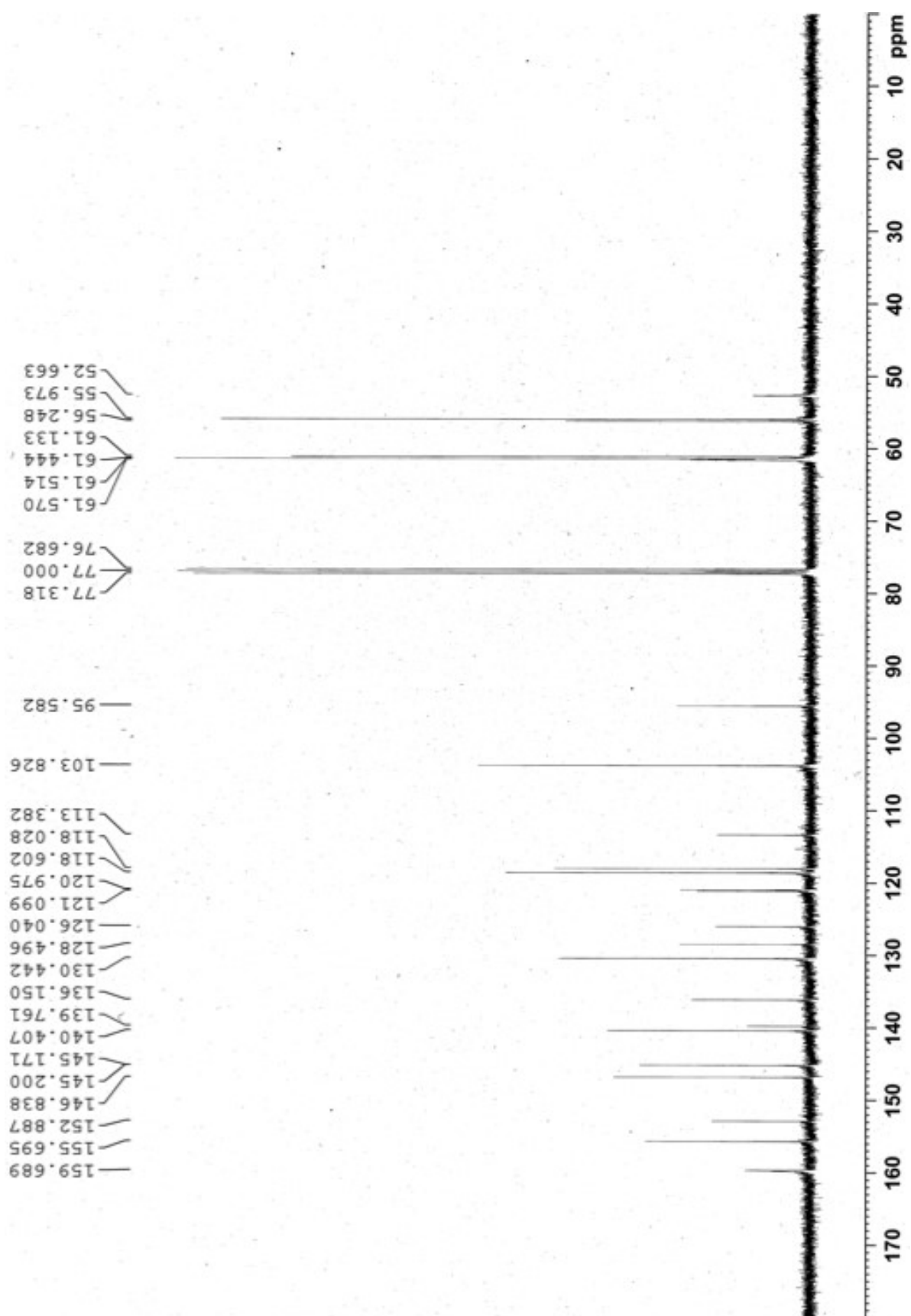


Fig. S34. <sup>13</sup>C NMR spectrum for TriMeO-8-MOMOTQEN in CDCl<sub>3</sub>.