Supporting Information

Multifunctionalization of cellulose microfibrils through a cascade pathway entailing the sustainable Passerini Multi-Component reaction

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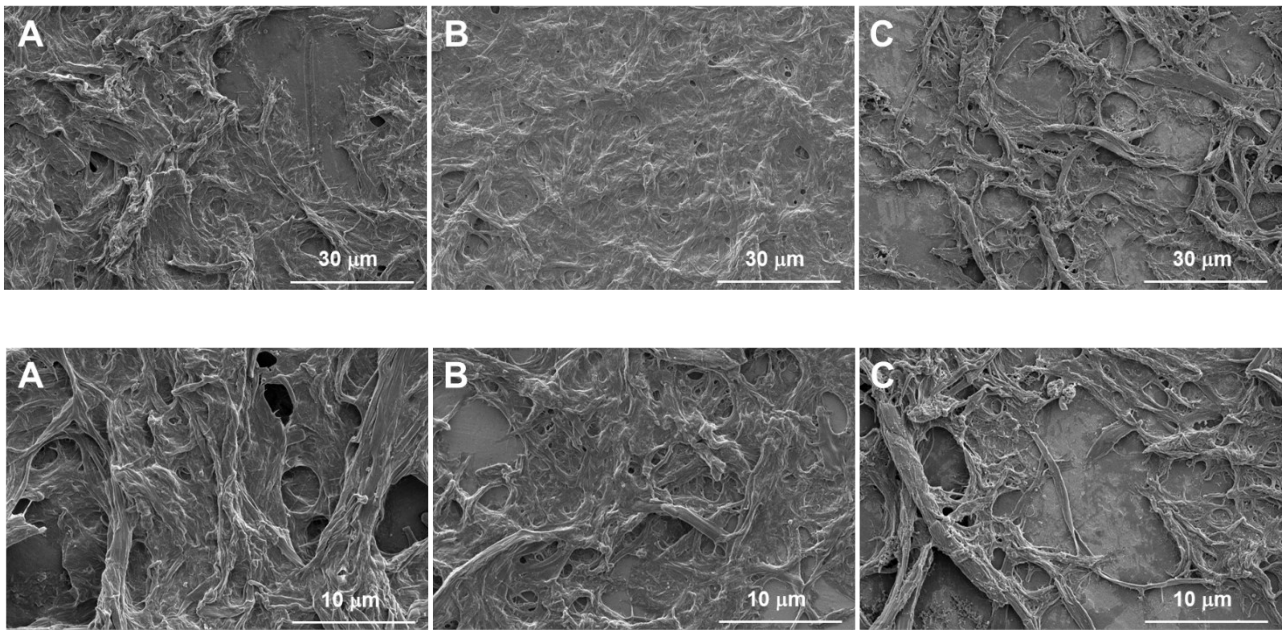


Fig. S1. SEM micrographs from dried suspensions of A) unmodified POC, DO = 0.77, B) $POC_{0.77}$-Pent-*t*B (Table 1, Entry 4) and C) $POC_{0.77}$-MA-*t*B (Table 1, Entry 11). Scale bar: 30 µm, and 10 µm.

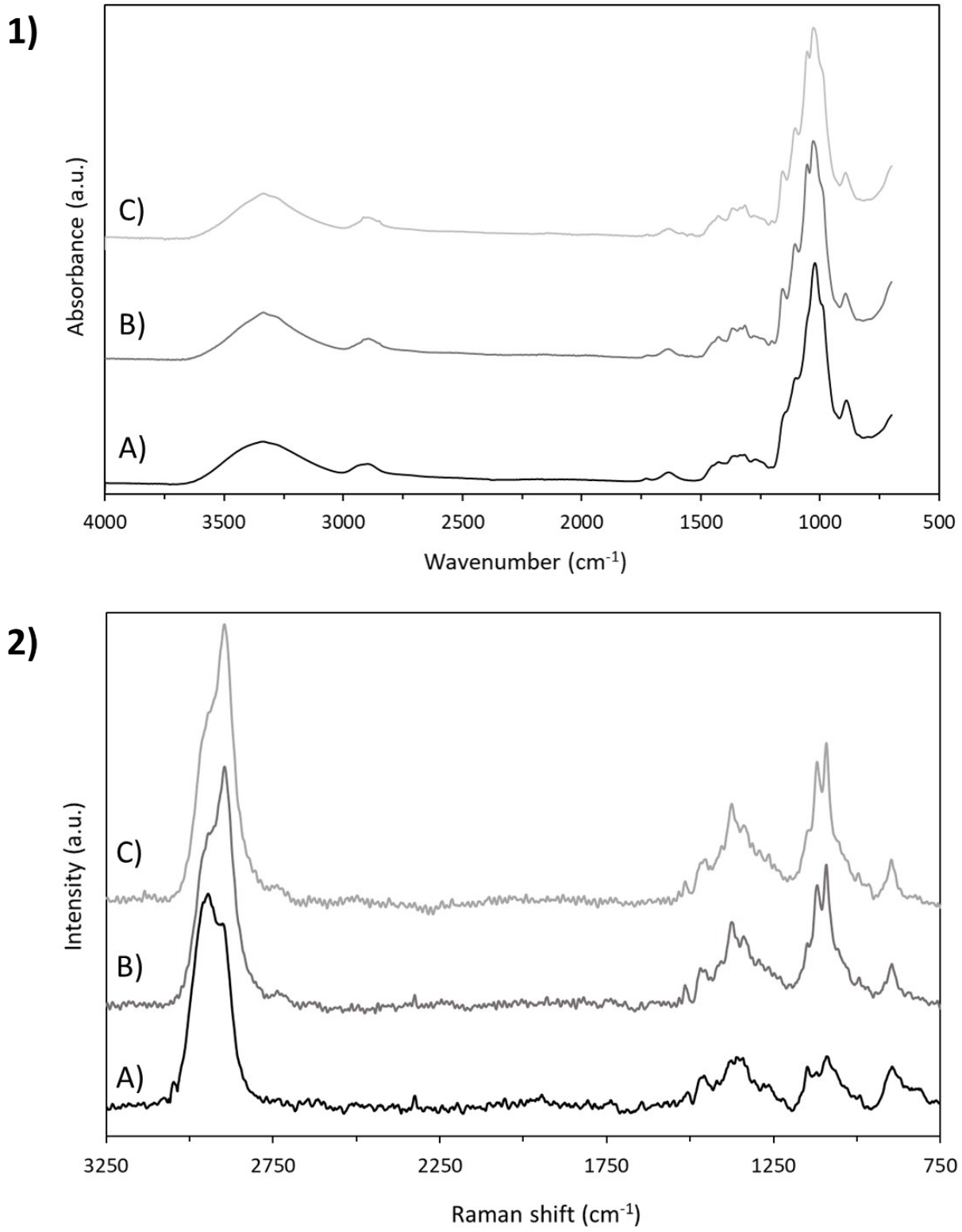
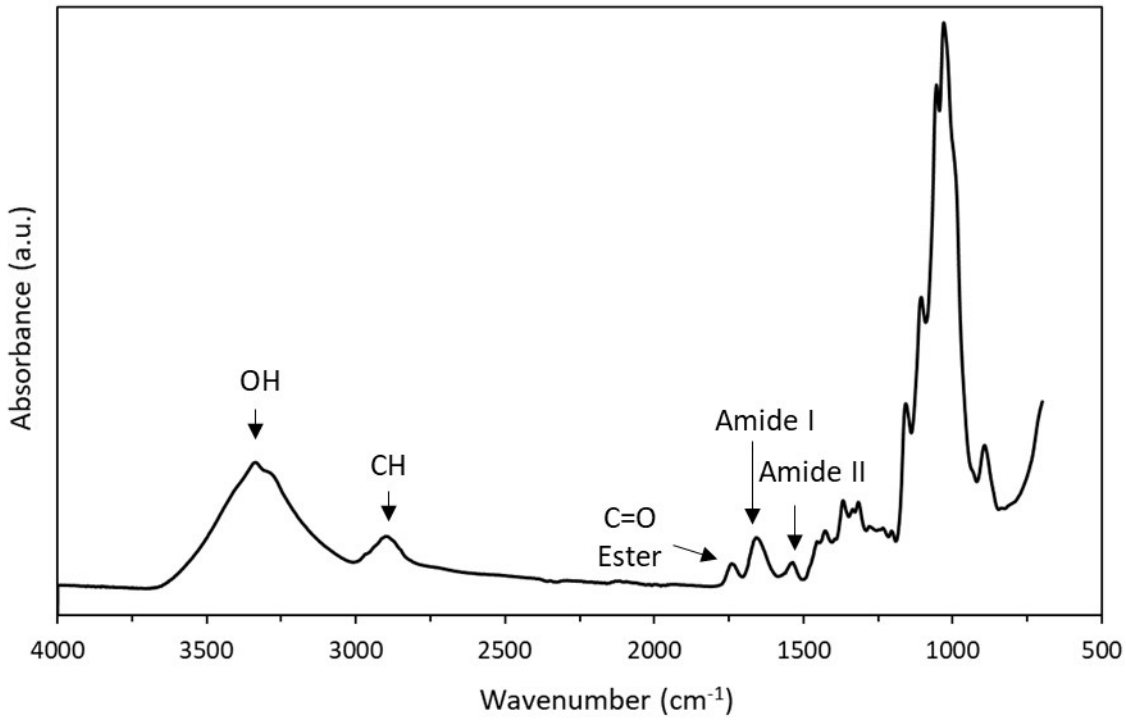
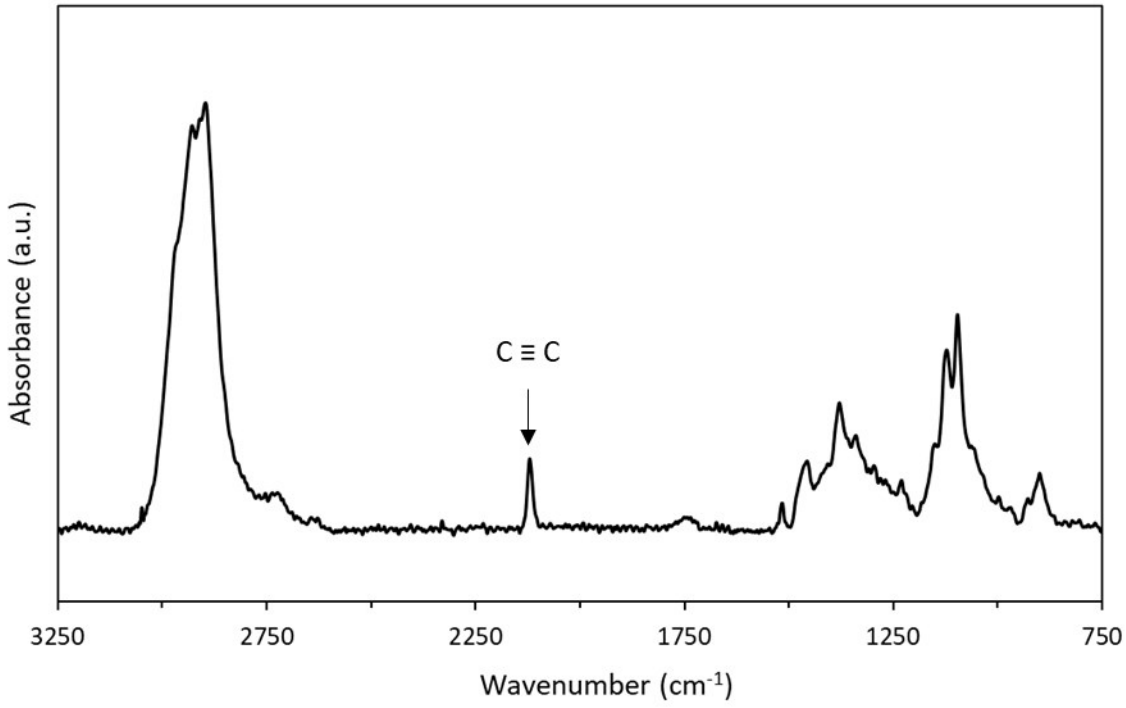


Fig. S2. ATR-IR (1) and Raman (2) spectra of unmodified POC, DO = 0.77 (A, ——), blank reaction between POC (DO = 0.77) and pentynoic acid (B, ——) and between POC (DO = 0.77) and methacrylic acid (C, ——).

A)


Absorbance (a.u.)
OH
CH
C=O
Ester
Amide I
Amide II
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm-1)

B)


Absorbance (a.u.)
C ≡ C
3250
2750
2250
1750
1250
750
Wavenumber (cm-1)

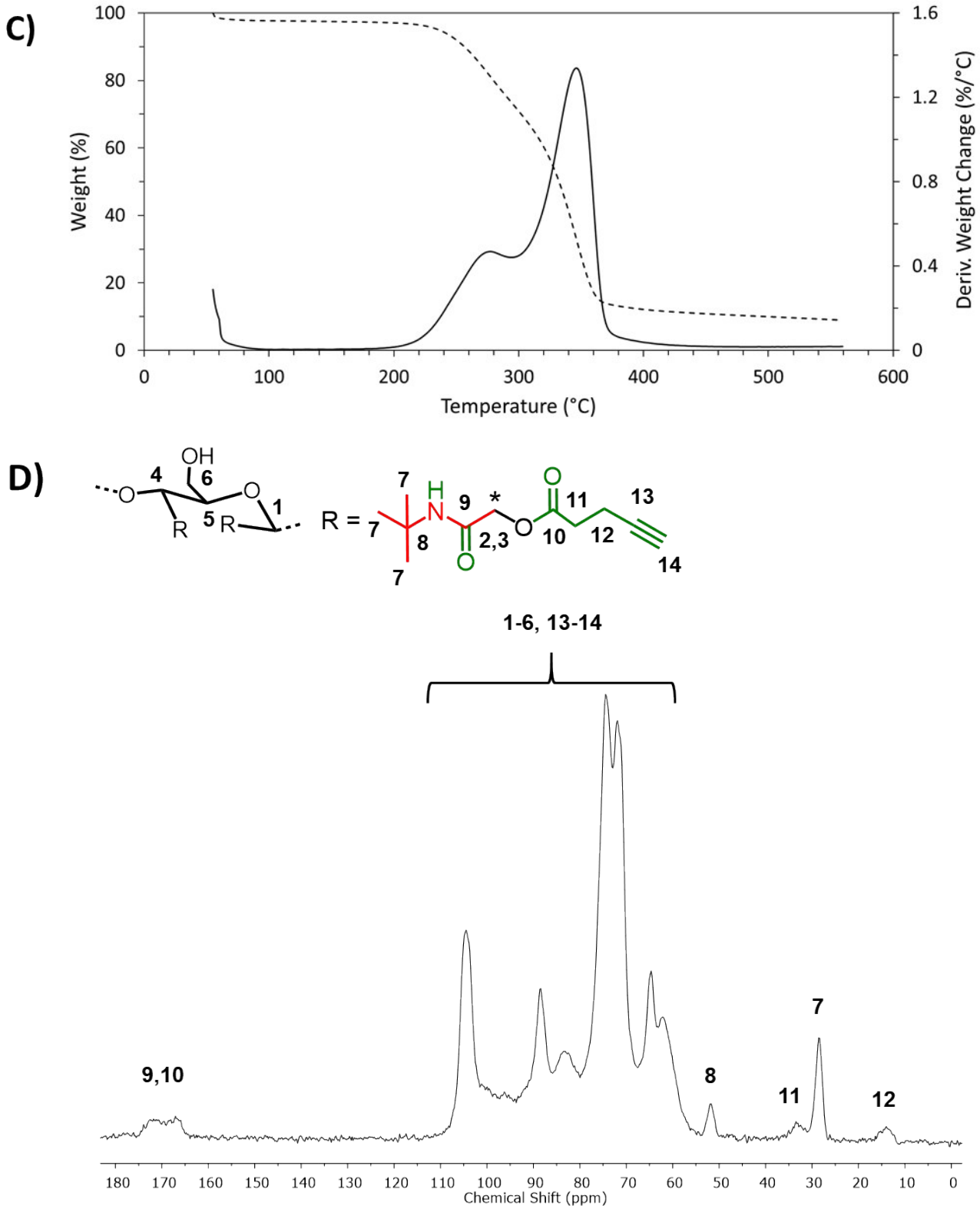
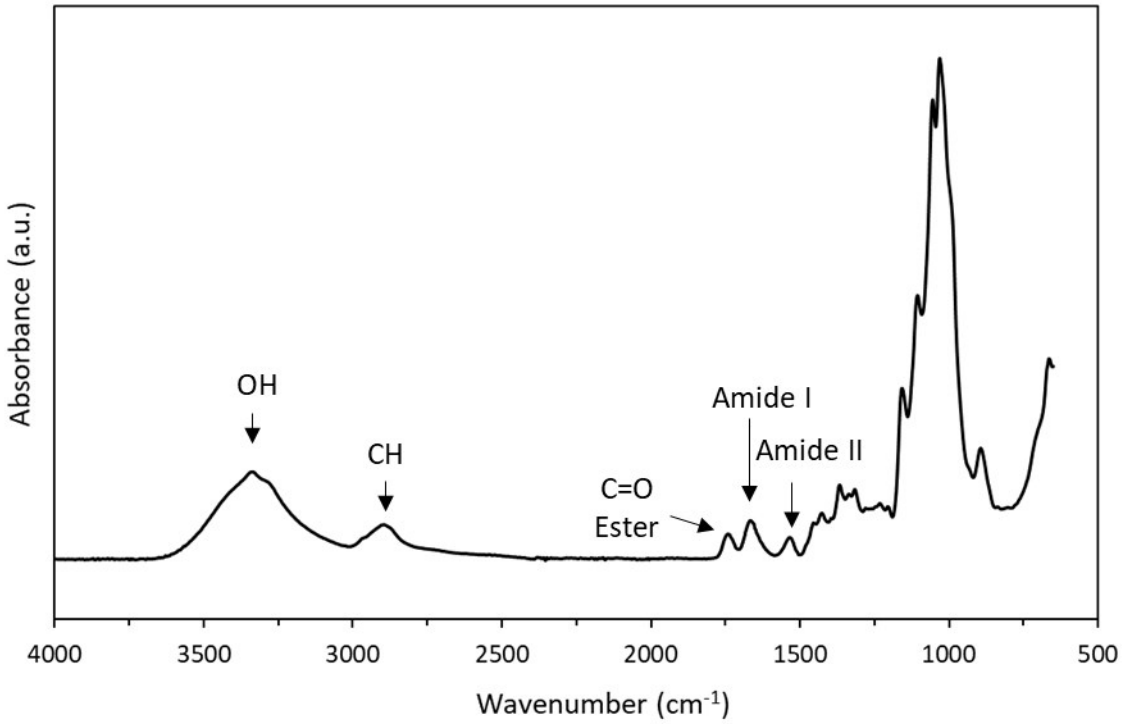
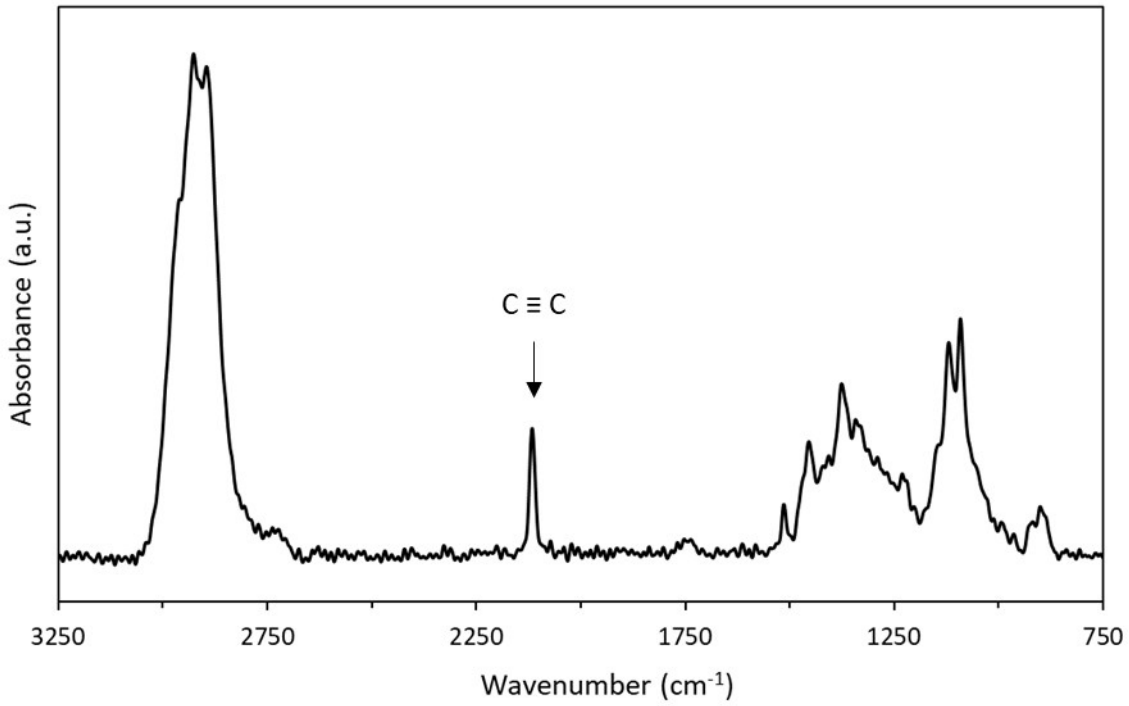


Fig. S3. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 1 (Table 1).

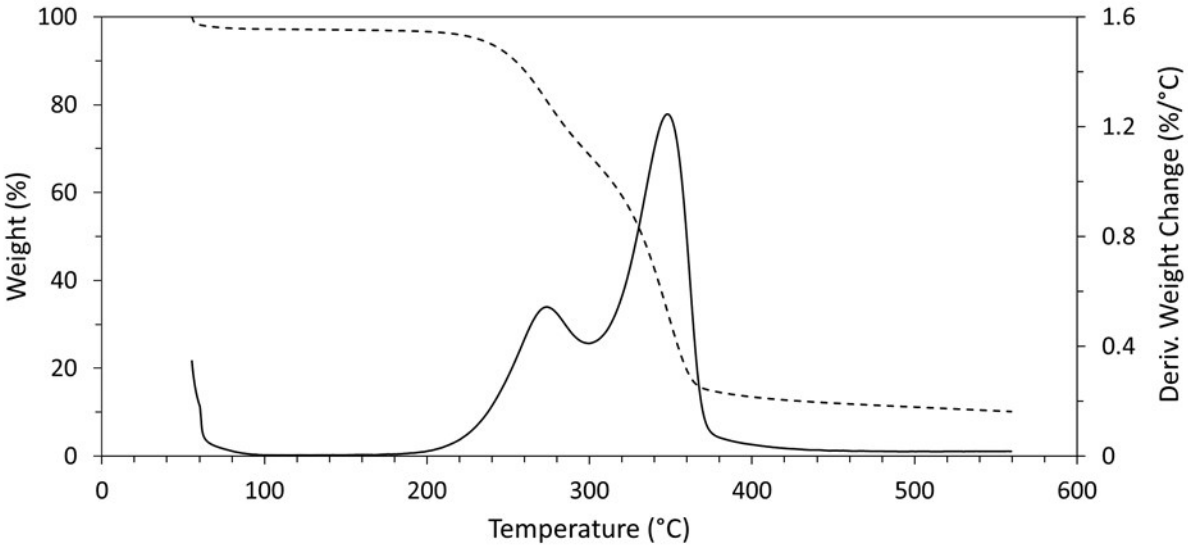
A)


Absorbance (a.u.)
OH
CH
C=O
Ester
Amide I
Amide II
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm-1)

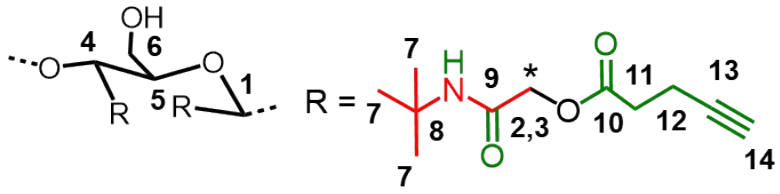
B)


Absorbance (a.u.)
C ≡ C
3250
2750
2250
1750
1250
750
Wavenumber (cm-1)

C)


Weight (%)
Deriv. Weight Change (%/°C)
Temperature (°C)
100
80
60
40
20
0
1.6
1.2
0.8
0.4
0
0
100
200
300
400
500
600

D)


OH
4
6
O
1
5
R
R =
7
H
N
9
*
11
13
7
8
2,3
10
12
14
7
O

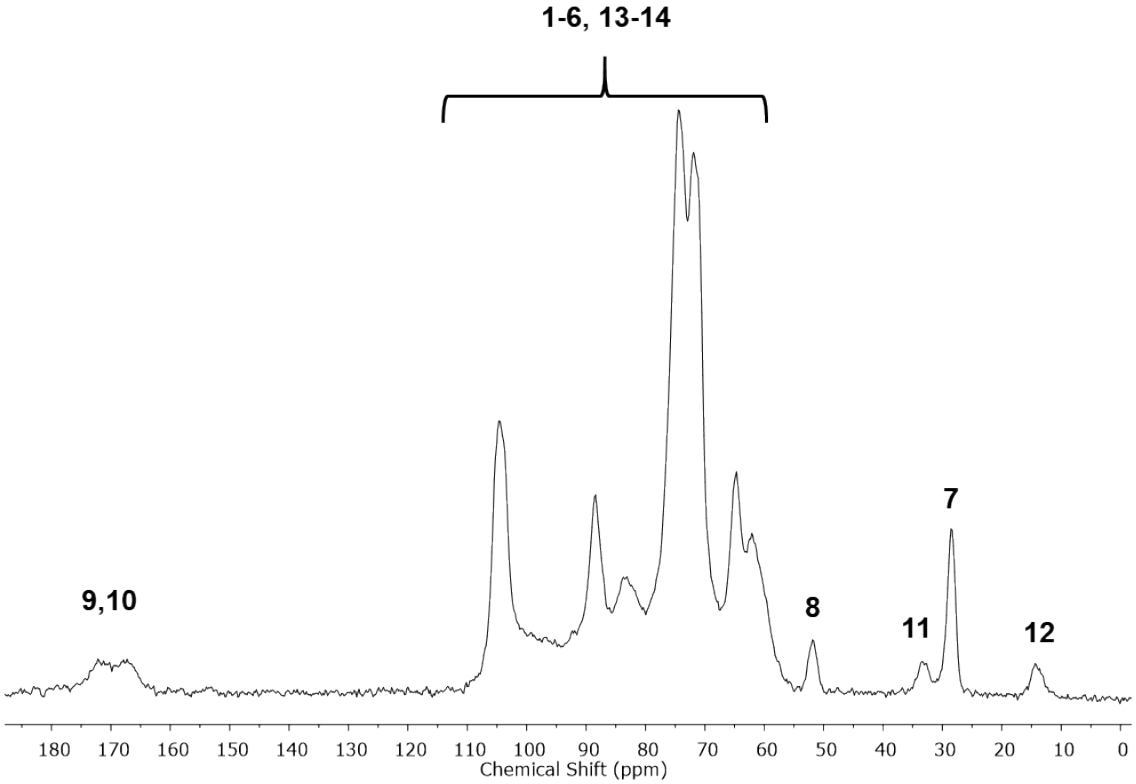
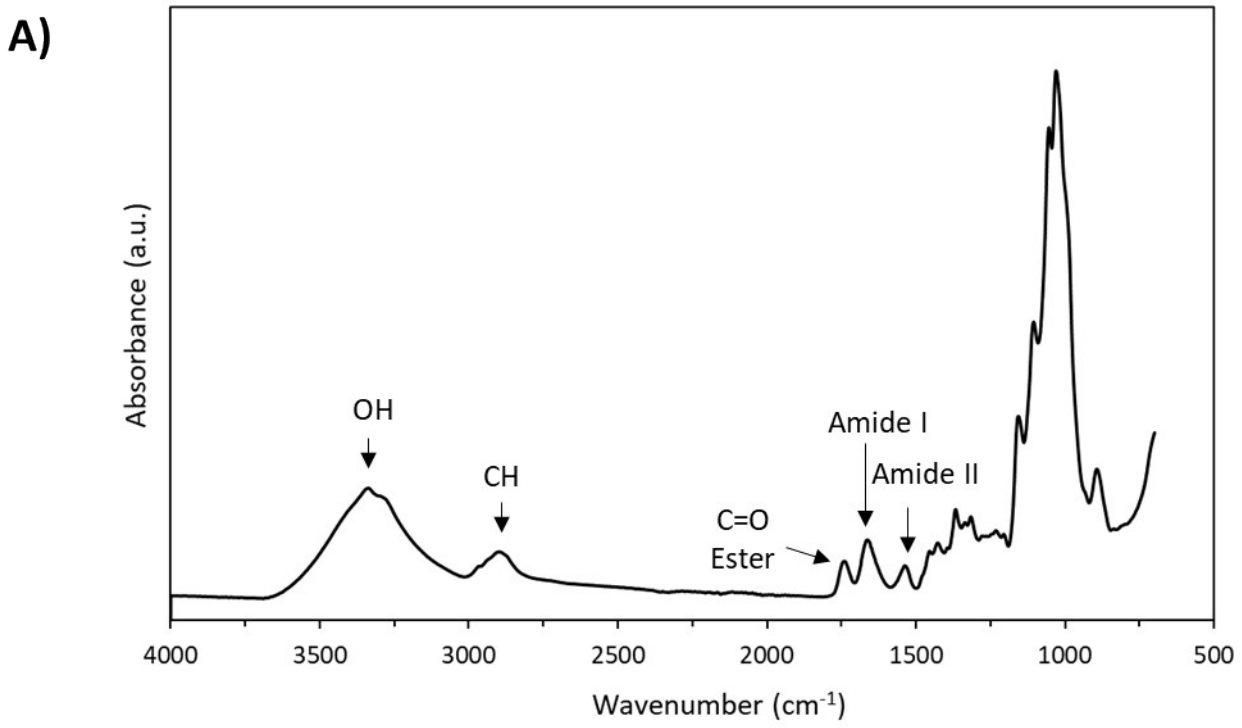
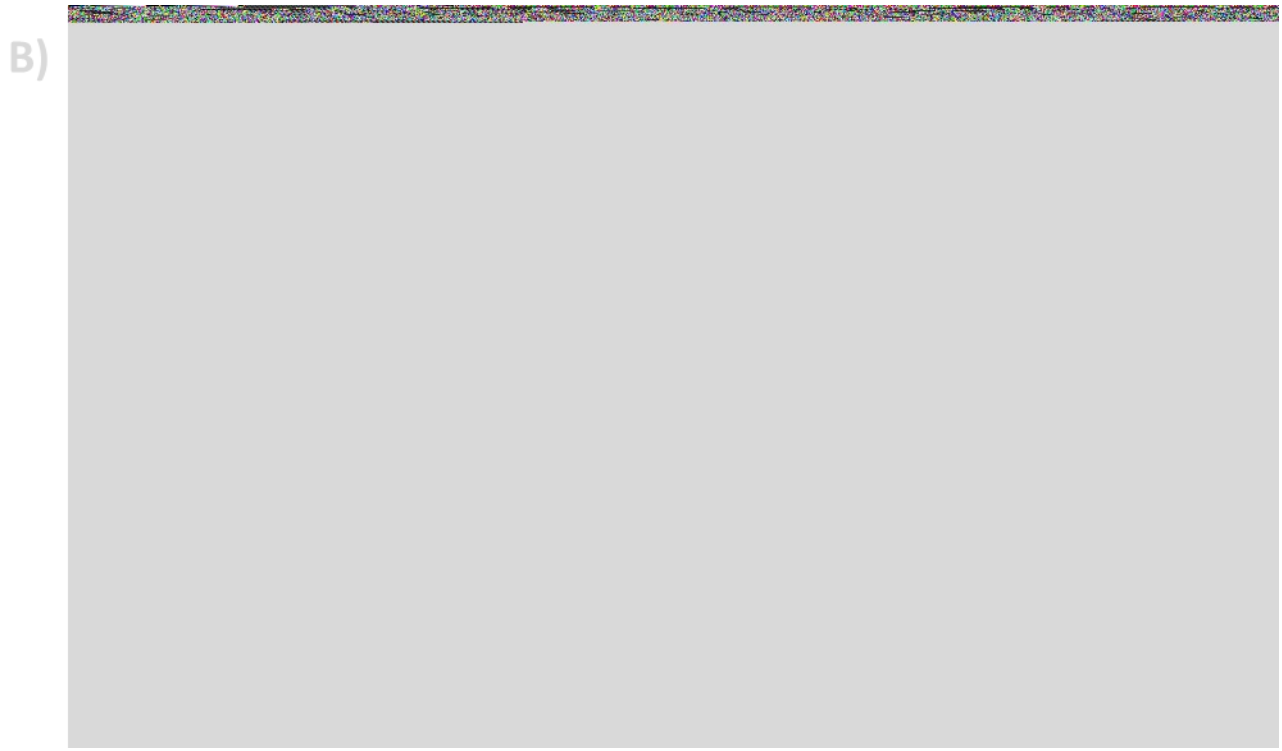
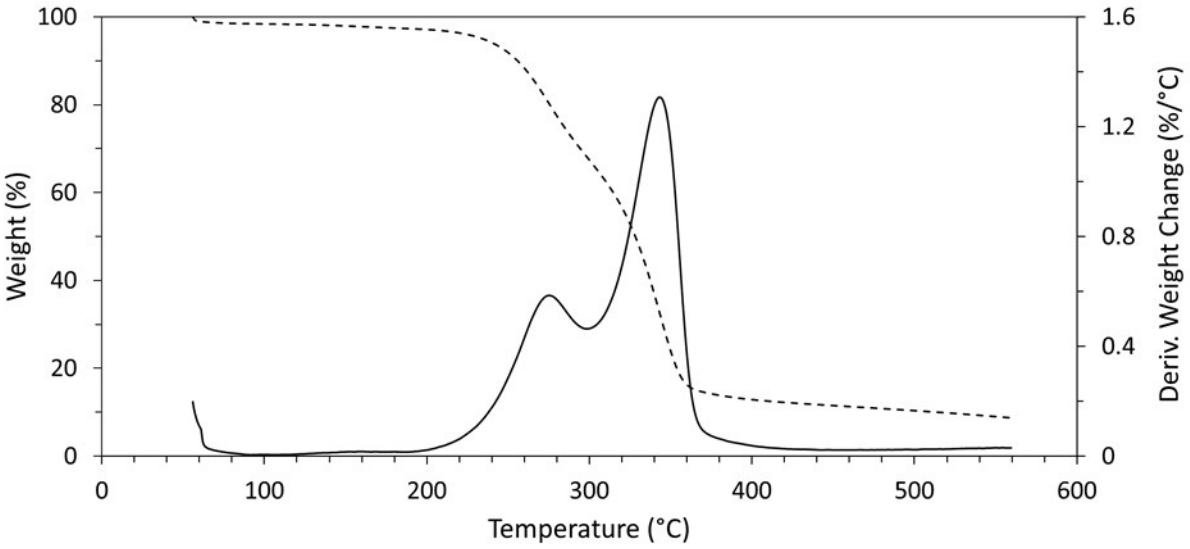

1-6, 13-14
9,10
8
11
7
12
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Chemical Shift (ppm)

Fig. S4. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 2 (Table 1).

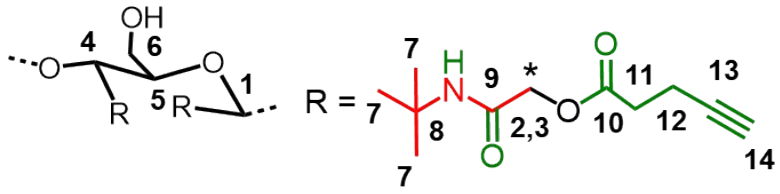




C)


Weight (%)
Deriv. Weight Change (%/°C)
Temperature (°C)
0
20
40
60
80
100
0
0.4
0.8
1.2
1.6
0
100
200
300
400
500
600

D)


OH
4
6
O
1
5
R
R =
7
H
N
9
*
11
13
7
8
2,3
10
12
14
7
O
O

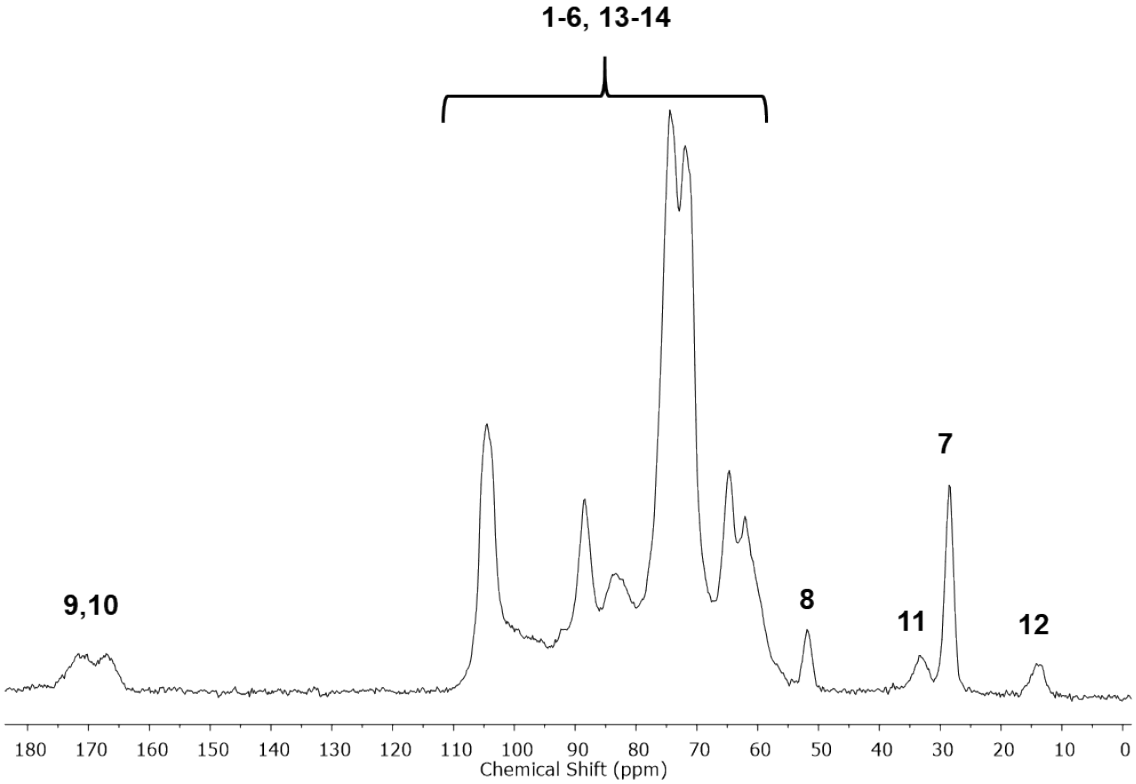
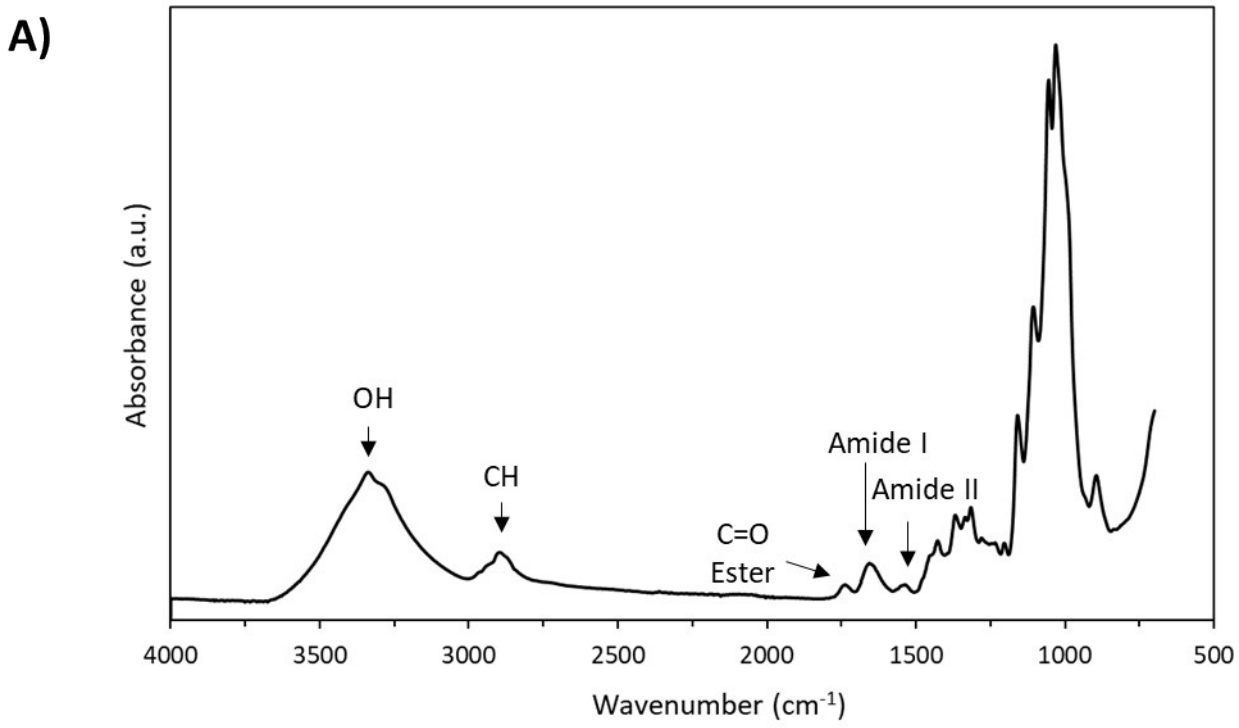
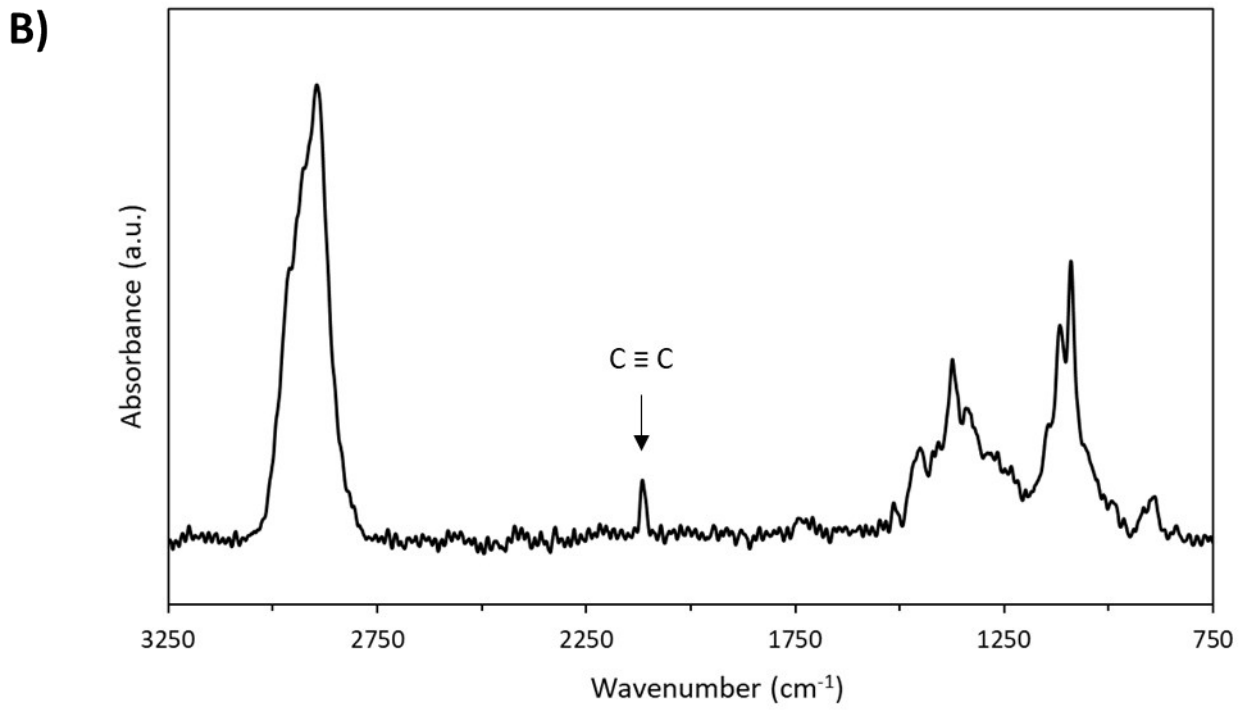

1-6, 13-14
9,10
8
11
7
12
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Chemical Shift (ppm)

Fig. S5. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 3 (Table 1).





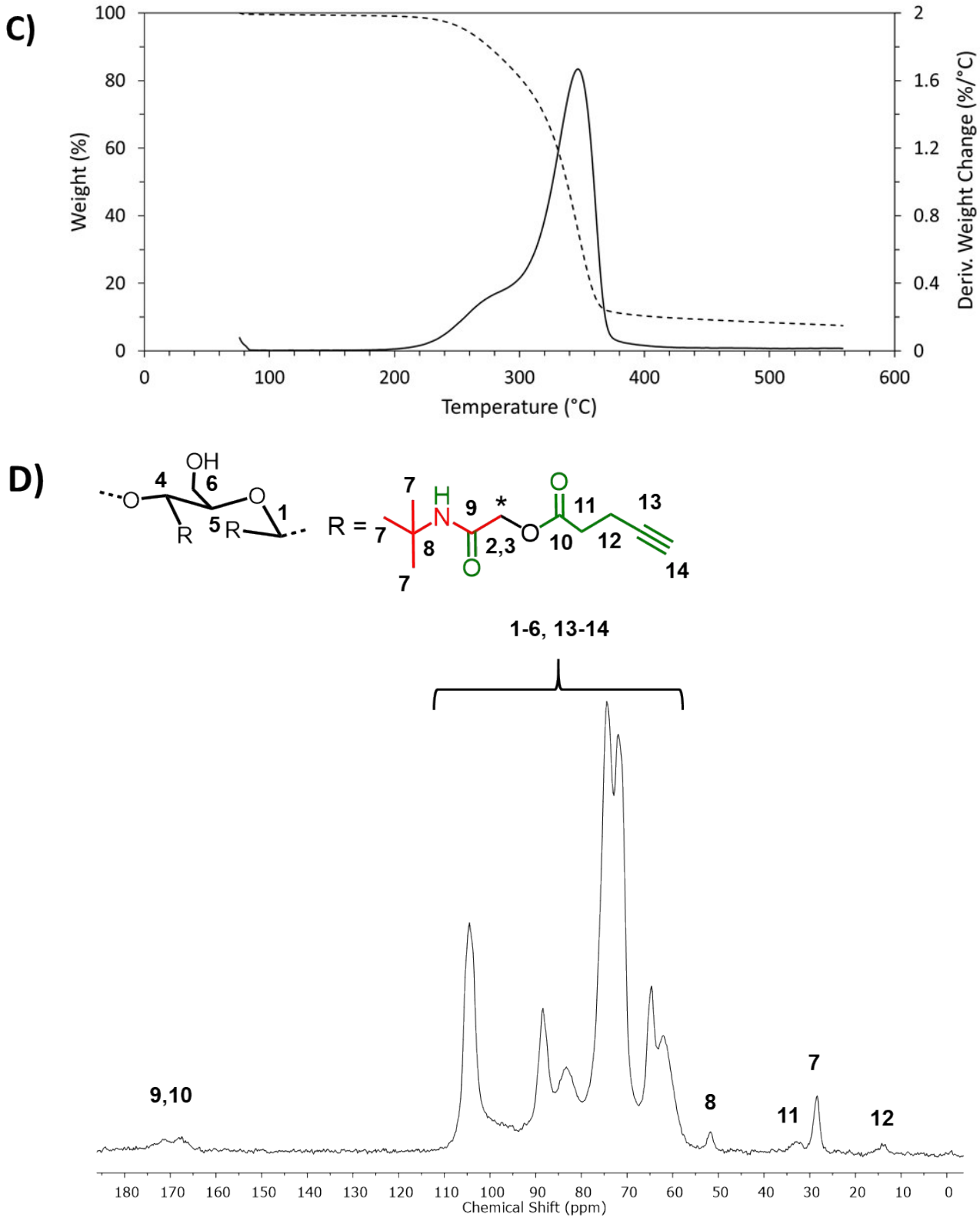
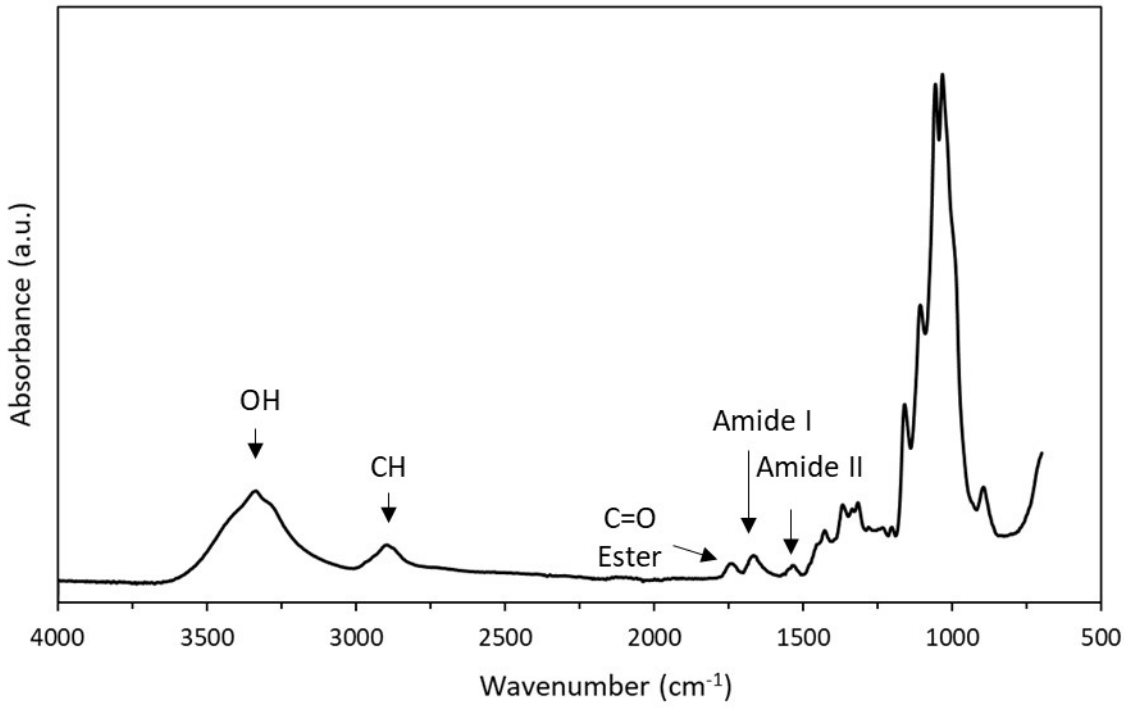
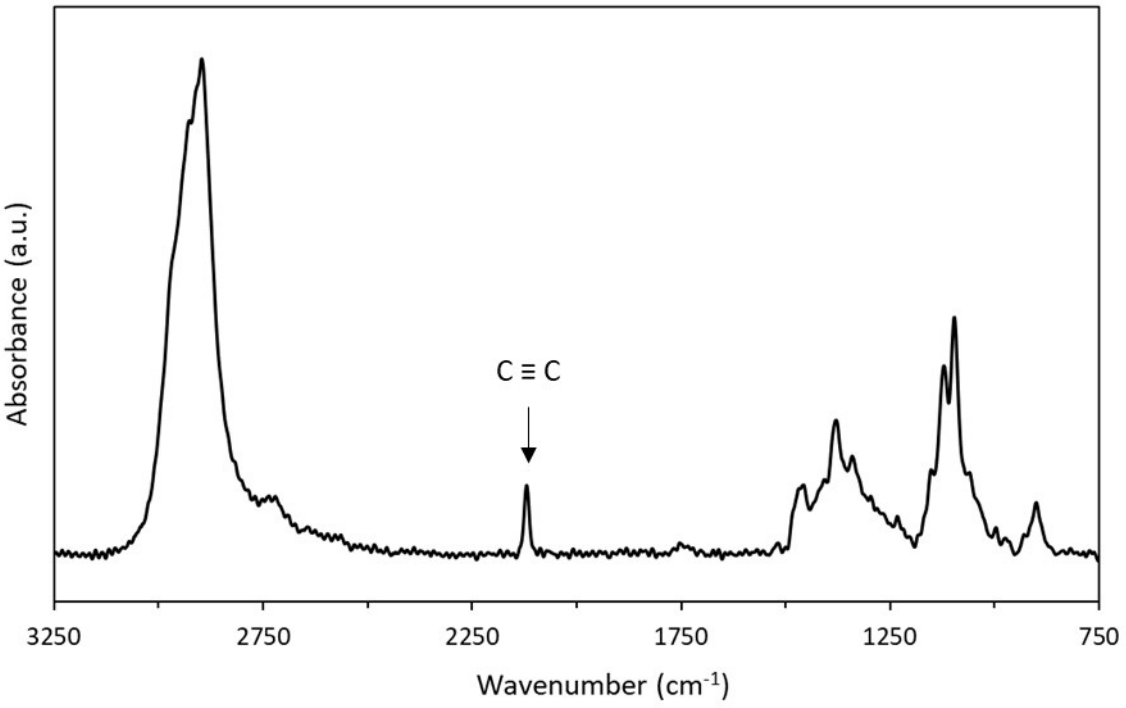


Fig. S6. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 5 (Table 1).

A)


Absorbance (a.u.)
OH
CH
C=O
Ester
Amide I
Amide II
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm-1)

B)


Absorbance (a.u.)
C ≡ C
3250
2750
2250
1750
1250
750
Wavenumber (cm-1)

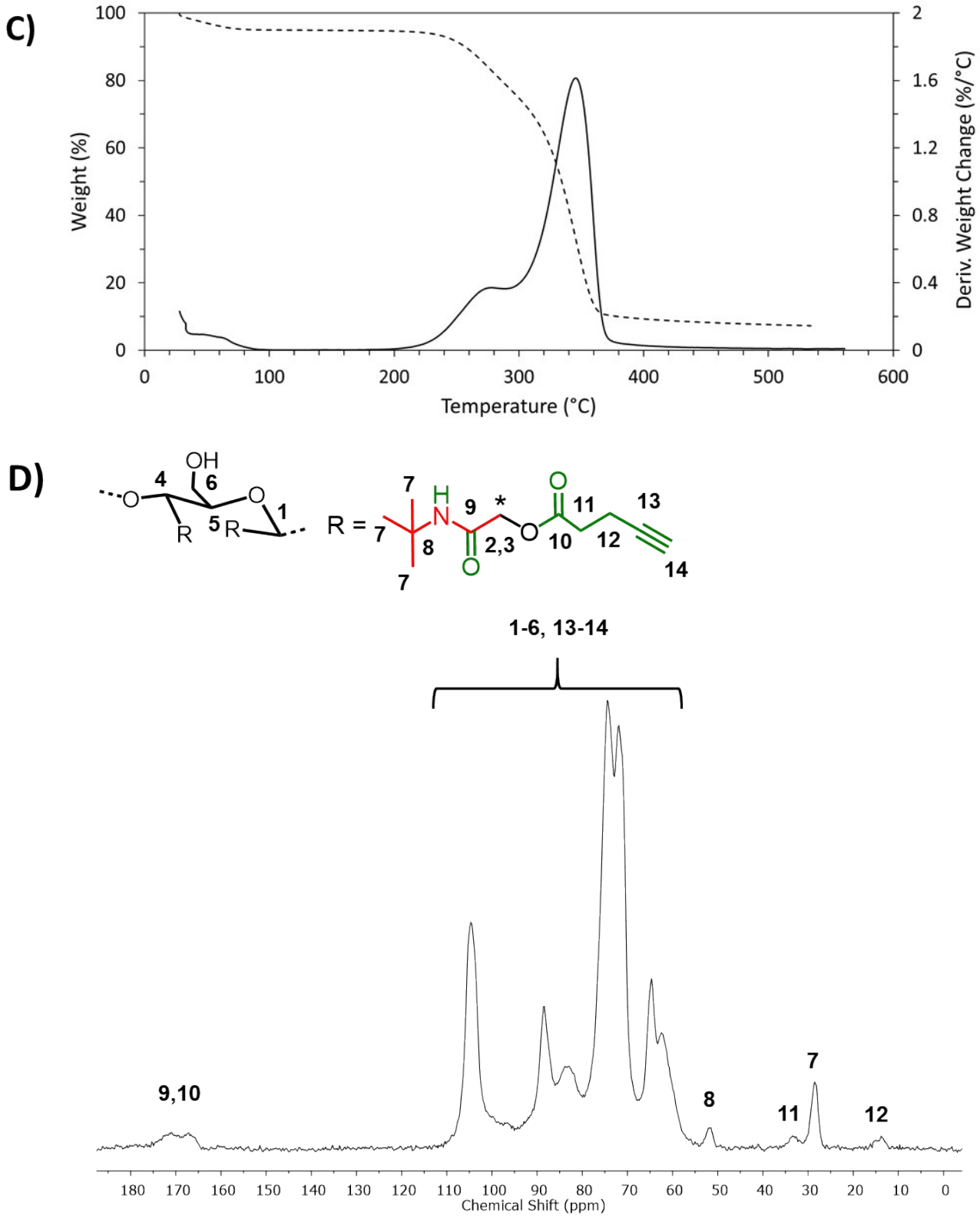
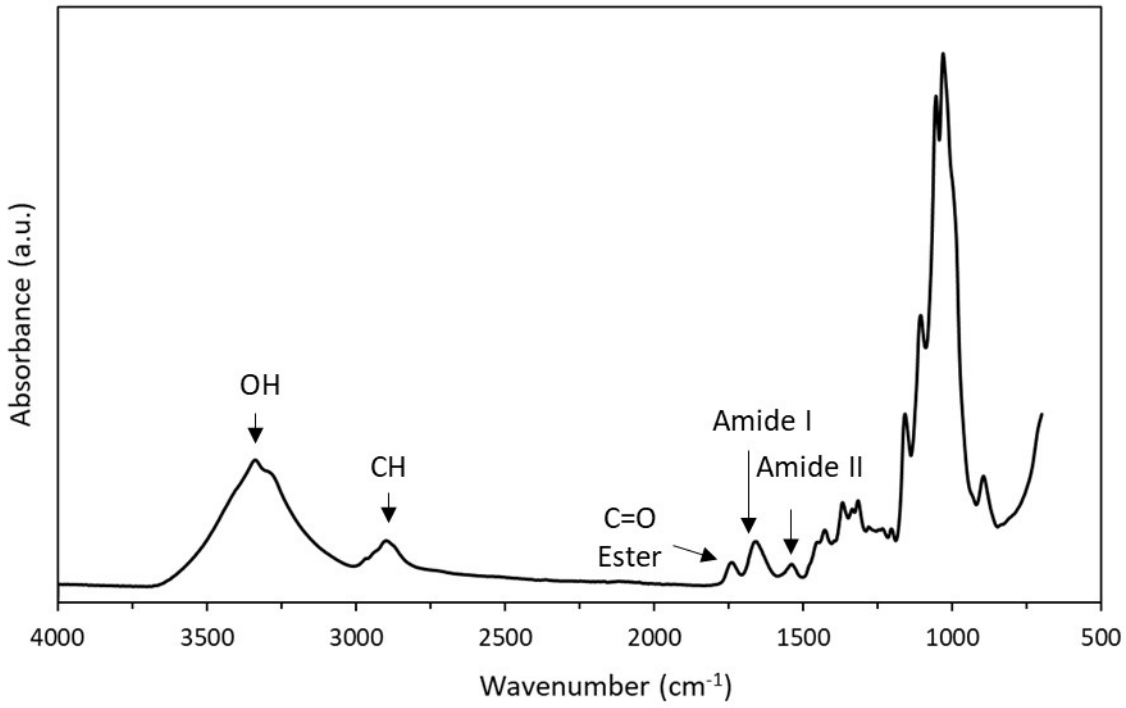
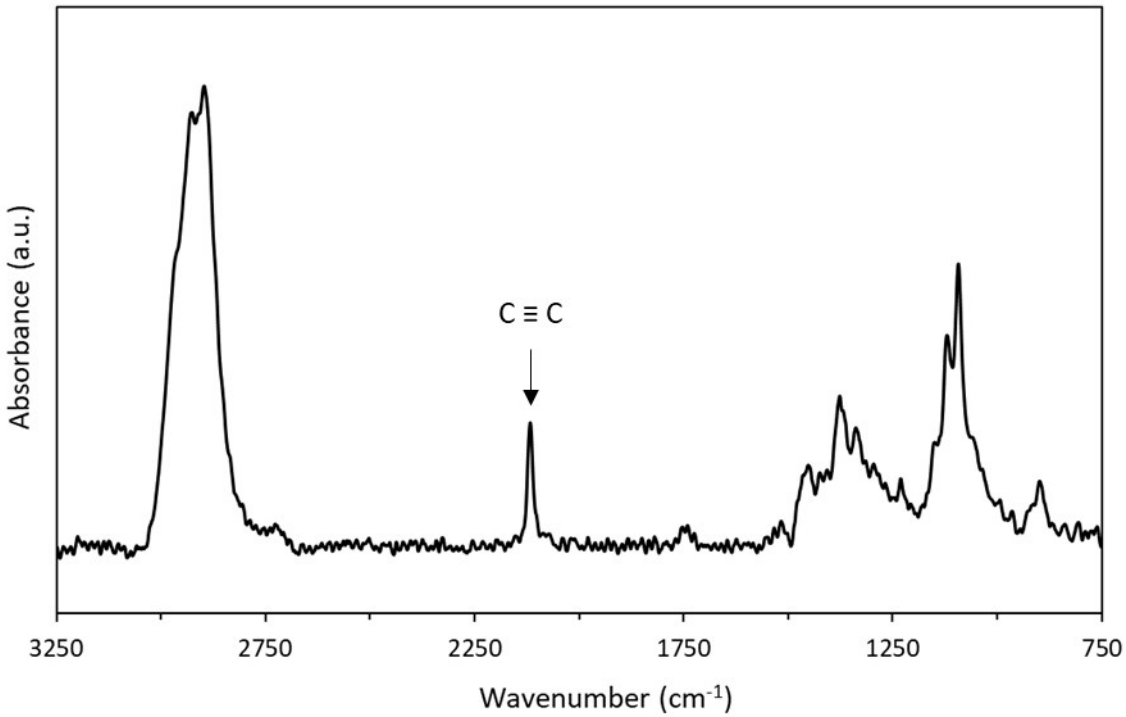


Fig. S7. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 6 (Table 1).

A)


Absorbance (a.u.)
OH
CH
C=O
Ester
Amide I
Amide II
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm-1)

B)


Absorbance (a.u.)
C ≡ C
3250
2750
2250
1750
1250
750
Wavenumber (cm-1)

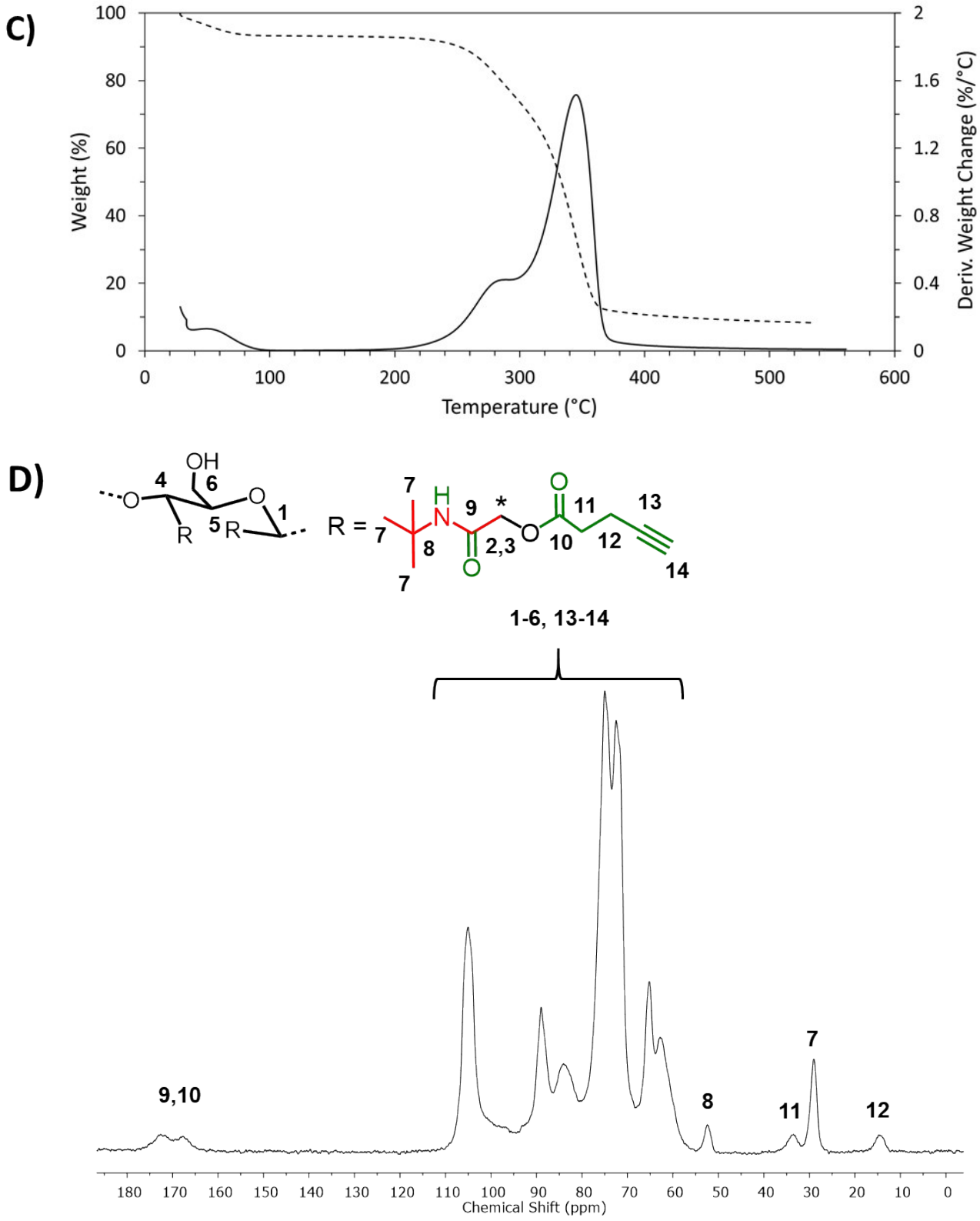
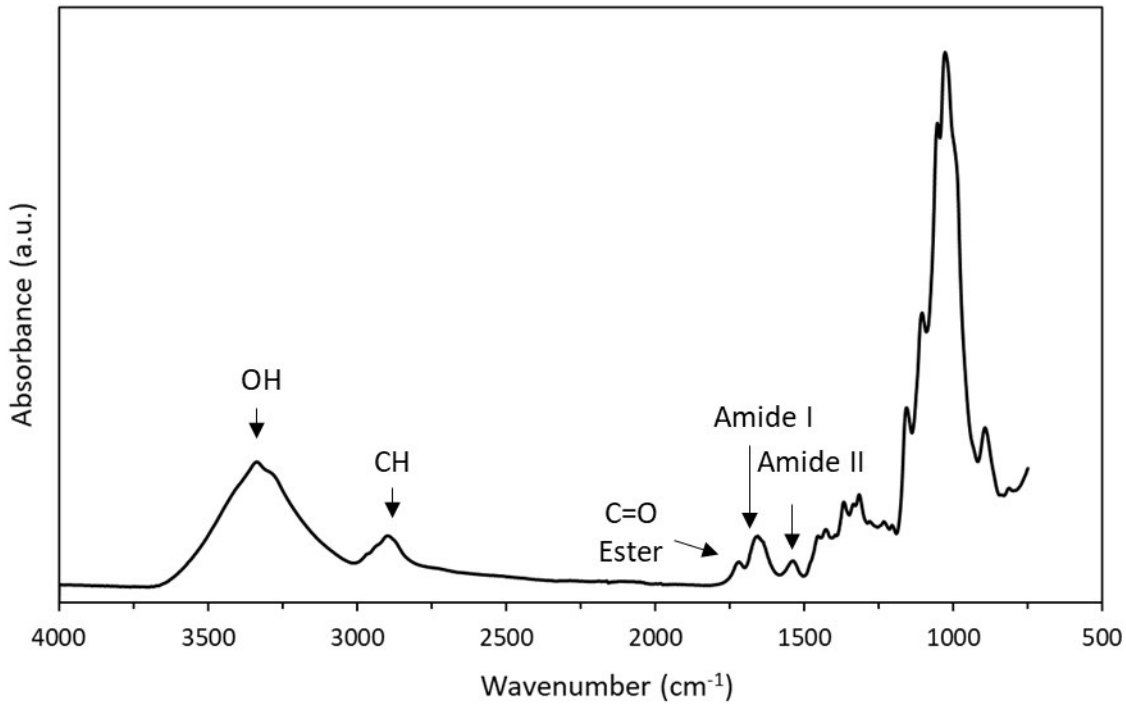
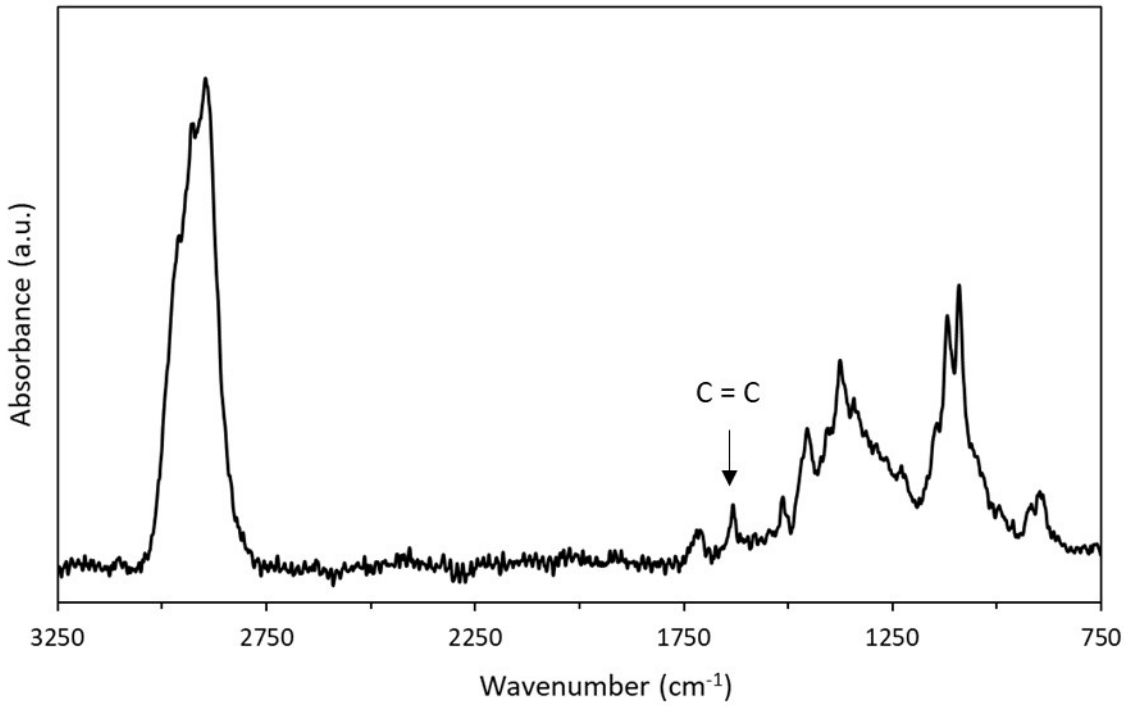


Fig. S8. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 7 (Table 1).

A)


Absorbance (a.u.)
OH
CH
C=O
Ester
Amide I
Amide II
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm-1)

B)


Absorbance (a.u.)
C = C
3250
2750
2250
1750
1250
750
Wavenumber (cm-1)

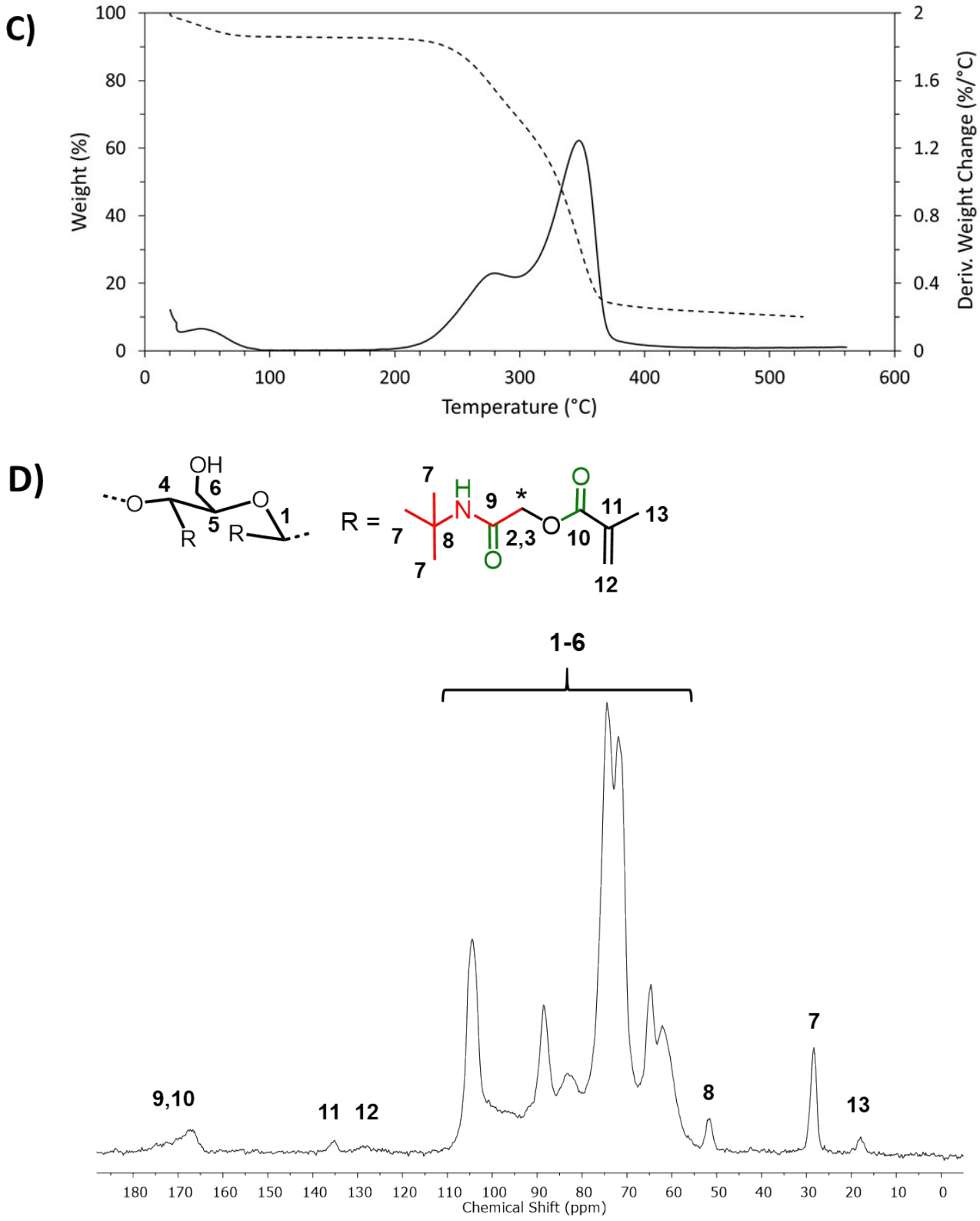
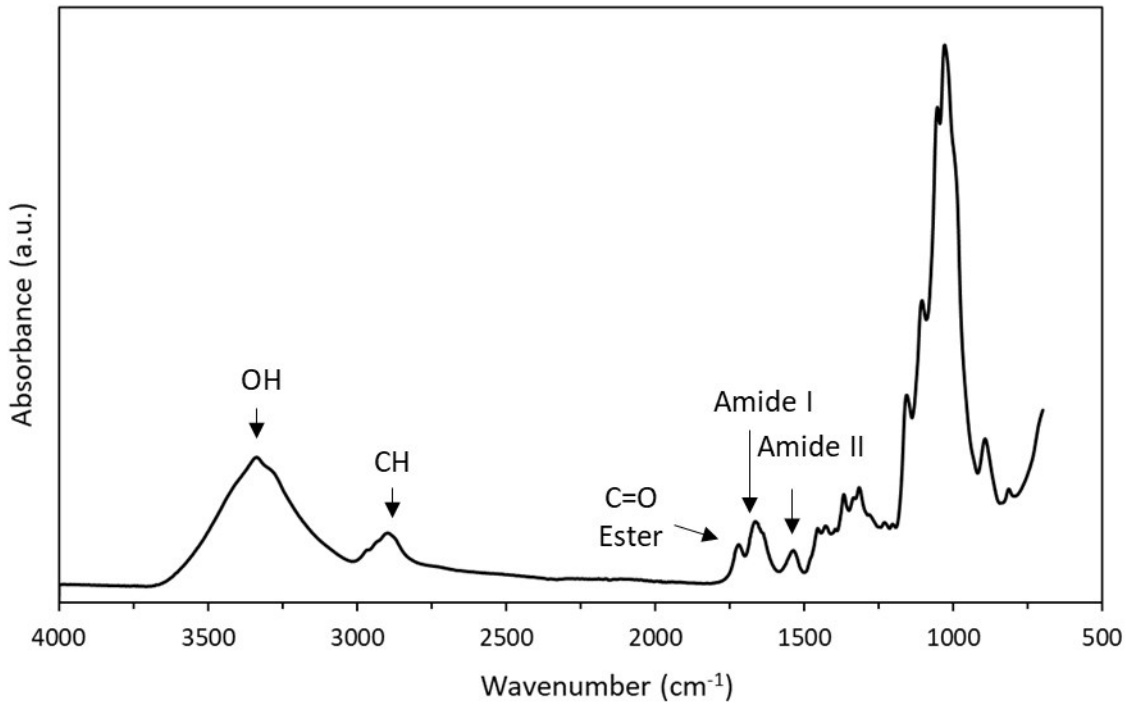
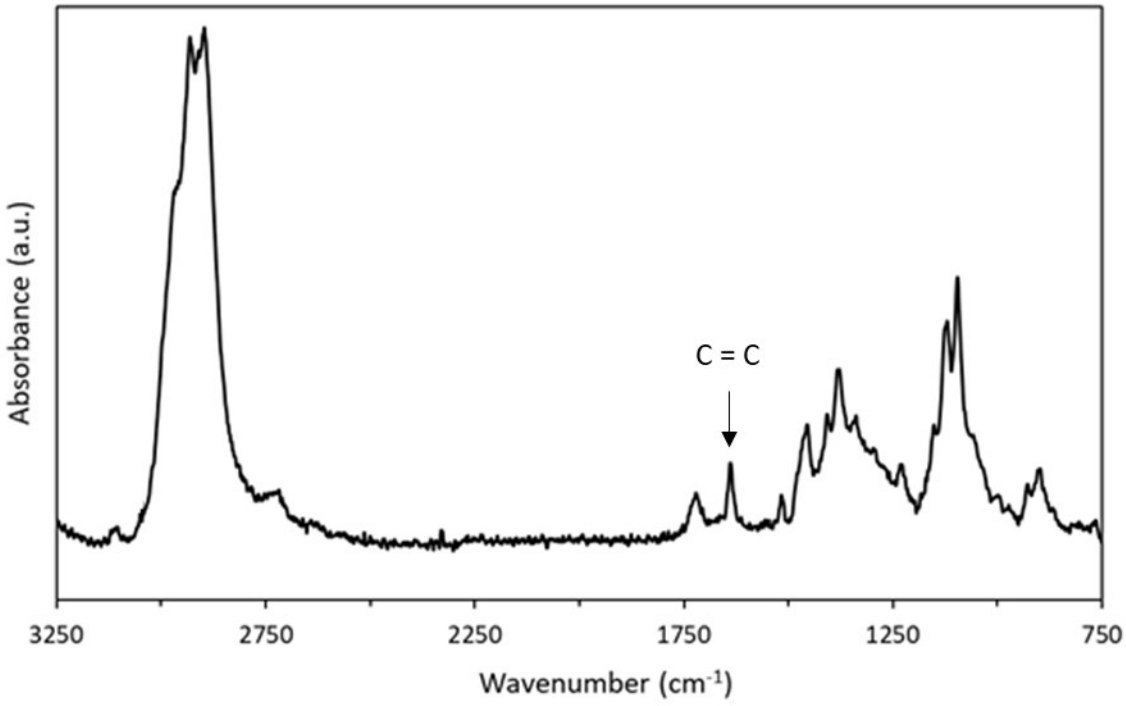


Fig. S9. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 8 (Table 1).

A)


Absorbance (a.u.)
OH
CH
C=O
Ester
Amide I
Amide II
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm-1)

B)


Absorbance (a.u.)
C = C
3250
2750
2250
1750
1250
750
Wavenumber (cm-1)

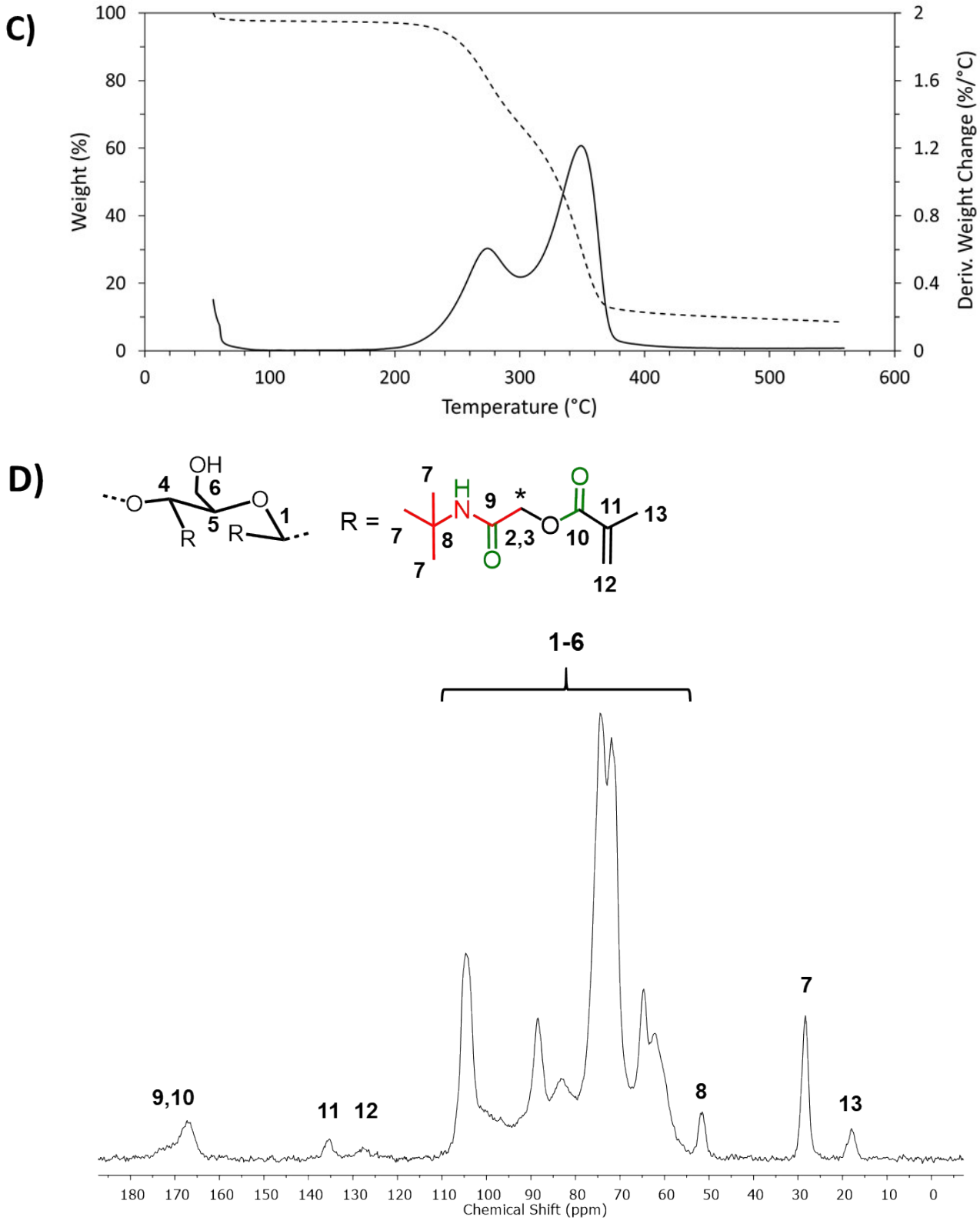
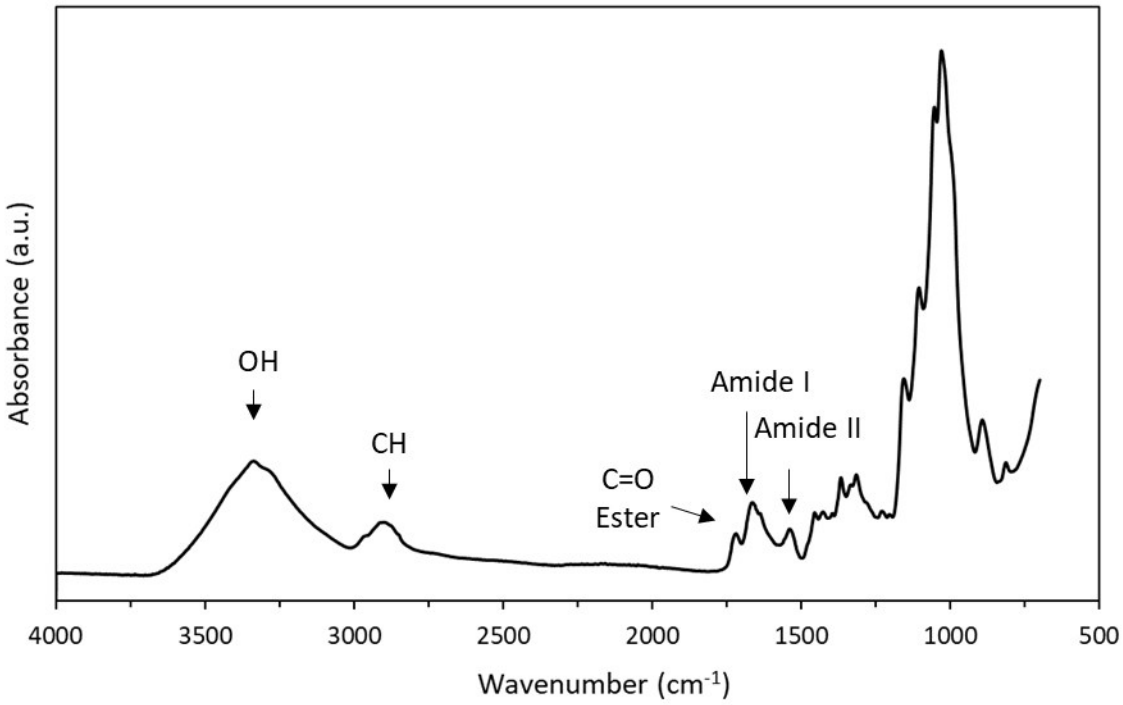
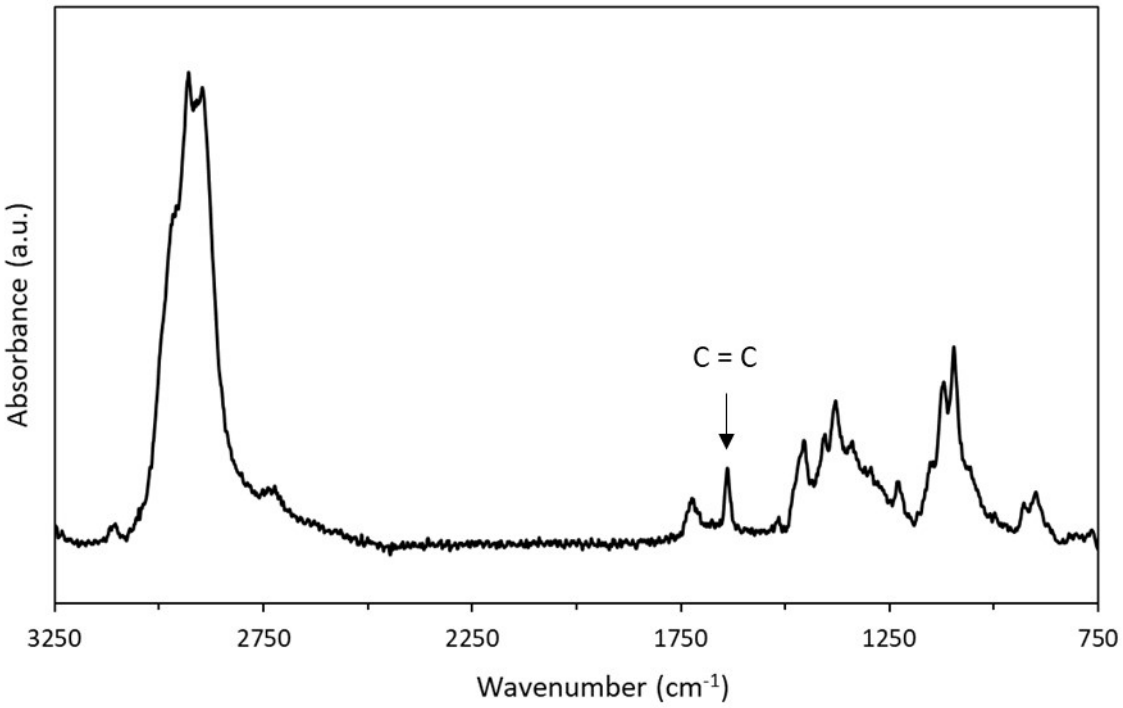


Fig. S10. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 9 (Table 1).

A)

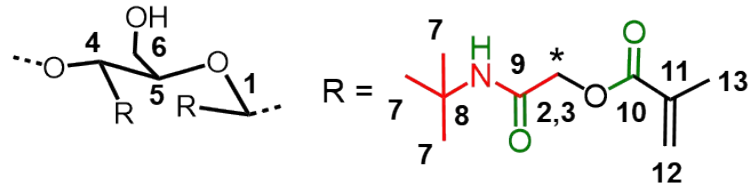

Absorbance (a.u.)
OH
CH
C=O
Ester
Amide I
Amide II
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm-1)

B)


Absorbance (a.u.)
C = C
3250
2750
2250
1750
1250
750
Wavenumber (cm-1)

C)

D)



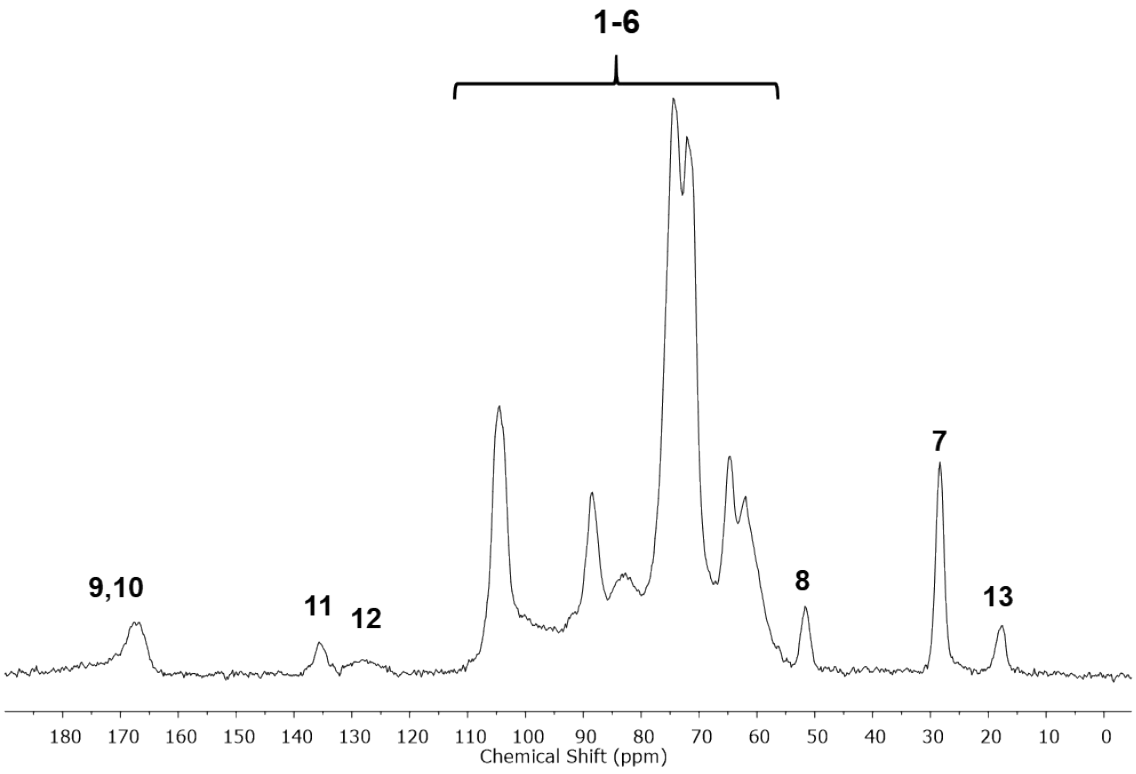
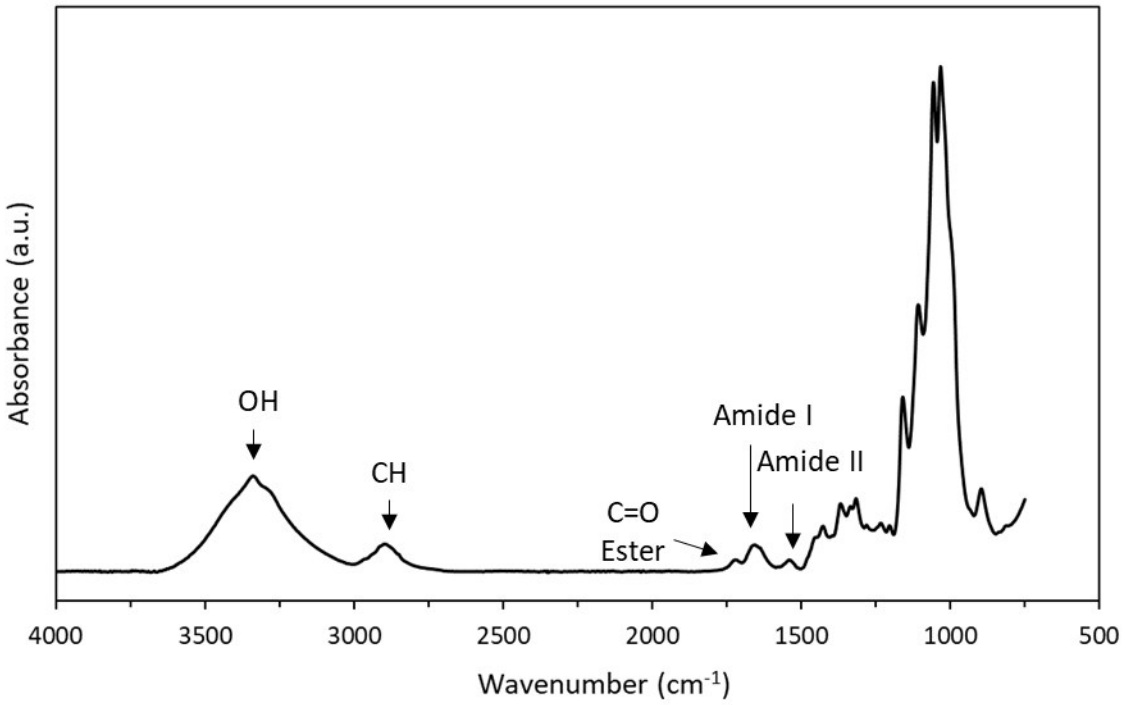
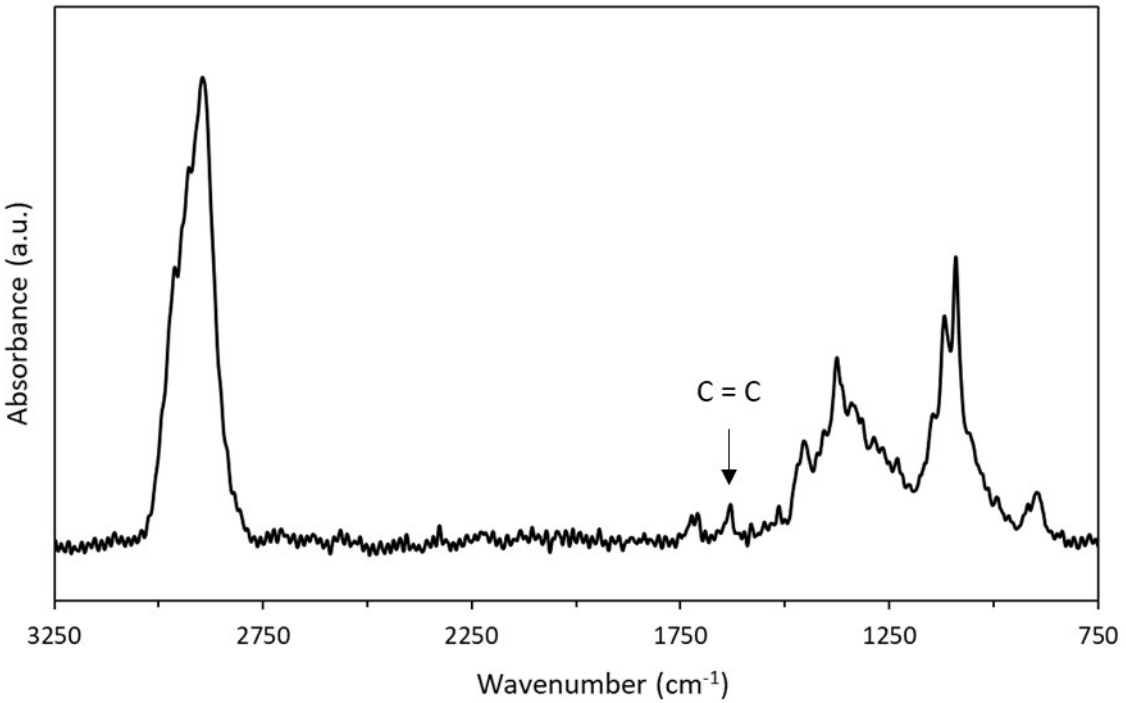


Fig. S11. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 10 (Table 1).

A)


Absorbance (a.u.)
OH
CH
C=O
Ester
Amide I
Amide II
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm-1)

B)


Absorbance (a.u.)
C = C
3250
2750
2250
1750
1250
750
Wavenumber (cm-1)

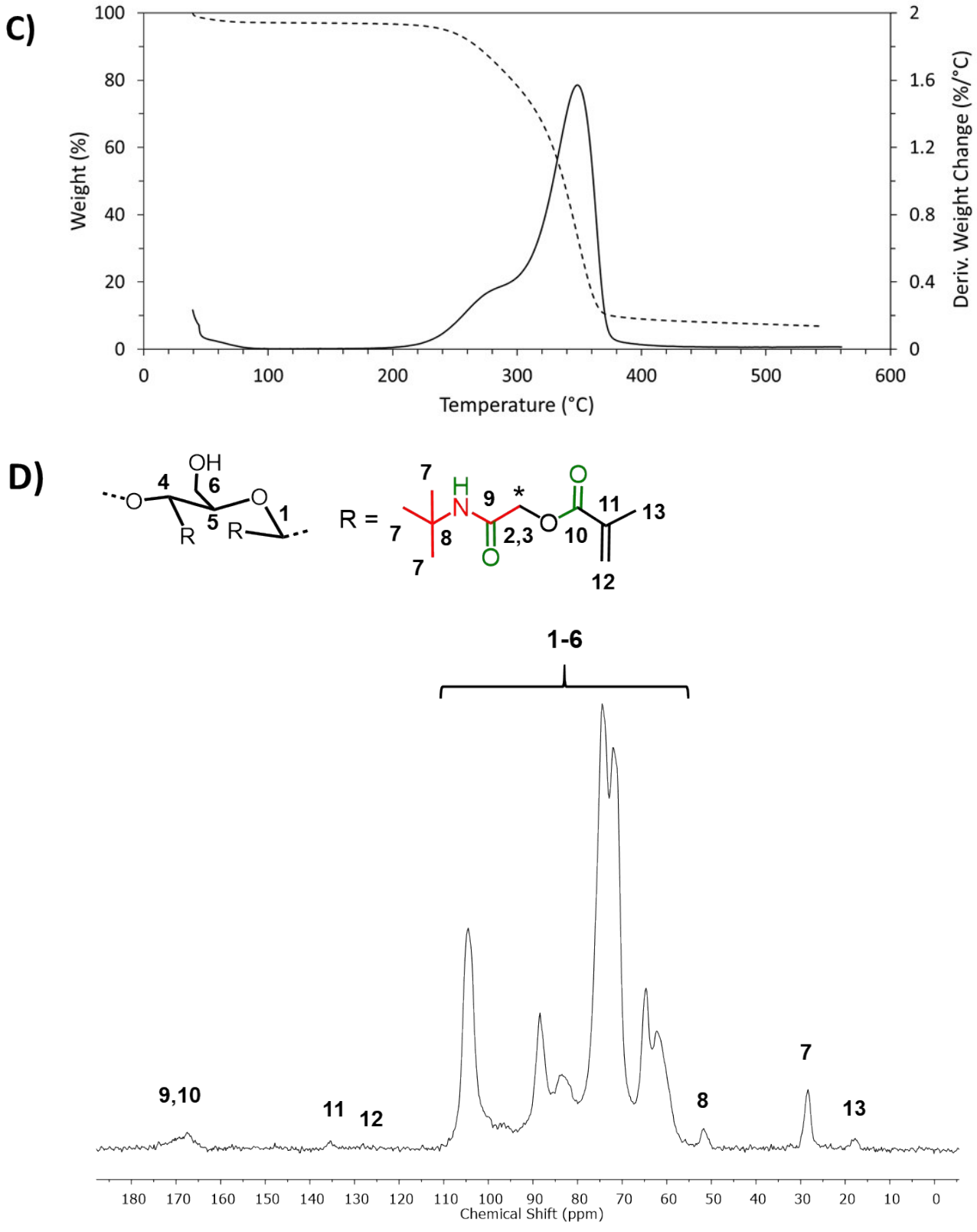
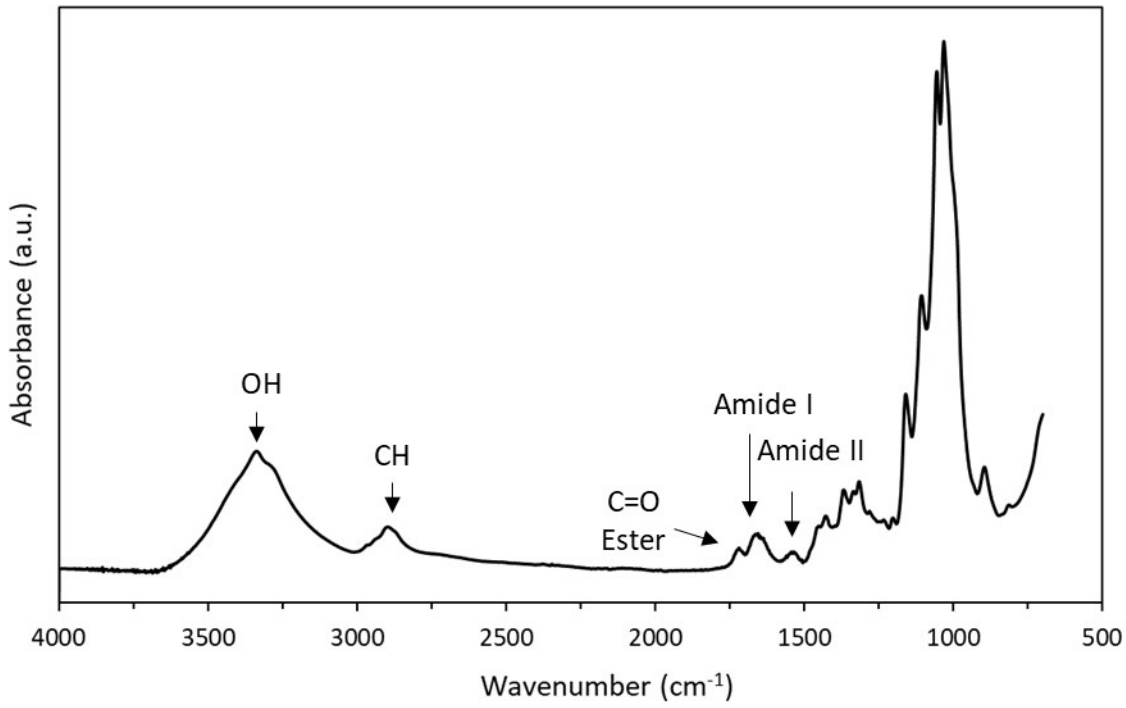
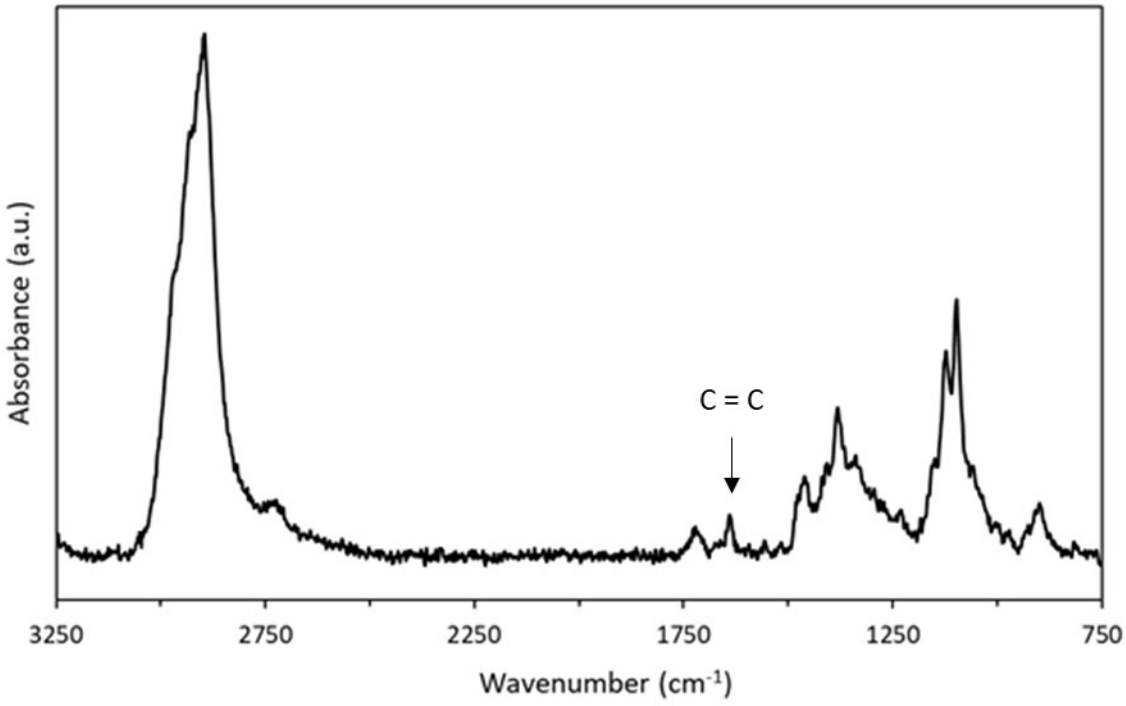


Fig. S12. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 12 (Table 1).

A)


Absorbance (a.u.)
OH
CH
C=O
Ester
Amide I
Amide II
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm-1)

B)


Absorbance (a.u.)
C = C
3250
2750
2250
1750
1250
750
Wavenumber (cm-1)

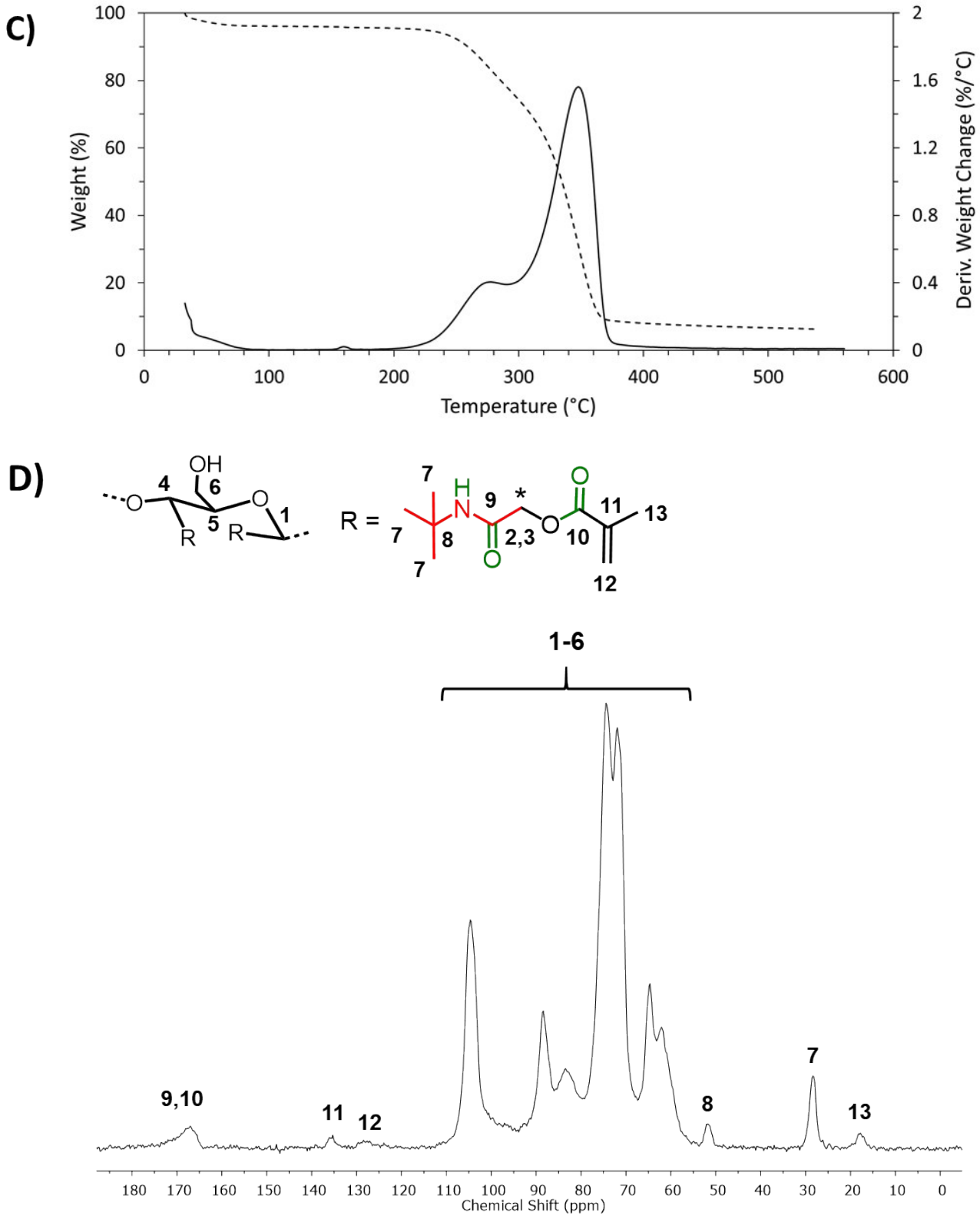
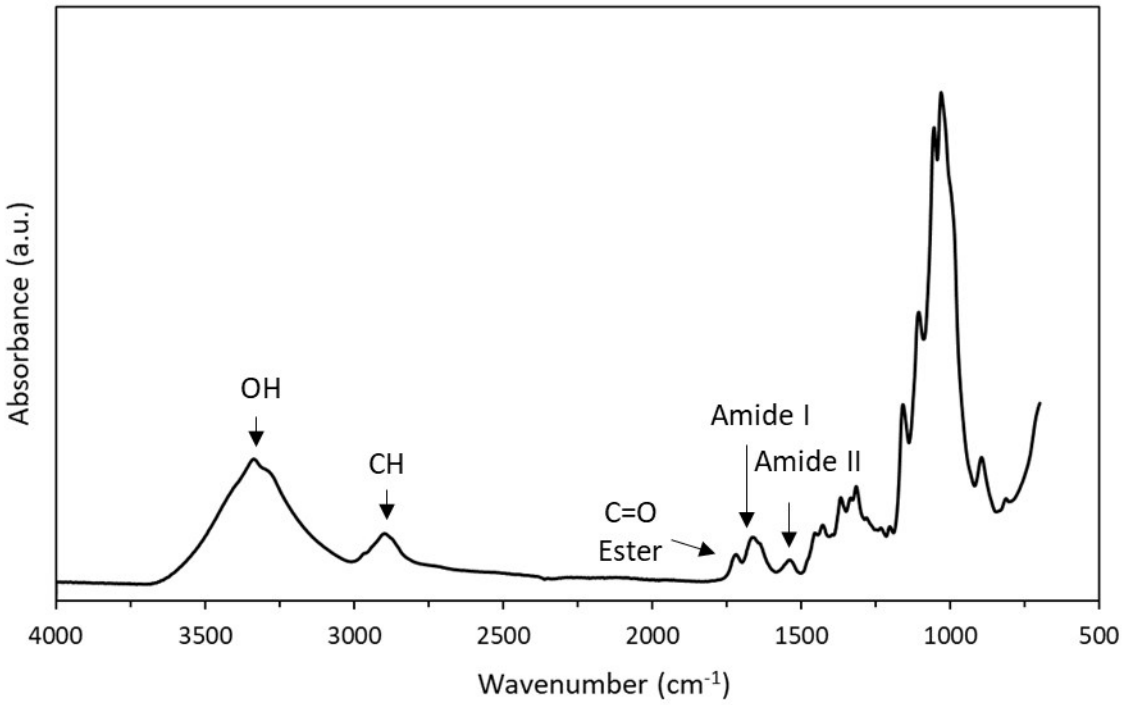
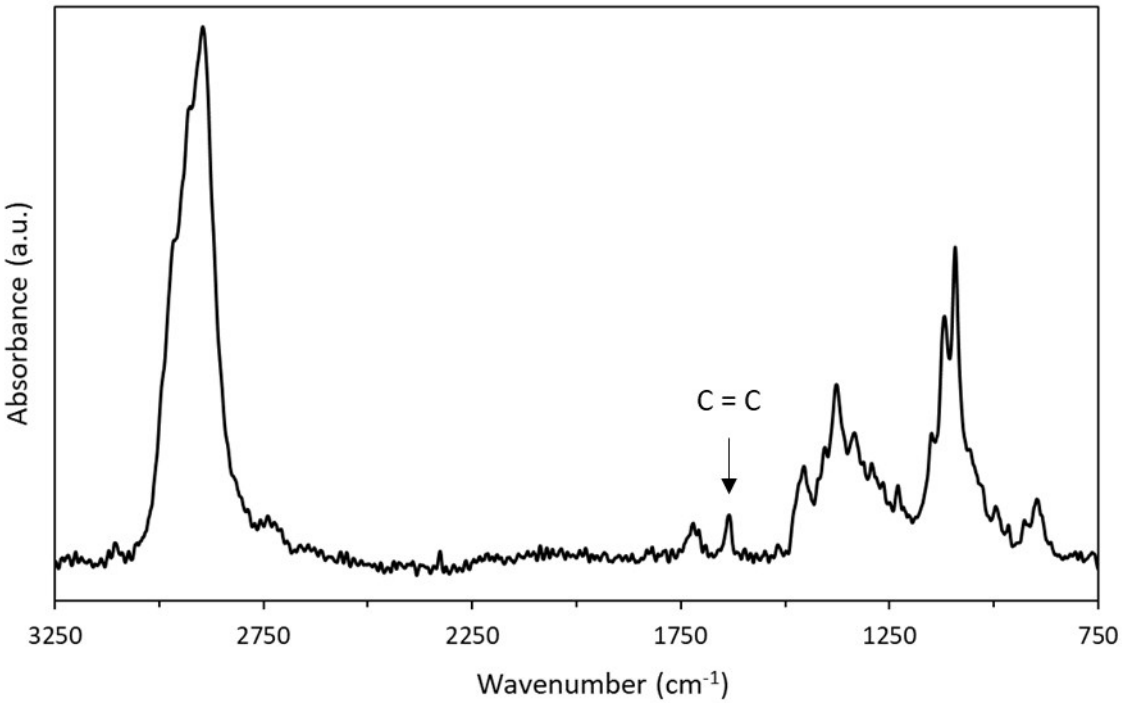


Fig. S13. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 13 (Table 1).

A)


Absorbance (a.u.)
OH
CH
C=O
Ester
Amide I
Amide II
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm-1)

B)


Absorbance (a.u.)
C = C
3250
2750
2250
1750
1250
750
Wavenumber (cm-1)

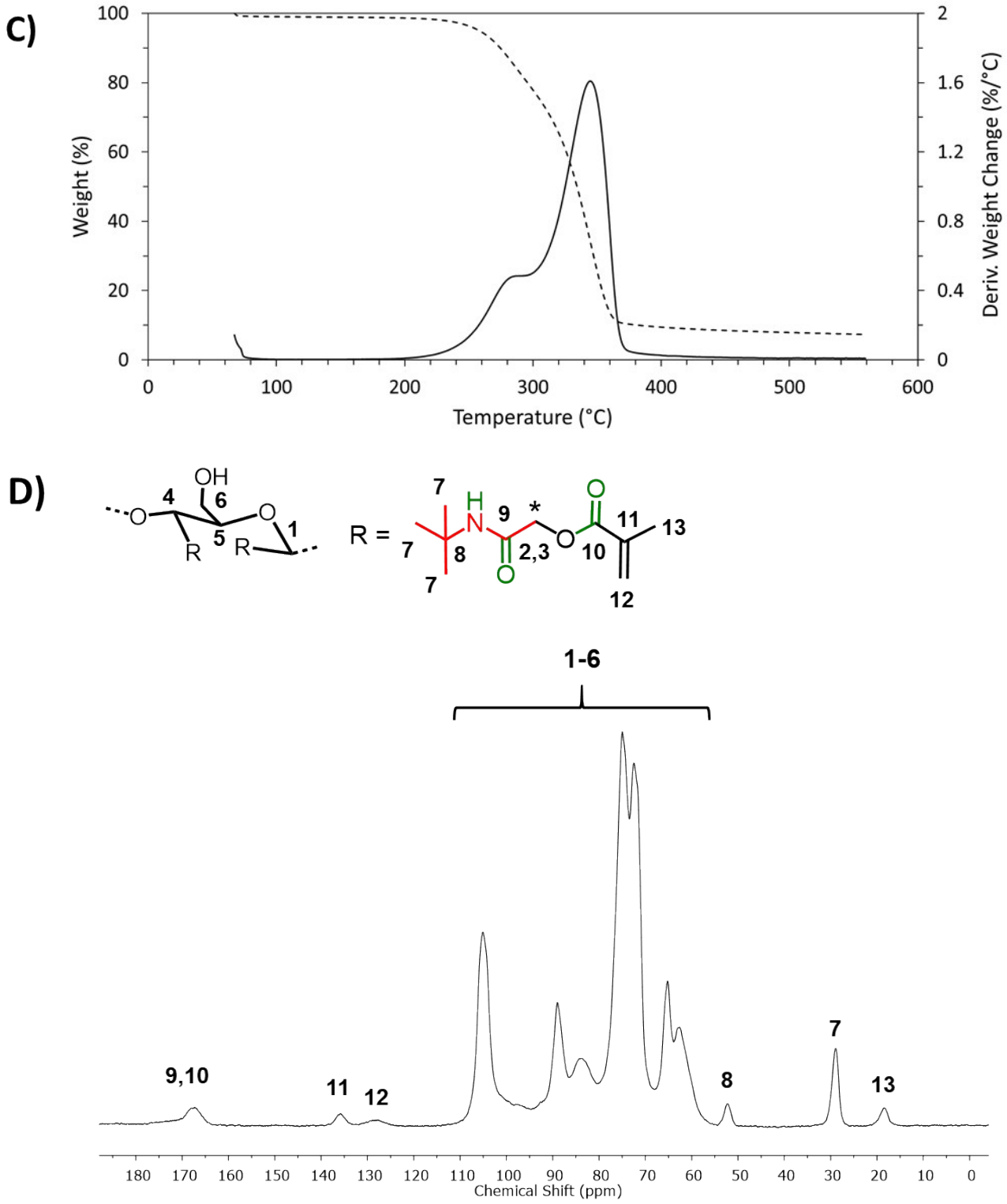


Fig. S14. A) ATR-IR, B) Raman, C) TGA and D) ^{13}C CP-MAS of Entry 14 (Table 1).

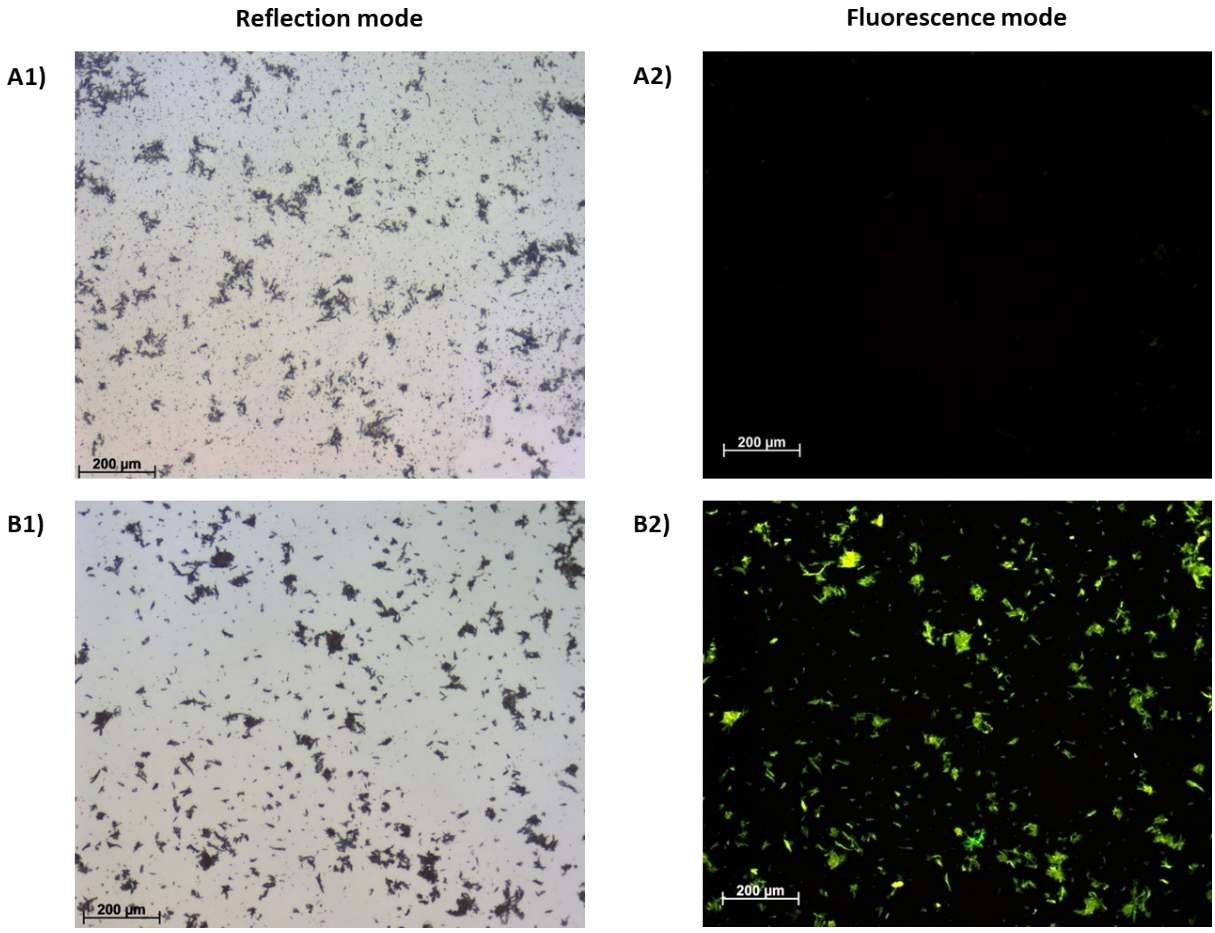


Fig. S15. Microscopy images of POC0.34-Control (A1 and B2) and POC0.34-Fluo (B1 and B2), in reflection and fluorescence mode.