

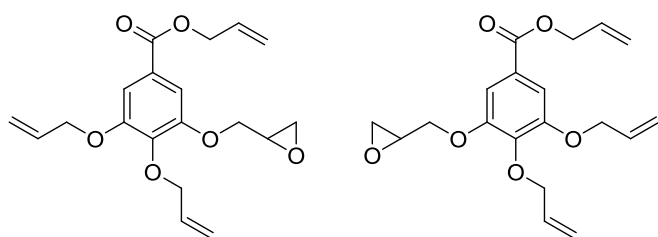
# Chemo-enzymatic functionalization of gallic and vanillic acids. Synthesis of bio-based epoxy resins prepolymers.

## Supporting information

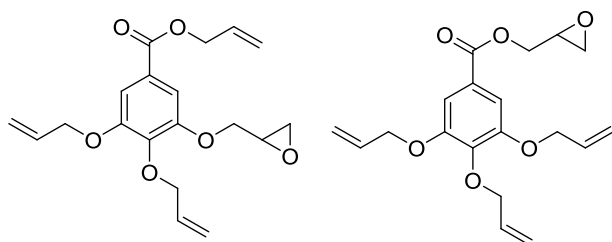
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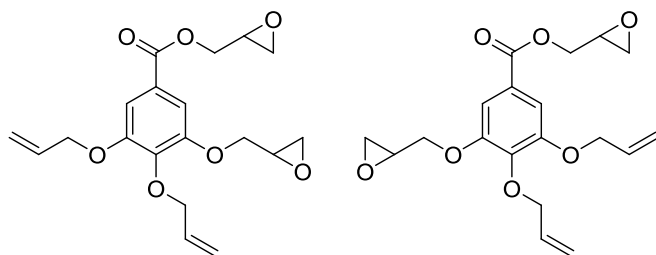
### Analytical data of **4b**, **4b'**, **4c**, **5b**, **5b'**, **5c** and **5d**.



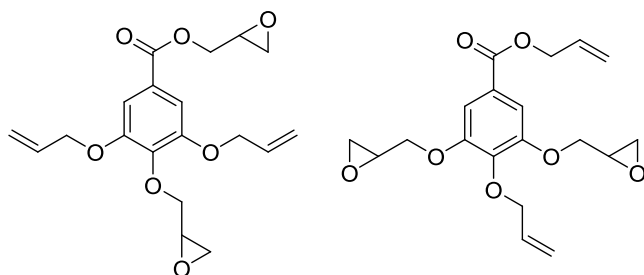
*Allyl 3,4-bis(allyloxy)-5-(oxiran-2-ylmethoxy)benzoate* **4b**, **4b'**: Colourless oil. <sup>1</sup>H NMR (500 MHz, DMSO-d<sub>6</sub>) δ= 2.75 (dd, *J*= 5.1, 2.7 Hz, 1 H, a), 2.84 (t, *J*= 4.7 Hz, 1 H, b), 3.46 (m, 1H, c), 3.89 (dd, *J*=11.3, 6.5 Hz, 1H, d), 4.26 (dd, *J*=11.3, 2.3 Hz, 1H, e), 4.55 (d, *J*= 5.7 Hz, 2H, f), 4.64 (d, *J*= 5.0 Hz, 2 H, f'), 4.80 (d, *J*= 5.3 Hz, 2H, f''), 5.33 (m, 6H, hi, h'i', h''i''), 6.03 (tdt, *J*= 16.2, 10.9, 5.3 Hz, 3H, g,g',g''), 7.27 (s, 2H, H-2 and H-6) ppm.



*Allyl-3,4-bis(allyloxy)-5-(oxiran-2-ylmethoxy)benzoate* **4b'**, **4c**: Colourless oil.  $^1\text{H}$  NMR (500 MHz, DMSO- $d_6$ )  $\delta$ = 2.73 (dd,  $J$ = 5.0, 2.5 Hz, 1H, a), 2.75 (dd,  $J$ = 5.0, 2.6 Hz, 1H, a), 2.84 (q,  $J$ = 4.7 Hz, 2H, b), 3.36 (m, 2H, c), 3.90 (dd,  $J$ =11.3, 6.5 Hz, 1H, d'), 4.07 (dd,  $J$ =12.3, 6.3 Hz, 1H, d), 4.43 (dd,  $J$ = 11.3, 2.0 Hz, 1H, e'), 4.55 (dd,  $J$ = 5.5, 3.0 Hz, 4H, f), 4.61 (d,  $J$ = 2.5 Hz, 1H, e), 4.64 (d,  $J$ = 5.0 Hz, 6H, f'), 4.80 (d,  $J$ = 5.2 Hz, 2H, f''), 5.31 (m, 12H, hi, h'i', h''i''), 6.04 (m, 6H, g,g',g''), 7.25 (s, 2H, H-2' and H-6'), 7.27 (s, 2H, H-2 and H-6) ppm.

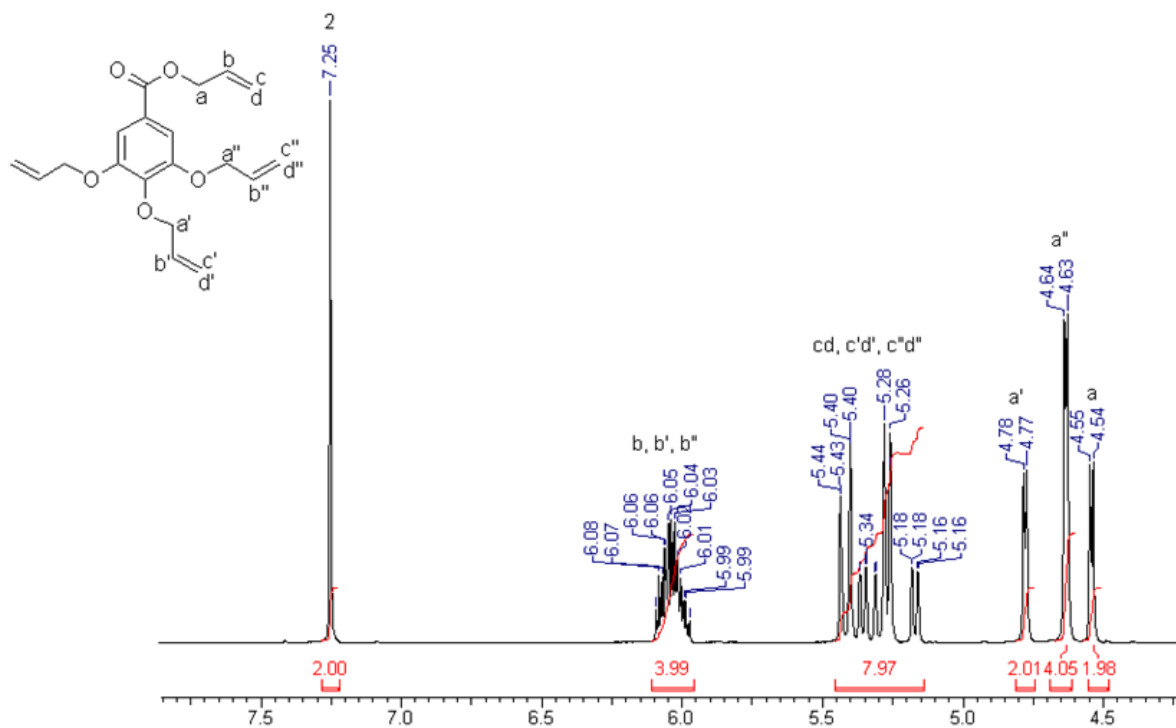


*Allyl-3,4-bis(allyloxy)-5-(oxiran-2-ylmethoxy)benzoate* **5b**, **5b'**: Colourless oil.  $^1\text{H}$  NMR (500 MHz, DMSO- $d_6$ )  $\delta$ = 2.73 (dd,  $J$ = 5.0, 2.6 Hz, 1H, a), 2.75 (dd,  $J$ = 5.1, 2.6 Hz, 1H, a), 2.84 (td,  $J$ = 7.8, 4.7 Hz, 2H, b), 3.35 (m, 2H, c), 3.90 (dd,  $J$ =11.3, 6.4 Hz, 1H, d'), 4.07 (dd,  $J$ =12.4, 6.3 Hz, 1H, d), 4.43 (dd,  $J$ = 11.3, 2.2 Hz, 1H, e'), 4.56 (d,  $J$ = 5.7 Hz, 2H, f), 4.61 (d,  $J$ = 2.6 Hz, 1H, e), 4.65 (d,  $J$ = 5.2 Hz, 2H, f'), 5.18 (d,  $J$ = 11.7 Hz, 1H, i'), 5.31 (ddd,  $J$ = 16.9, 12.00, 1.5 Hz, 2H, i, h'), 5.42 (dd,  $J$ = 17.3, 1.6 Hz, 1H, h), 6.04 (tdt,  $J$ = 17.0, 10.6, 5.4 Hz, 2H, g,g'), 7.26 (s, 2H, H-2 and H-6) ppm.

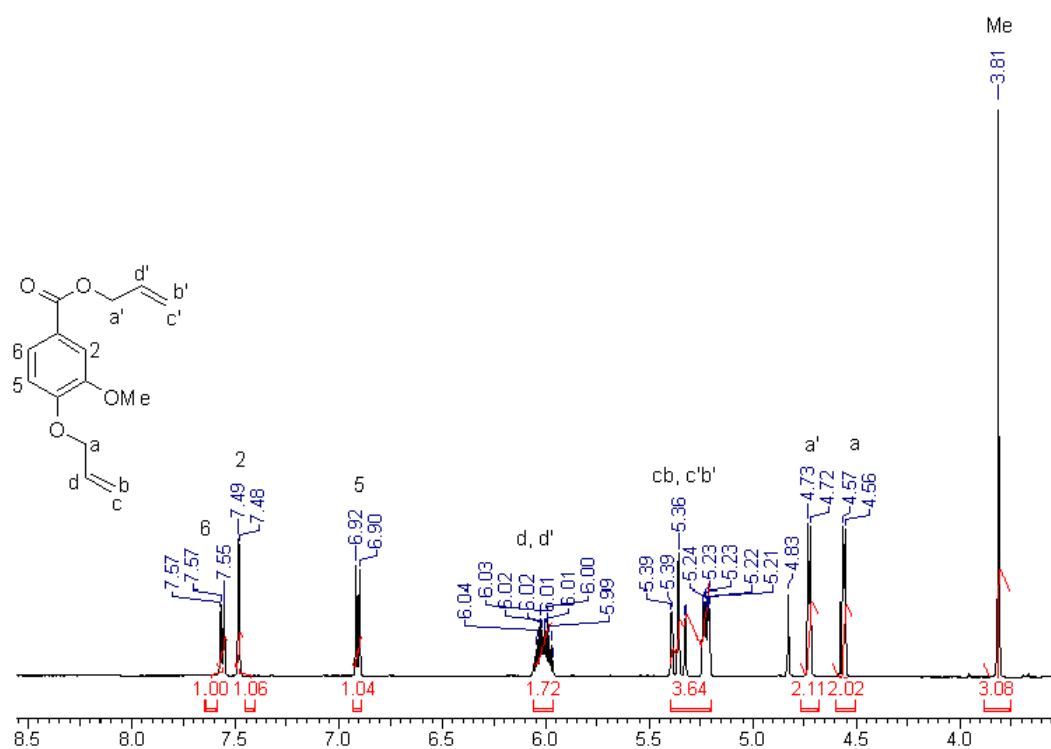


*Allyl-4-(allyloxy)-3,5-bis(oxiran-2-ylmethoxy)benzoate* **5d** and *oxiran-2-ylmethyl 3,5-bis(allyloxy)-4-(oxiran-2-ylmethoxy)benzoate* **5c**: Colourless oil.  $^1\text{H}$  NMR (500 MHz, DMSO- $d_6$ )  $\delta$ = [2.60 (dd,  $J$ = 5.0, 2.6 Hz, 1H), 2.72 (dd,  $J$ = 5.0, 2.6 Hz, 1H), 2.75 (m, 3H), 2.84 (q,  $J$ = 5.0 Hz, 3H), ab, a'b', a''b''], 3.34 (m, 3H, c,c',c''), 3.89 (td,  $J$ =11.8, 6.8 Hz, 3H, d',d''), 4.07 (dd,  $J$ =12.4, 6.3 Hz, 1H, d), 4.26 (dd,  $J$ = 11.6, 2.9 Hz, 1H, e'), 4.43 (dd,  $J$ = 11.3, 2.2 Hz, 2H, e''), 4.57 (d,  $J$ = 5.8 Hz, 2H, f'), 4.62 (d,  $J$ = 2.6 Hz, 1H, e), 4.65 (d,  $J$ = 5.0 Hz, 4H, f''), 4.78 (d,  $J$ = 5.3 Hz, 2H, f), 5.32 (m, 8H, hi, h'i', h''i''), 6.04 (m, 4H, g,g',g''), 7.26 (s, 2H, H-2), 7.28 (s, 2H, H-2') ppm.

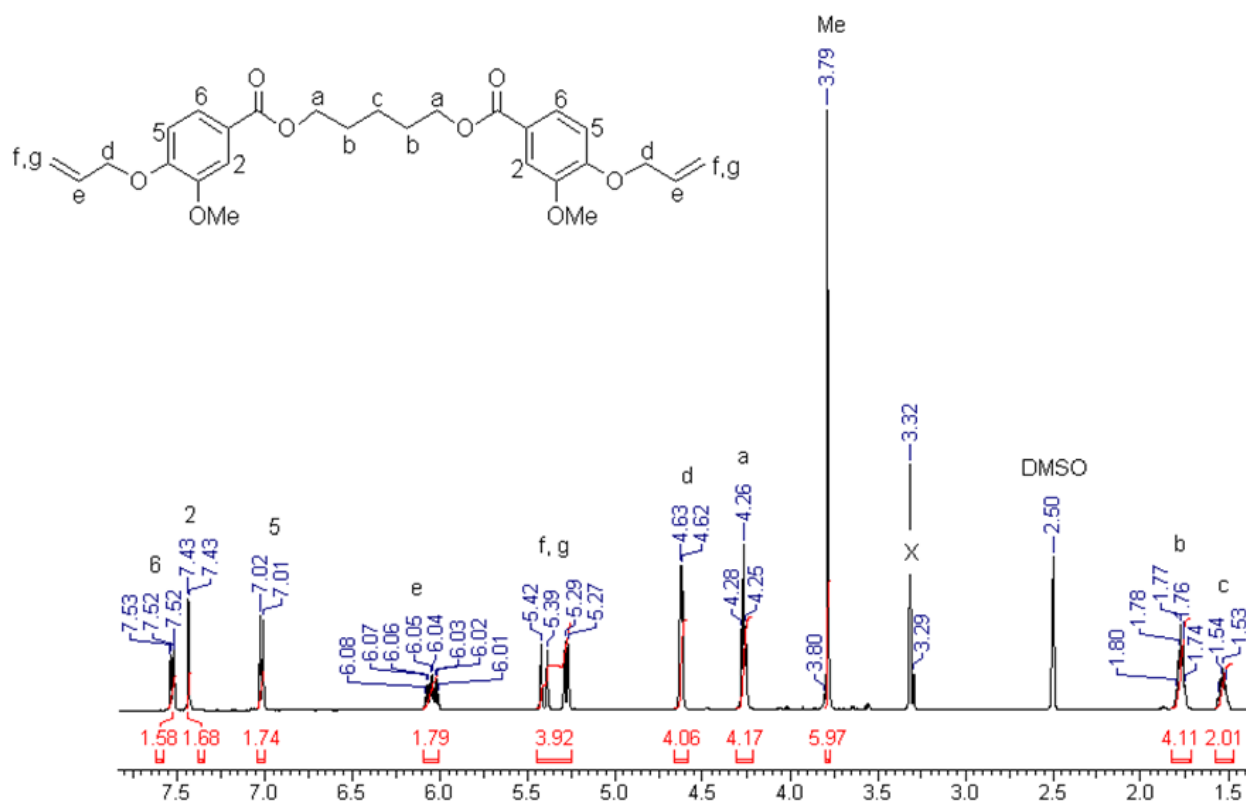
# **<sup>1</sup>H NMR Spectra**



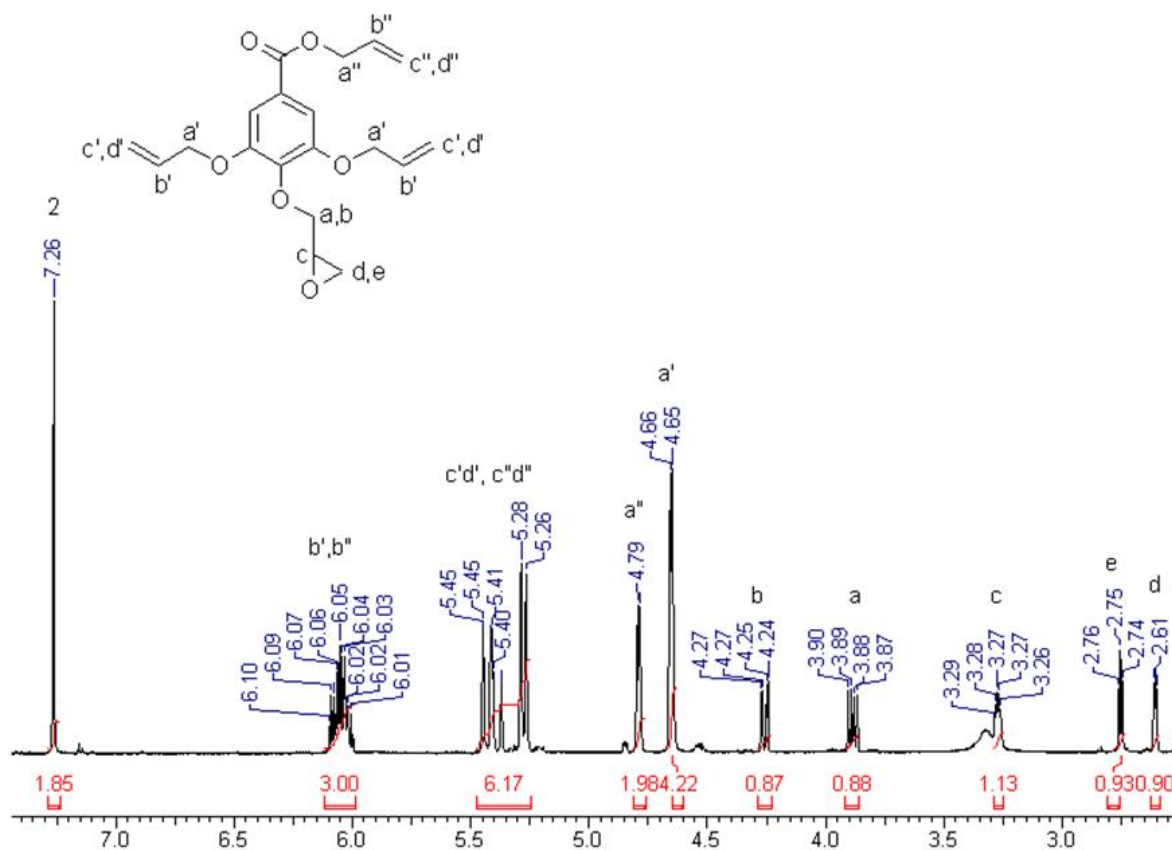
<sup>1</sup>H NMR of **1** in d<sub>6</sub>-DMSO.



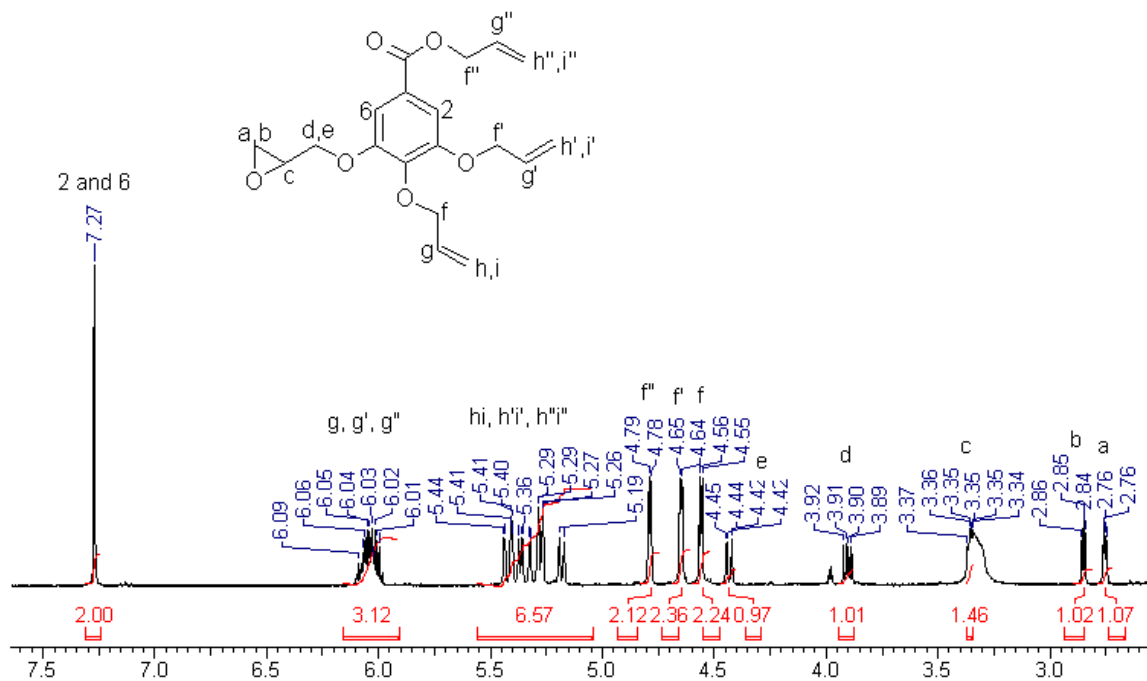
<sup>1</sup>H NMR of 2 in d<sub>4</sub>-methanol.



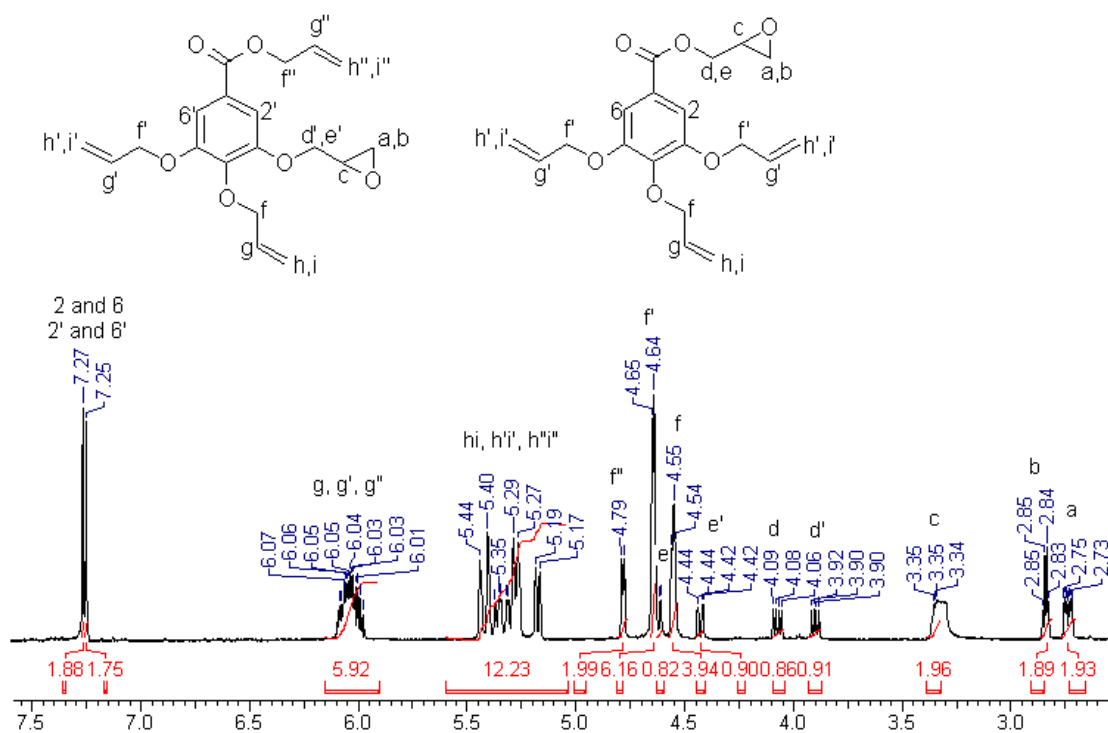
<sup>1</sup>H NMR of 3 in d<sub>6</sub>-DMSO.



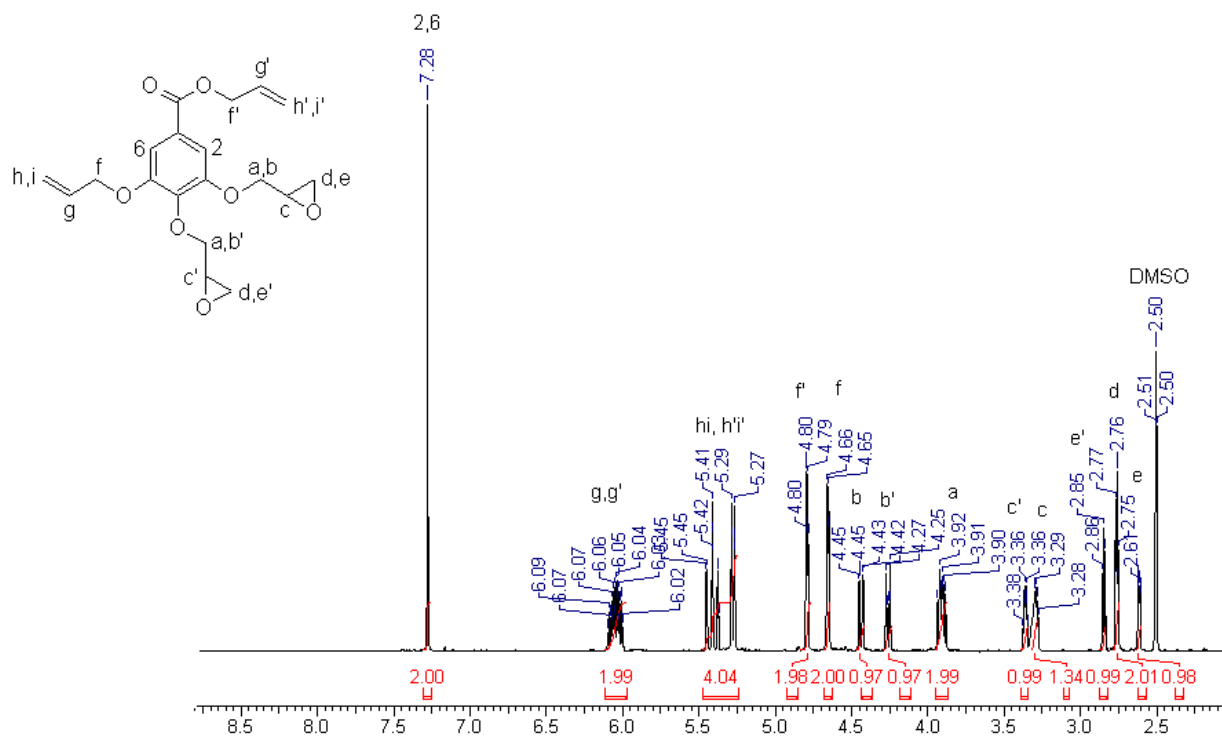
$^1\text{H}$  NMR of **4a** in  $\text{d}_6\text{-DMSO}$ .



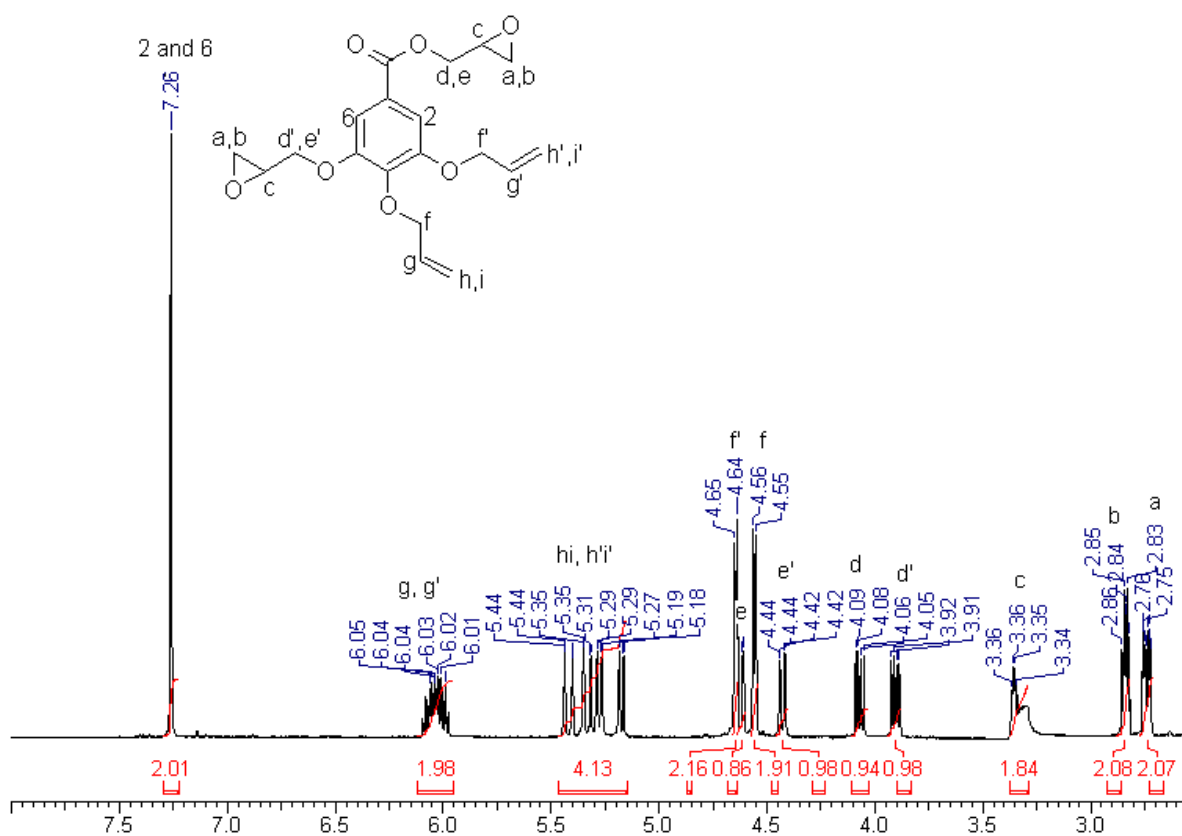
$^1\text{H}$  NMR of **4b** and **4b'** in  $\text{d}_6\text{-DMSO}$ .



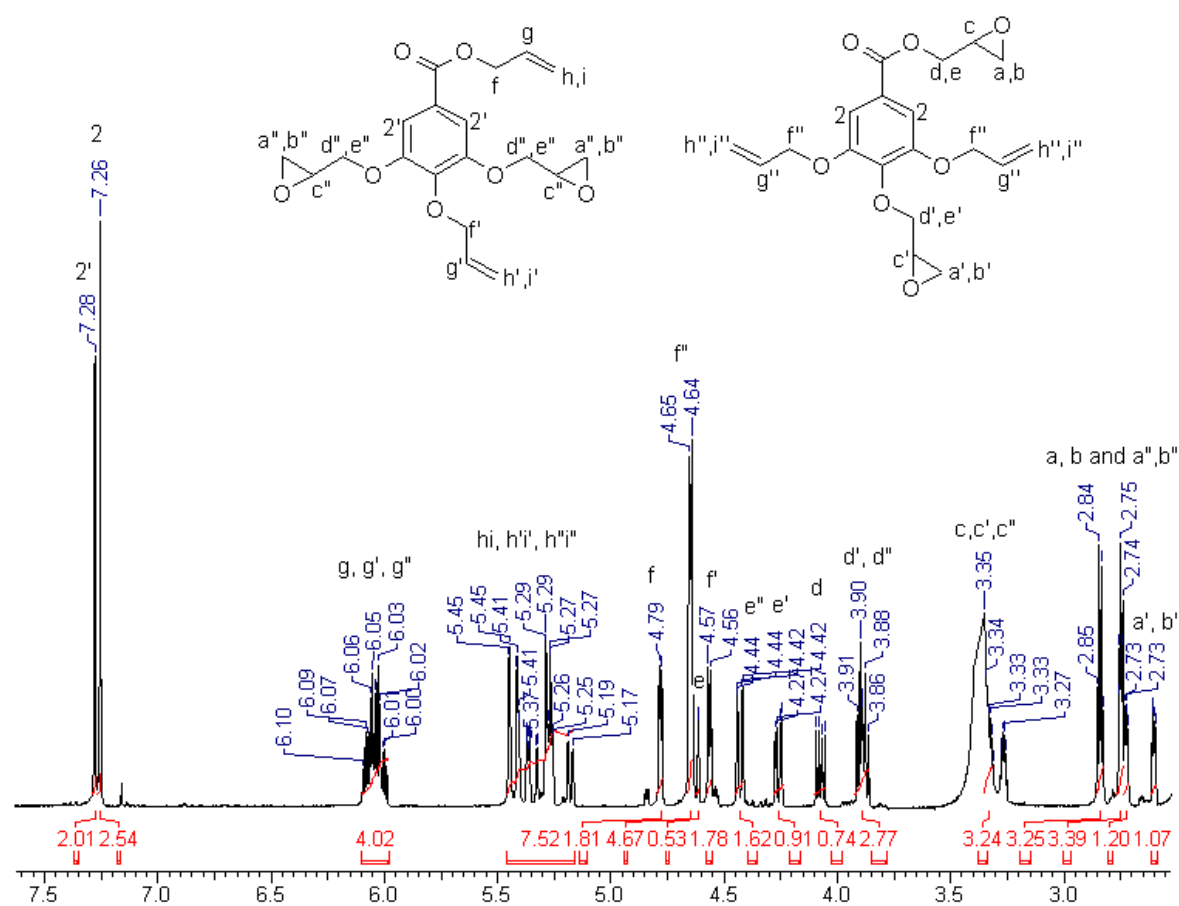
<sup>1</sup>H NMR of **4b'** and **4c** in d<sub>6</sub>-DMSO.



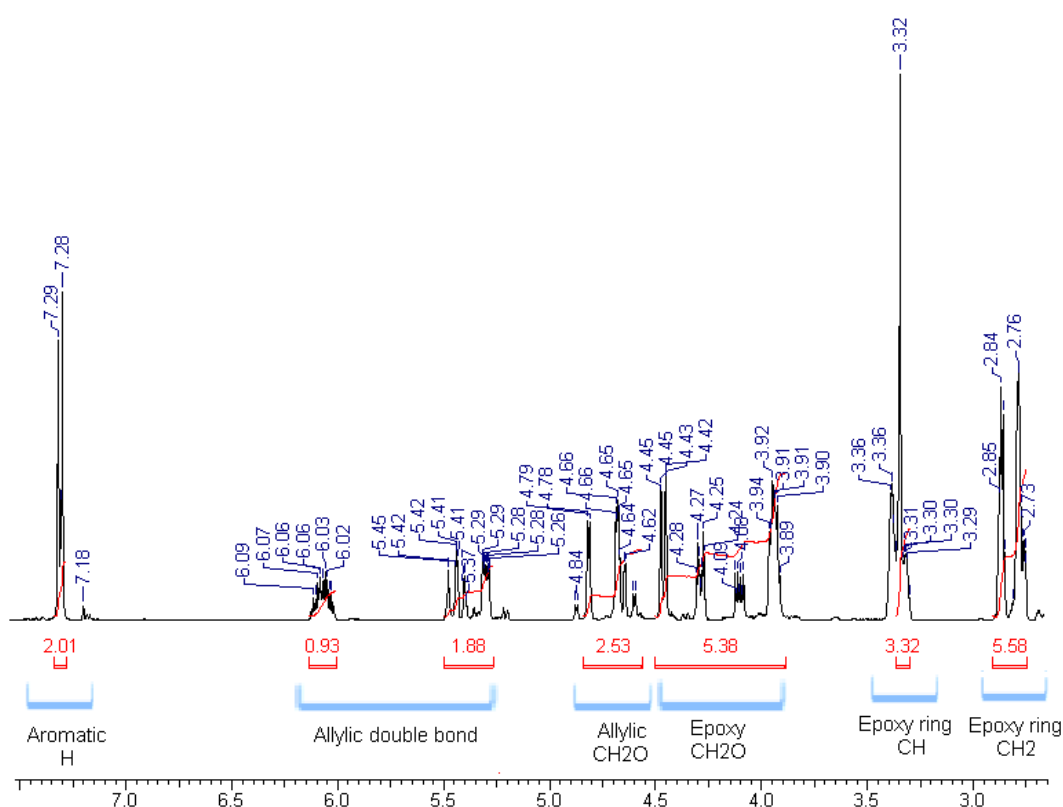
<sup>1</sup>H NMR of **5a** and **5a'** in d<sub>6</sub>-DMSO.



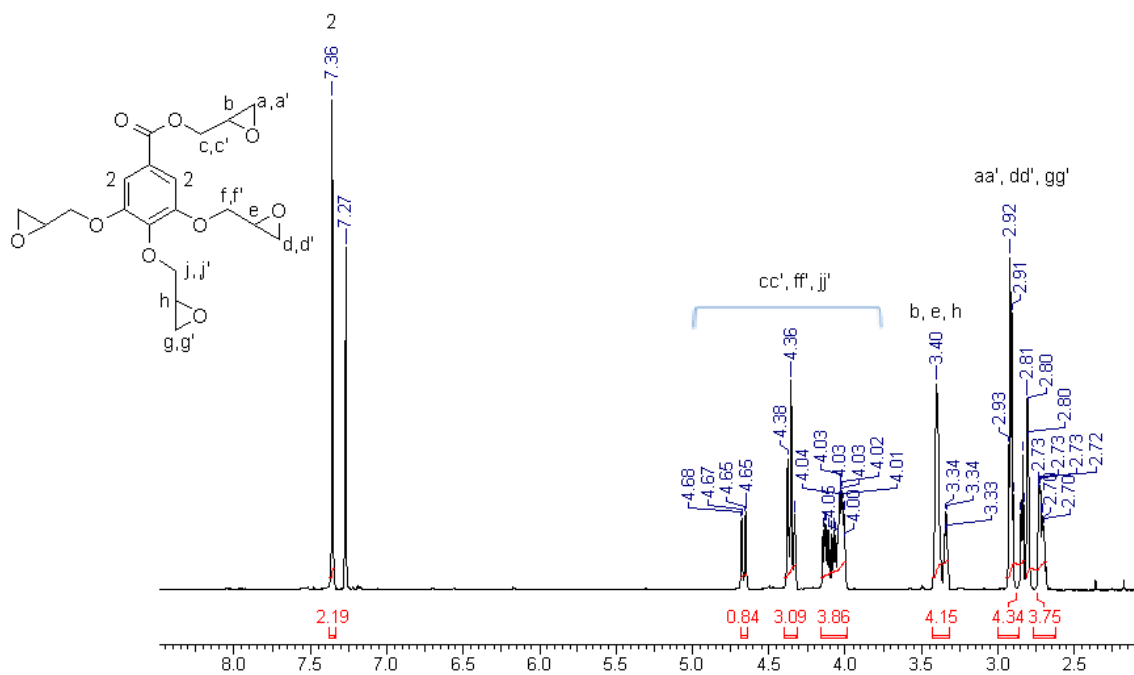
$^1\text{H}$  NMR of **5b** and **5b'** in  $\text{d}_6\text{-DMSO}$ .



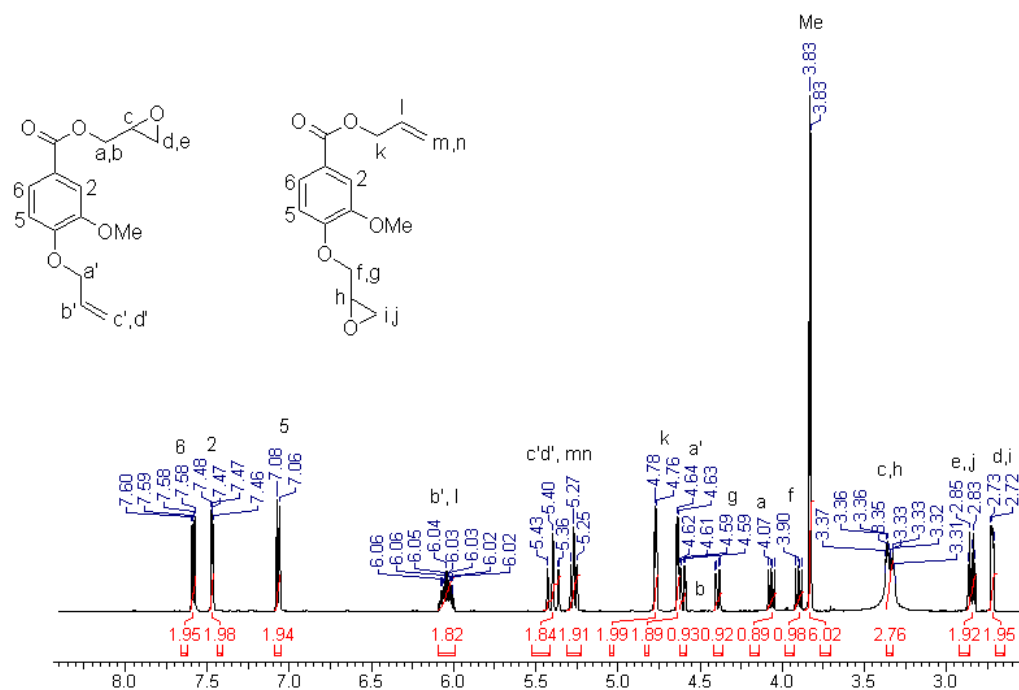
<sup>1</sup>H NMR of 5c and 5d in d<sub>6</sub>-DMSO.



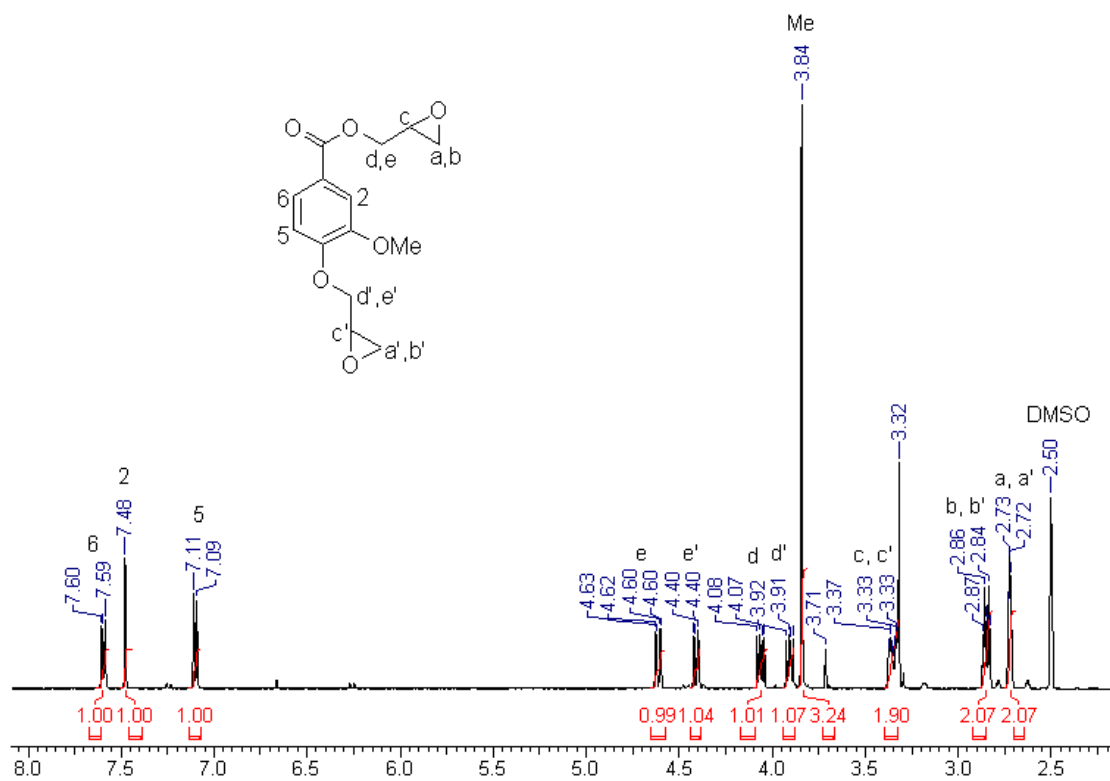
<sup>1</sup>H NMR of 6 (a, b, b', c) in d<sub>6</sub>-DMSO.



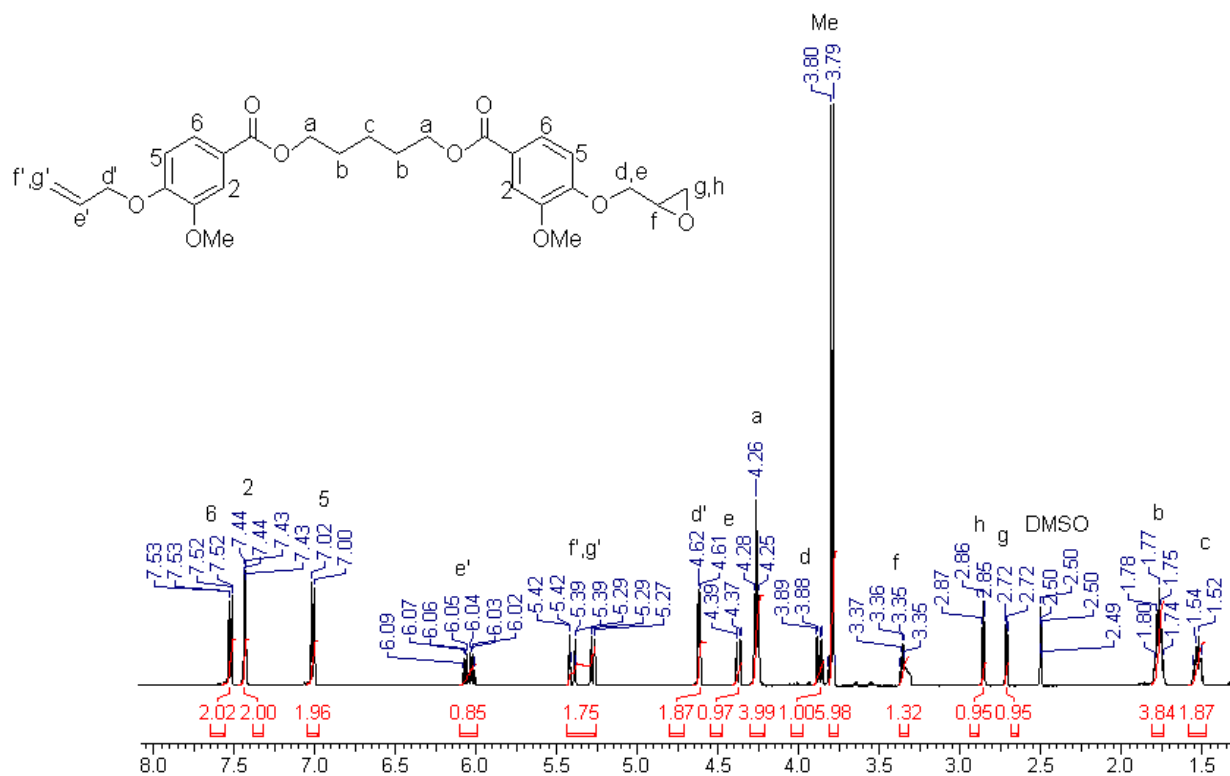
<sup>1</sup>H NMR of 7 in CDCl<sub>3</sub>.



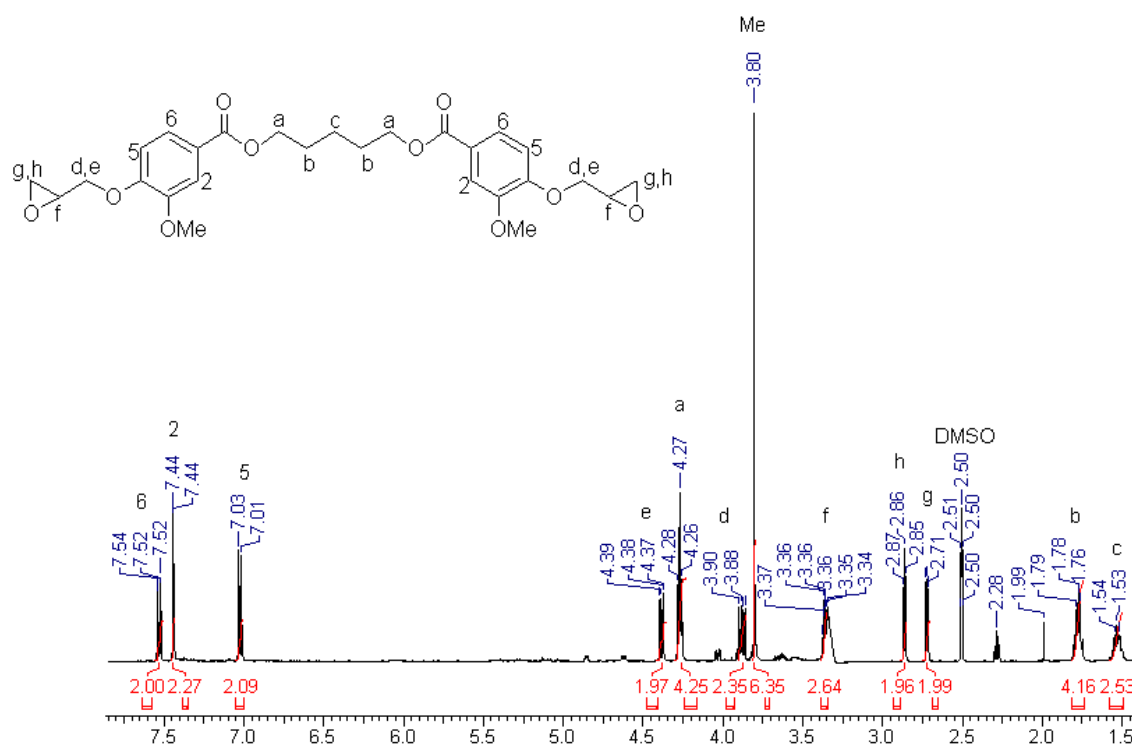
<sup>1</sup>H NMR of **8a** and **8b** in d<sub>6</sub>-DMSO.



<sup>1</sup>H NMR of **9** in d<sub>6</sub>-DMSO.

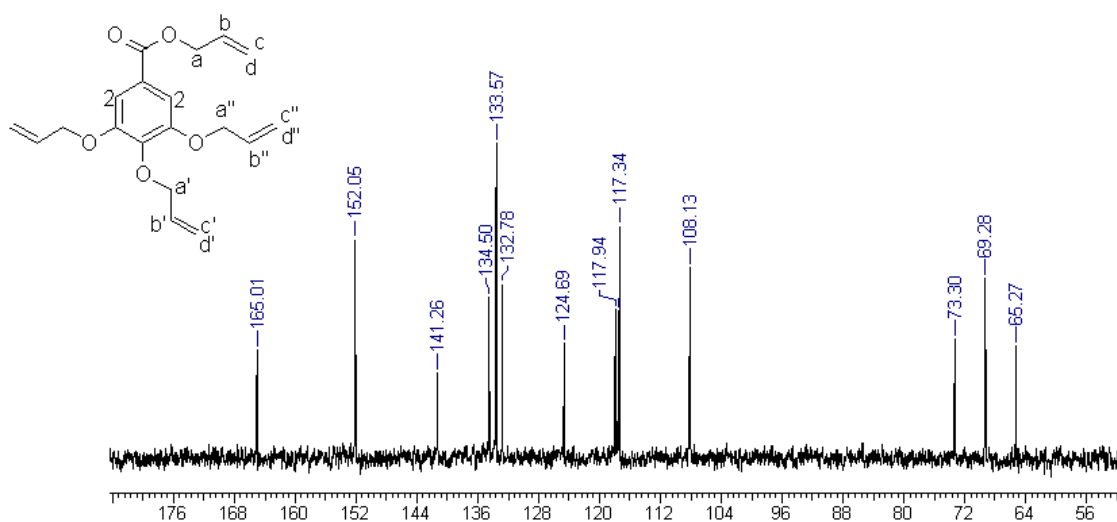


<sup>1</sup>H NMR of **10** in d<sub>6</sub>-DMSO.

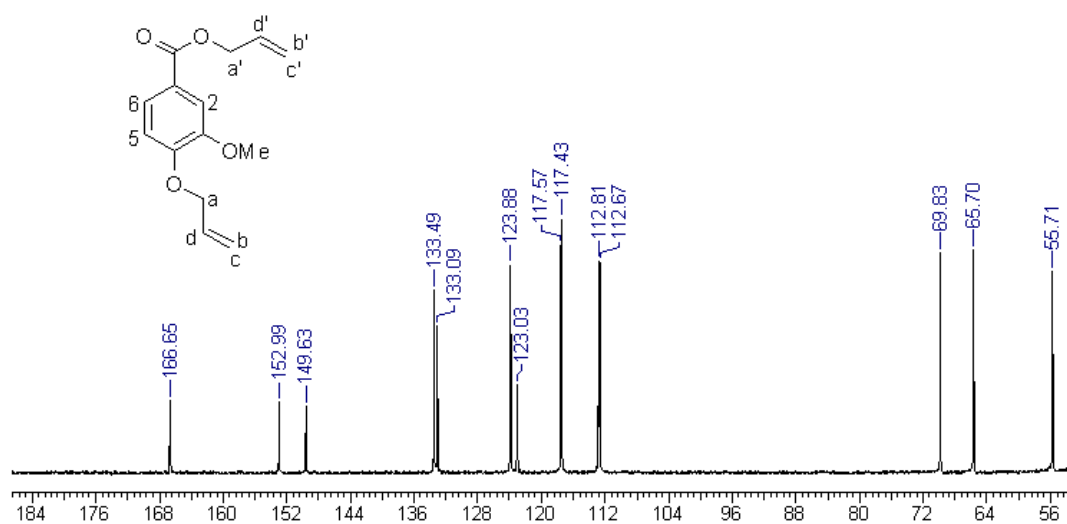


<sup>1</sup>H NMR of **11** in d<sub>6</sub>-DMSO.

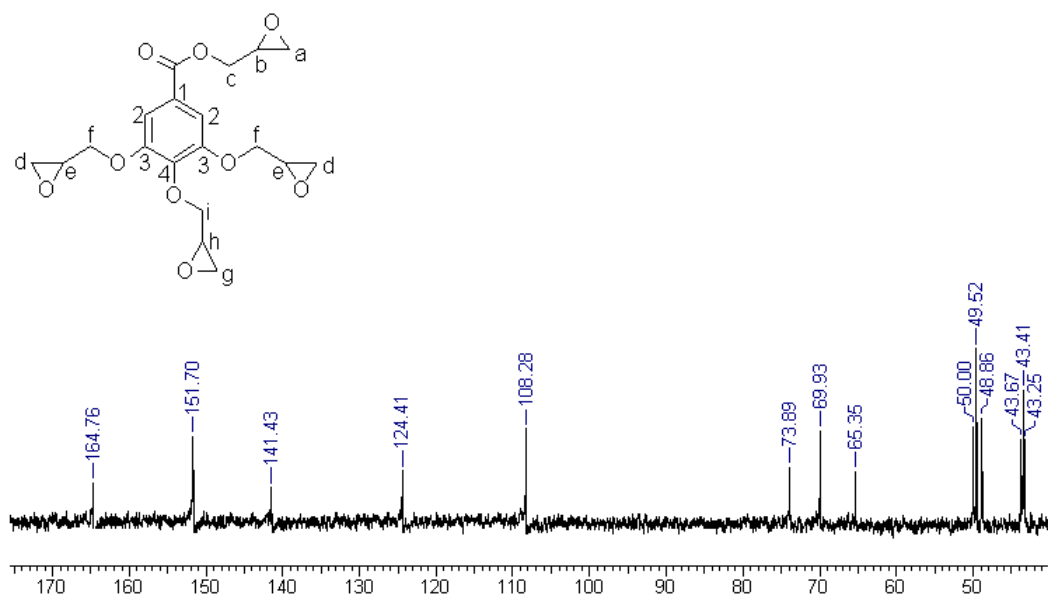
### **<sup>13</sup>C NMR Spectra**



<sup>13</sup>C NMR of **1** in d<sub>6</sub>-DMSO

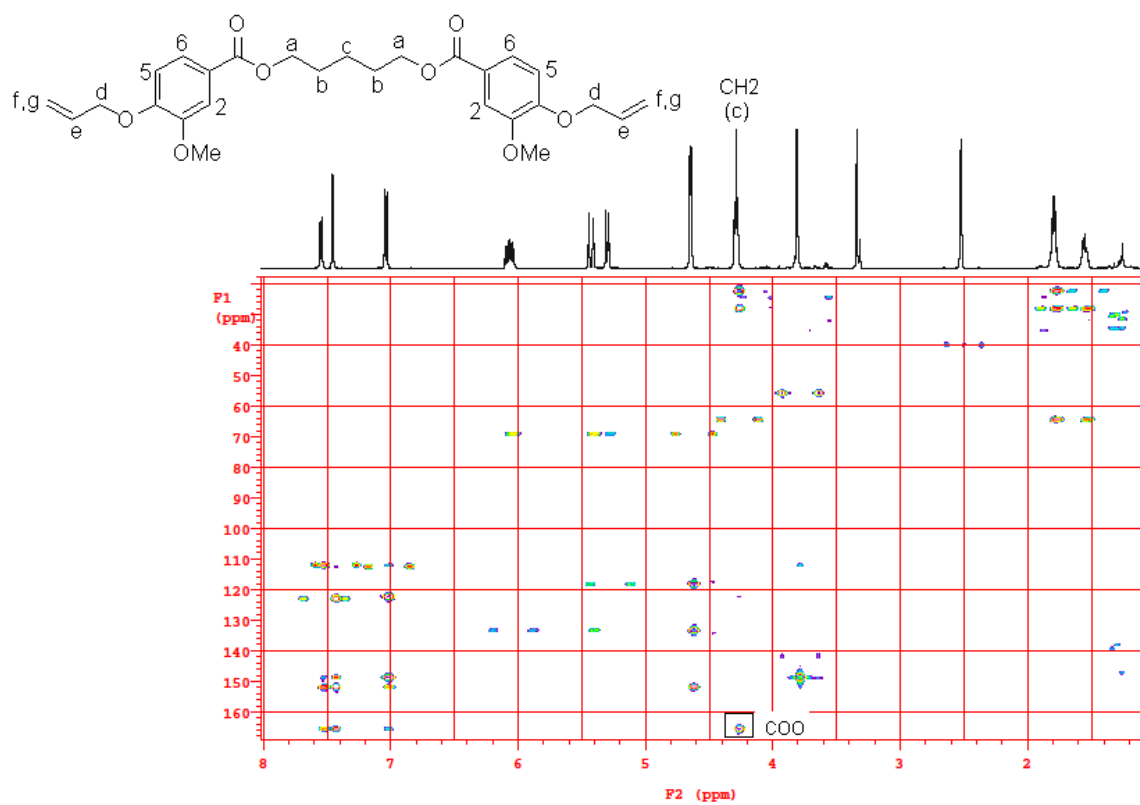


<sup>13</sup>C NMR of **2** in d<sub>4</sub>-methanol

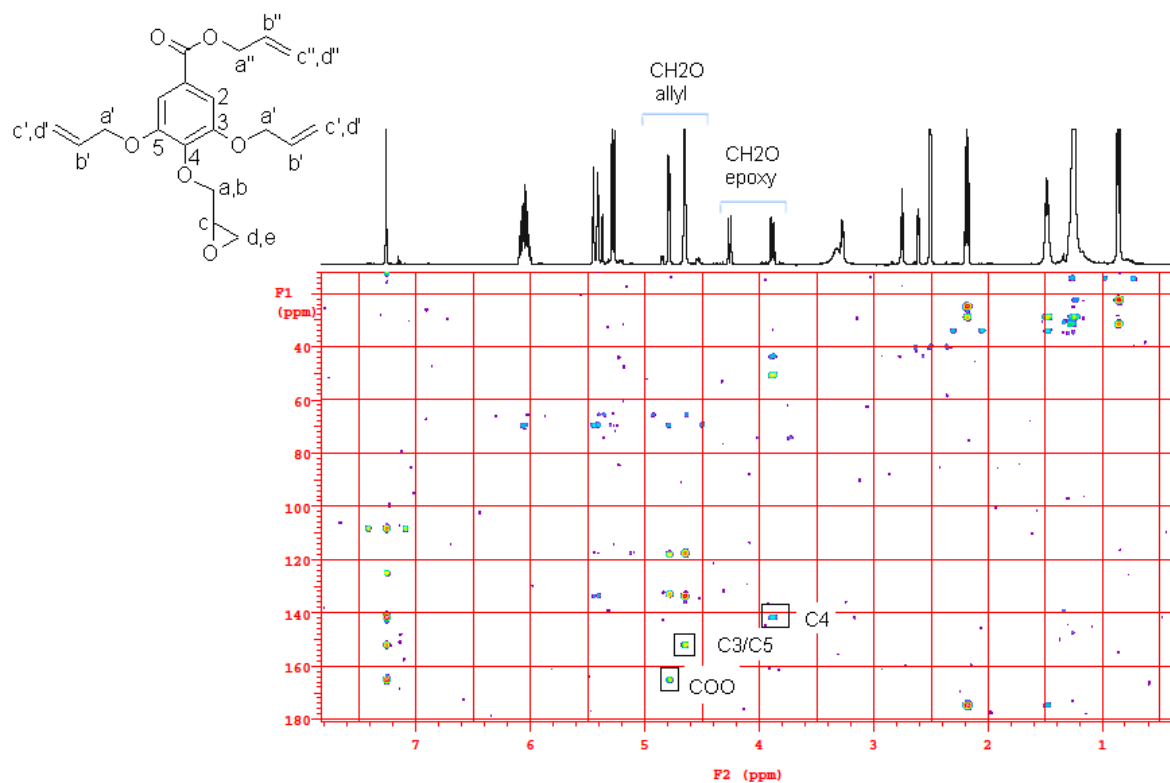


$^{13}\text{C}$  NMR of 7 in d<sub>4</sub>-methanol.

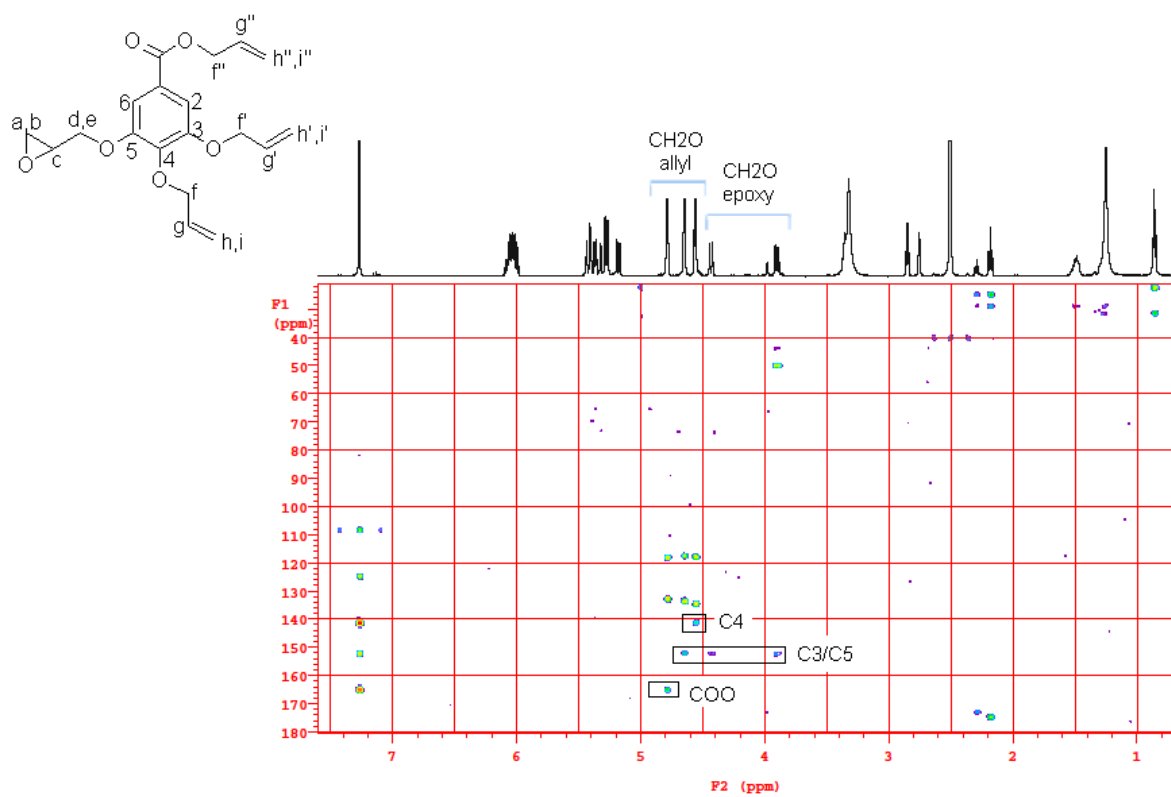
# HMBC Spectra



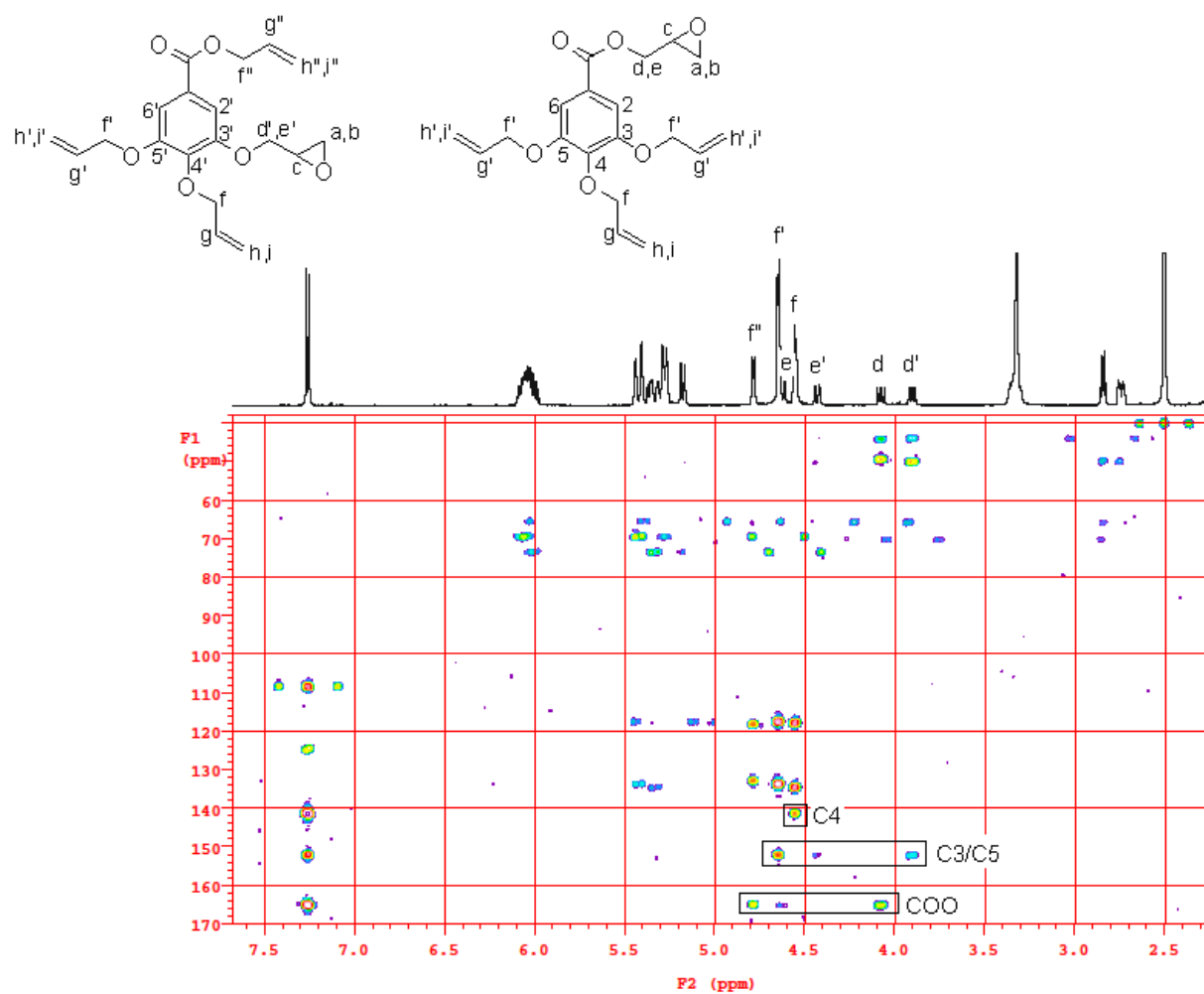
HMBC of **3** in d6-DMSO.



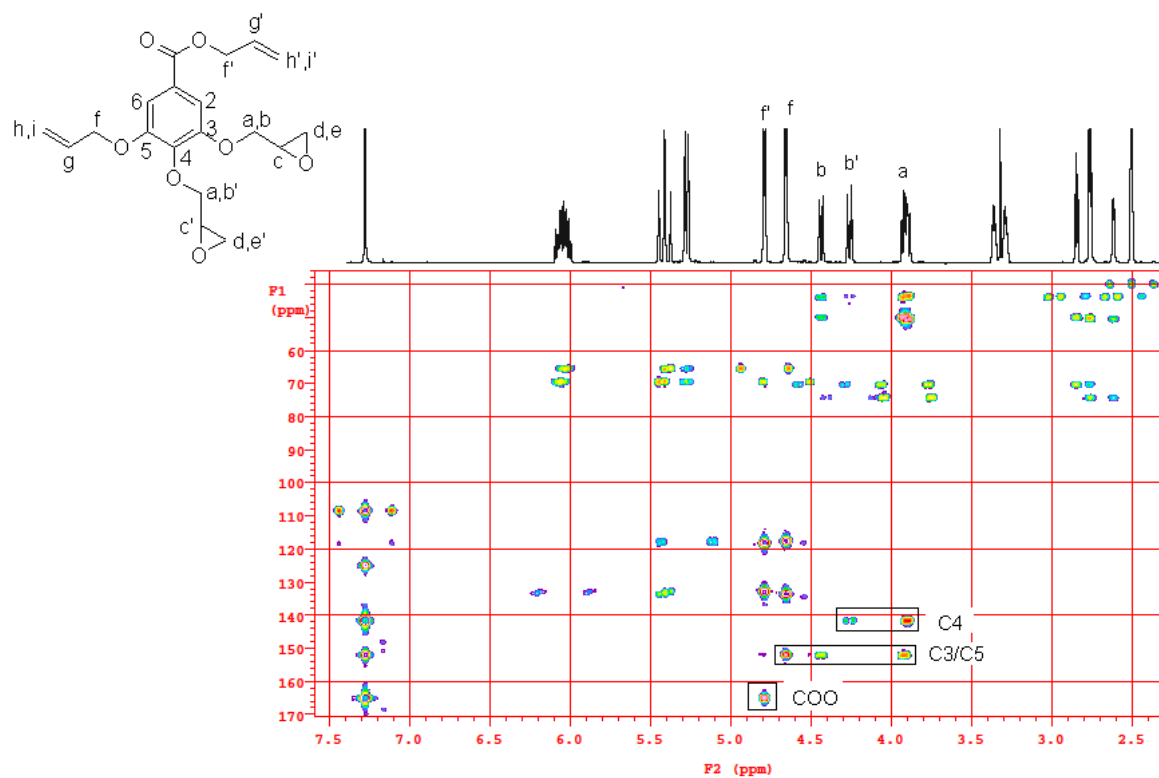
HMBC of **4a** in d<sub>6</sub>-DMSO.



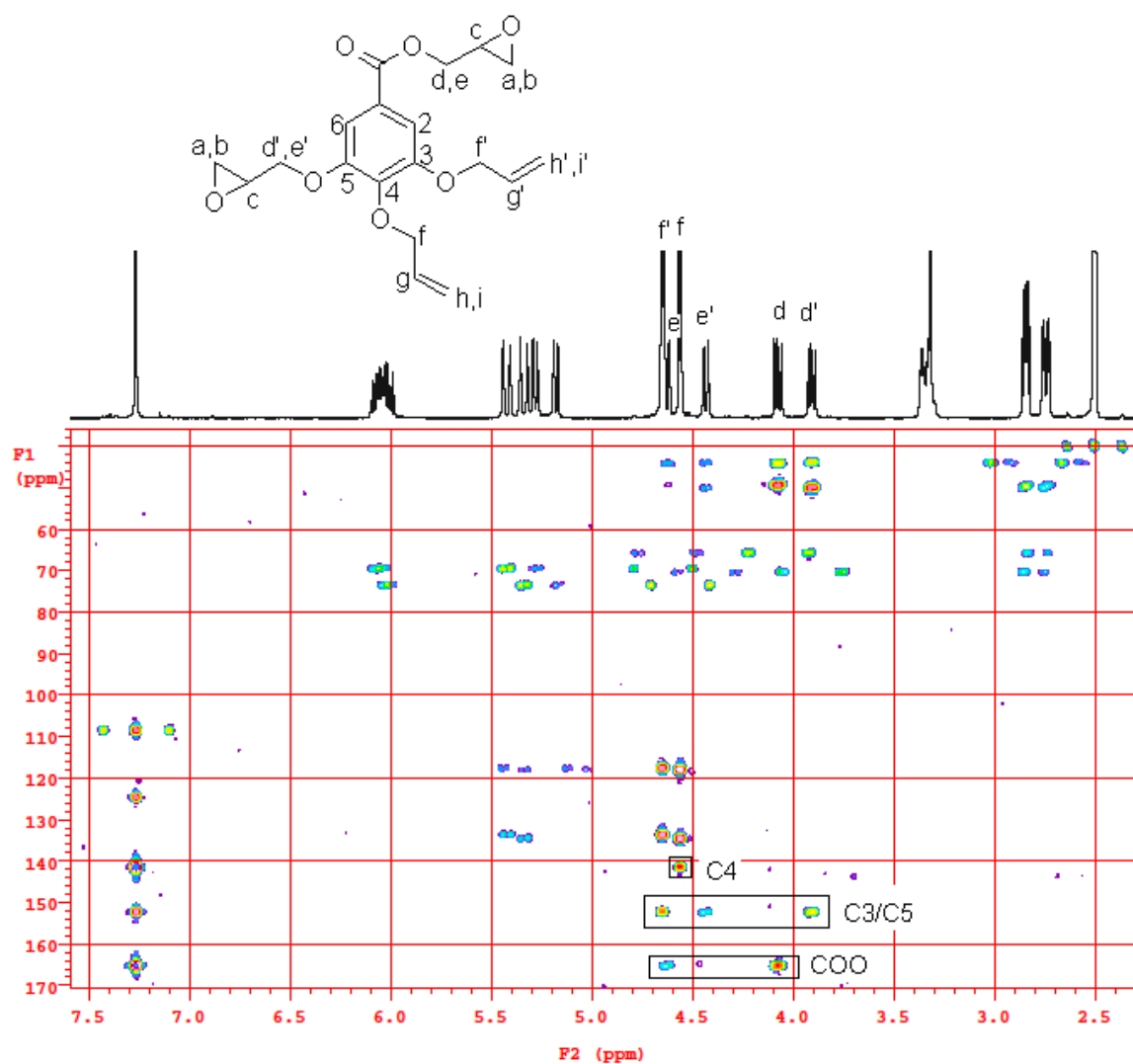
HMBC of **4b, 4b'** in d<sub>6</sub>-DMSO.



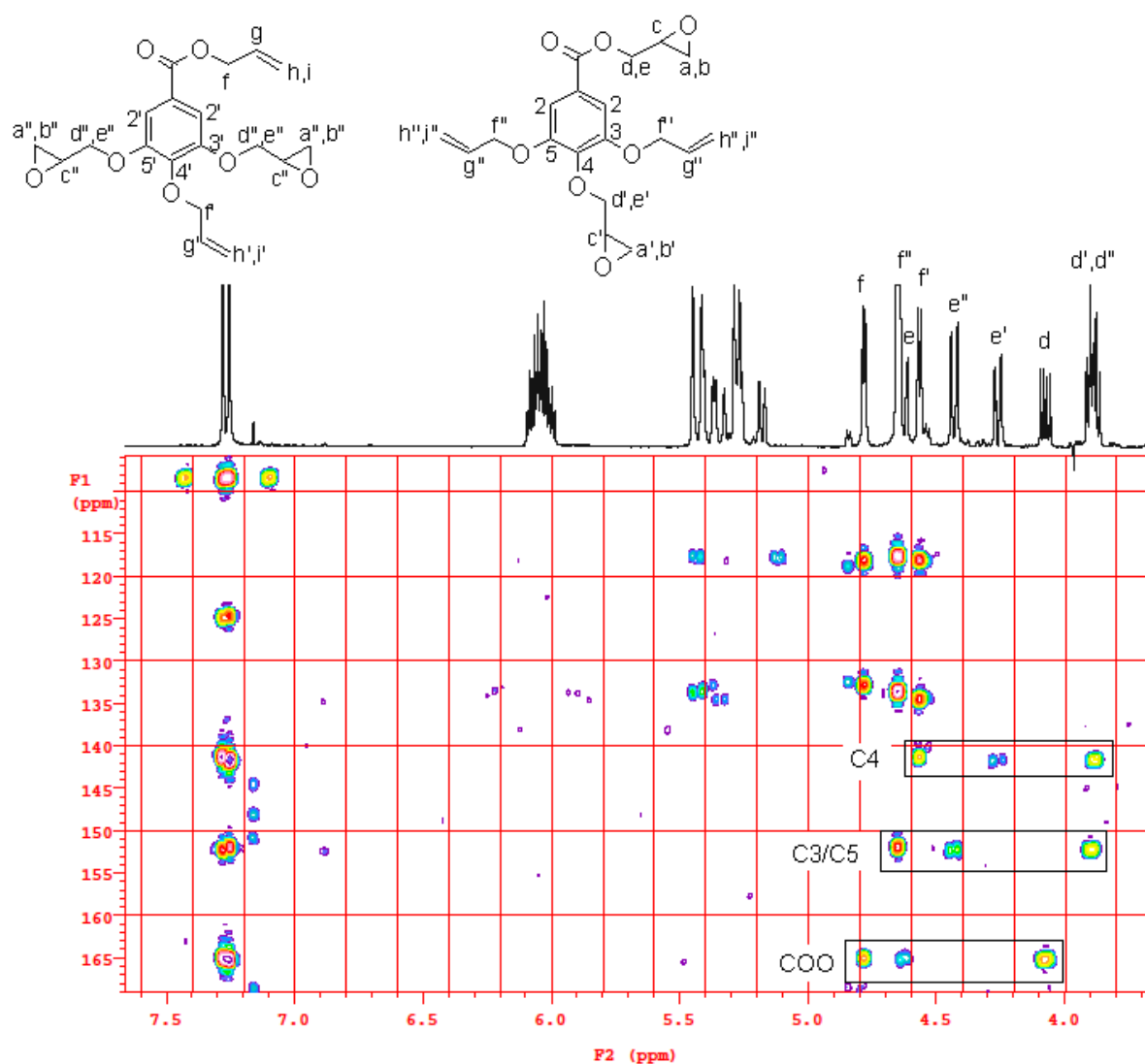
HMBC of **4b'**, **4c** in  $d_6$ -DMSO.



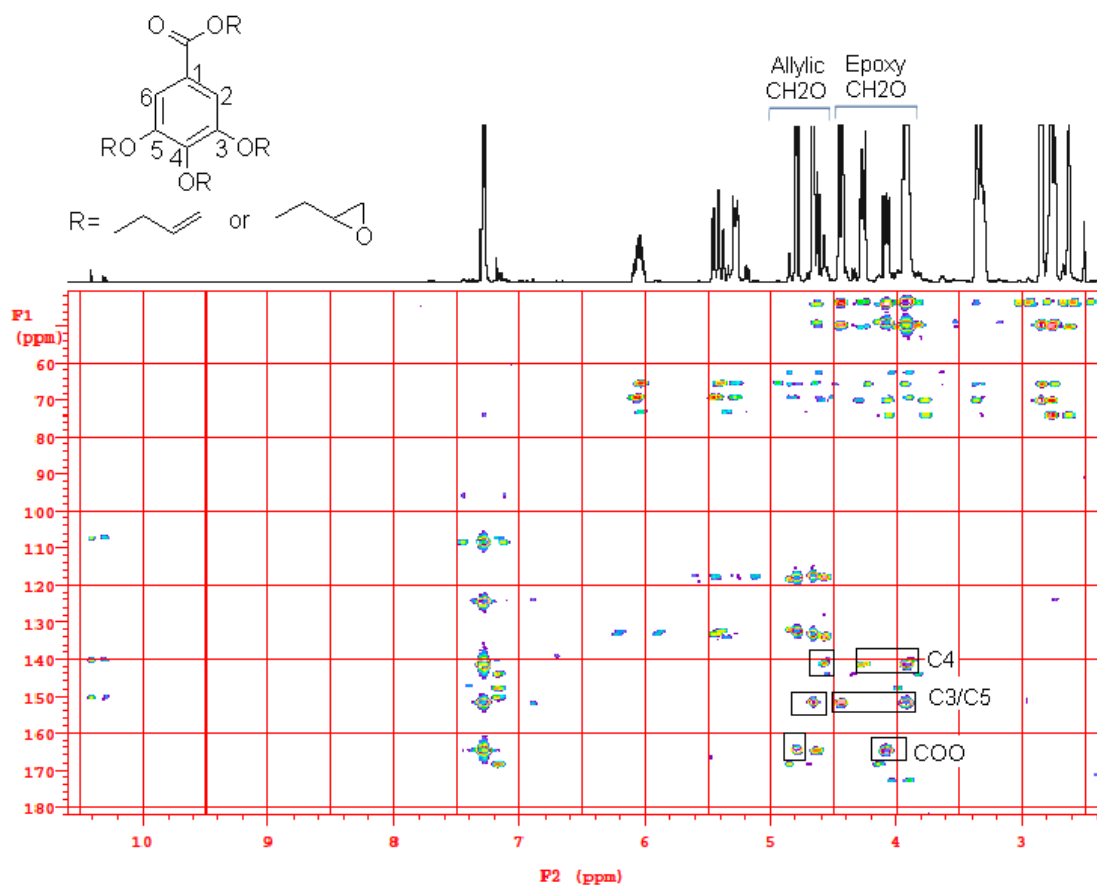
HMBC of 5a, 5a' in d<sub>6</sub>-DMSO.



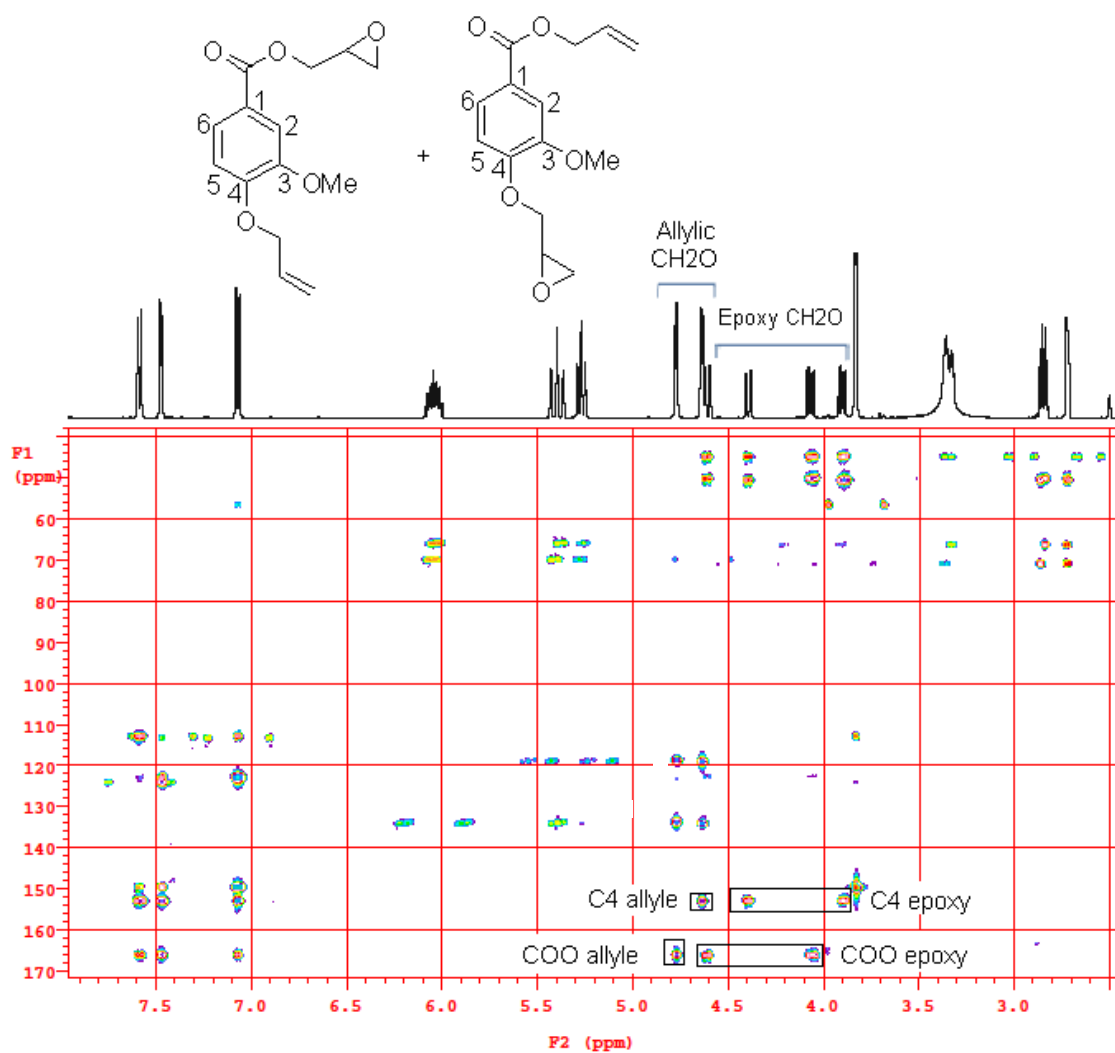
HMBC of **5b**, **5b'** in d<sub>6</sub>-DMSO.



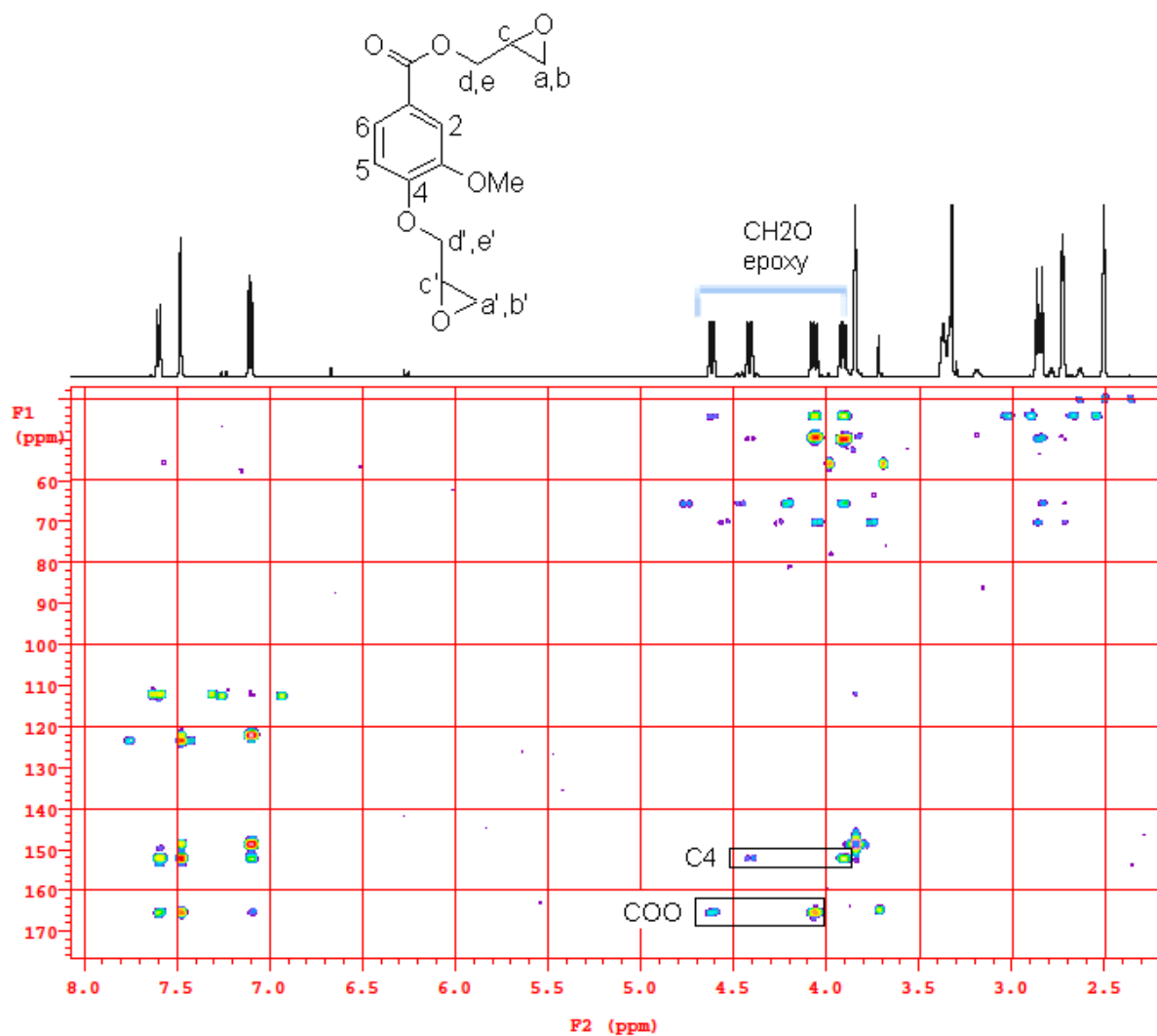
HMBC of **5c** and **5d** in  $\text{d}_6\text{-DMSO}$ .



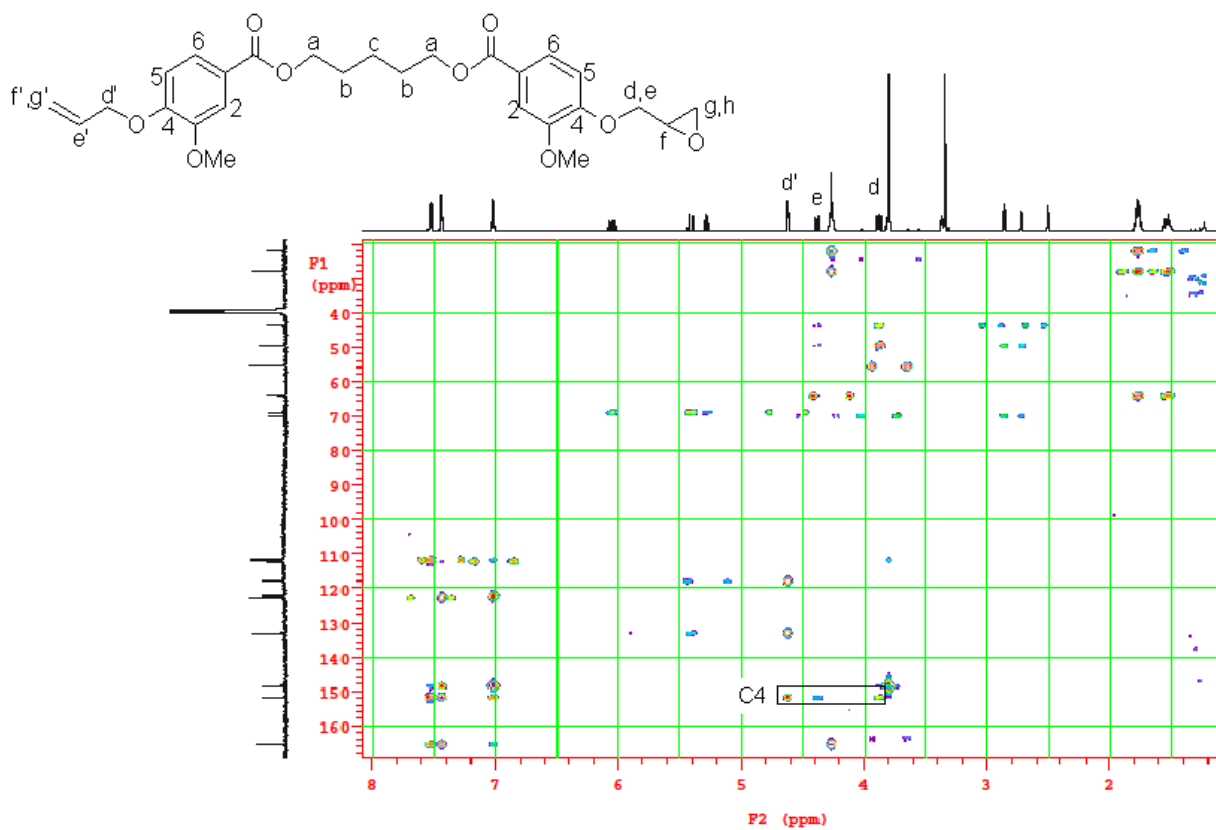
HMBC of **6** (a, b, b', c) in d<sub>6</sub>-DMSO.



HMBC of **8a**, **8b** in d<sub>6</sub>-DMSO.



HMBC of **9** in d<sub>6</sub>-DMSO.



HMBC of **10** in  $d_6$ -DMSO.