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SUPPORTING INFORMATION

Augmentation of the Productivity in Olefin Cross-Metathesis: Maleic Acid does the Trick!

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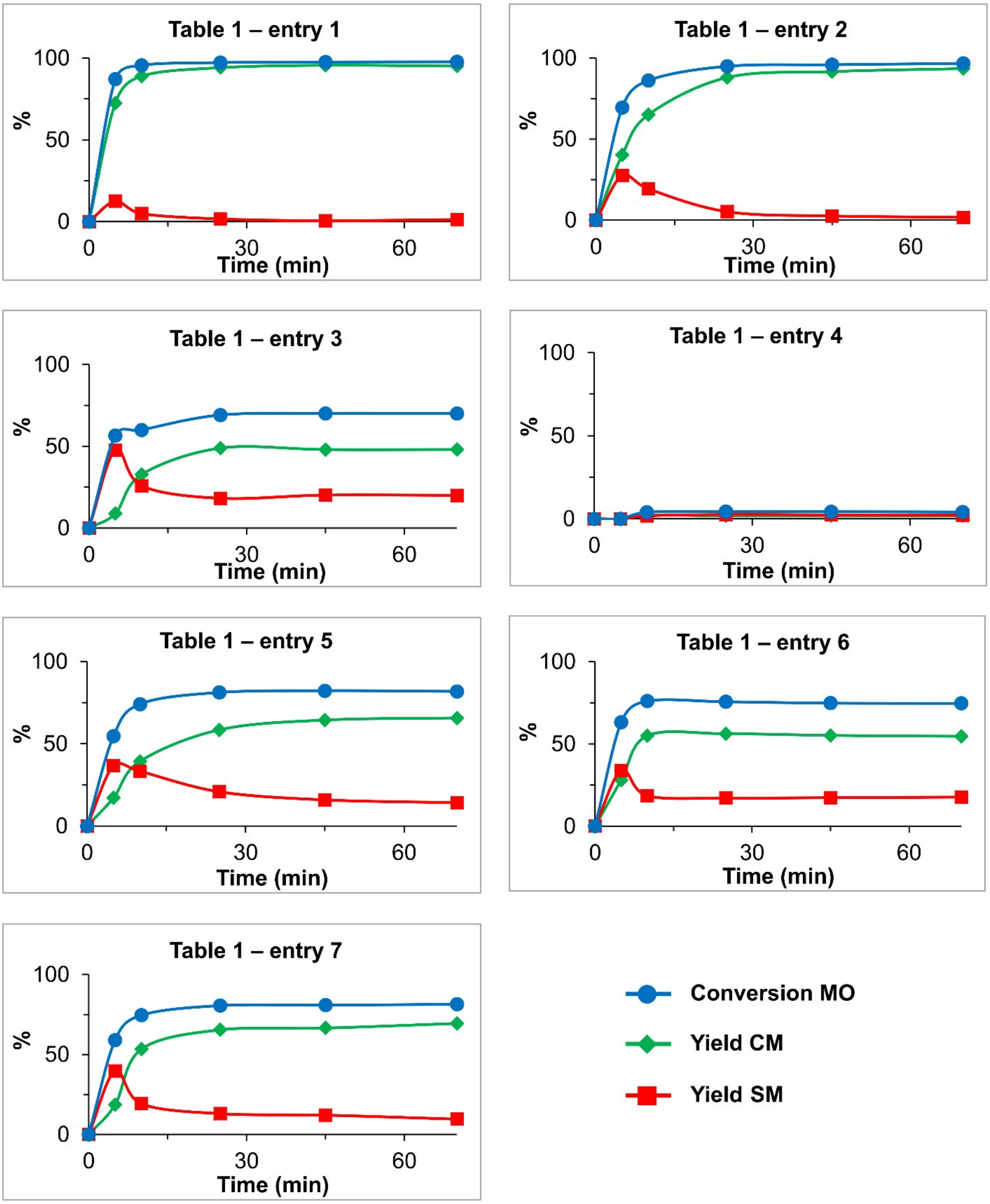


Figure S1 Time-dependent plots of the effect of the **MO** purification procedure on the product distribution in the CM of **MO** with **MA-H** catalyzed by **GII** (data are summarized in **Table 1**). The lines were added with the only purpose to aid visualization.

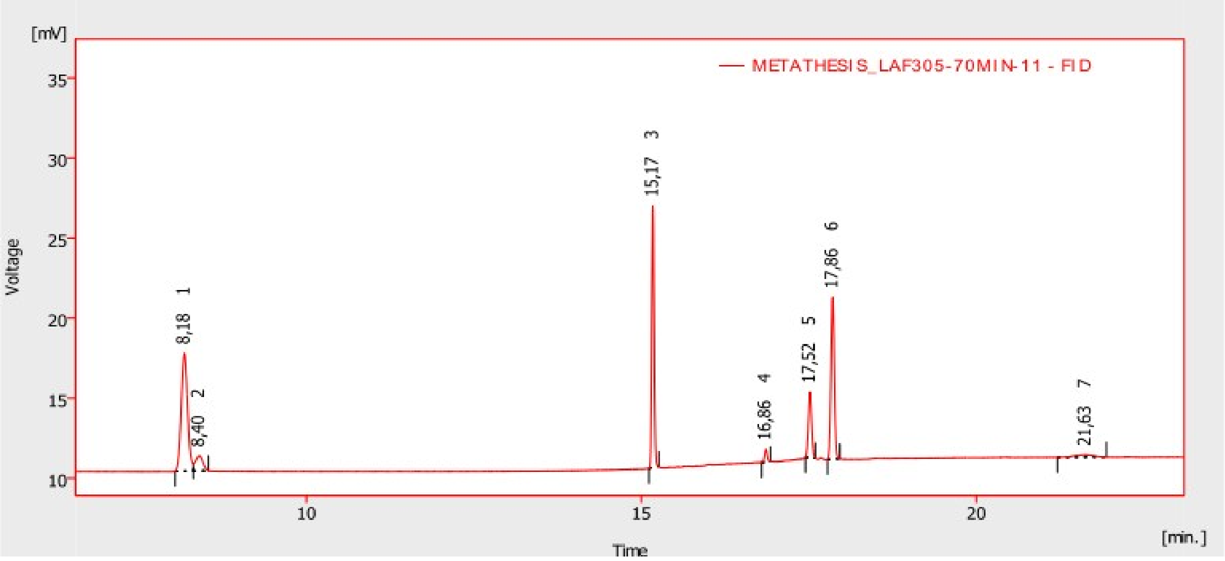


Figure S2 Typical chromatogram obtained in the cross-metathesis of **MO** with **MA-H** (after derivatization). Methyl 2-undecenoate (8.18 min); 9-octadecene (8.40 min); internal standard (1,3,5-trimethoxybenzene; 15.17 min); unknown compound (16.86 min); methyl oleate (17.52 min); dimethyl 2-undecenedioate (17.86 min); dimethyl 9-octadecenedioate (21.63 min).

Conditions: **MO**: 0.5236 g (1.766 mmol); **MA-H**: 0.2086 g (1.797 mmol); 1,3,5-trimethoxybenzene: 0.3056 g (1.817 mmol); **GII**: 3 mL of a 0.5889 mol.L^{-1} THF solution (0.00176 mmol); THF: 7 mL in total; reaction time: 70 min; temperature: 50 °C.

GC method: Column: DN-WAX (polyethyleneglycol; internal diameter: 0.32 mm; length: 30.0 m; film thickness: 0.25 μm); Injector temperature: 230 °C; Carrier gas: N_2 (3.6 mL/min); Detector temperature: 230 °C; Split flow: 180 mL/min; Split rate: 1:50; Oven temperature:

	Temp. (°C)	**Time (min)**	**Rate (°C/min)**
1	120.0	1.00	1.0
2	130.0	1.00	20.0
3	210.0	9.00	0.00

Table S1 Effect of the catalyst on the CM of **MO** with **MA-H**.

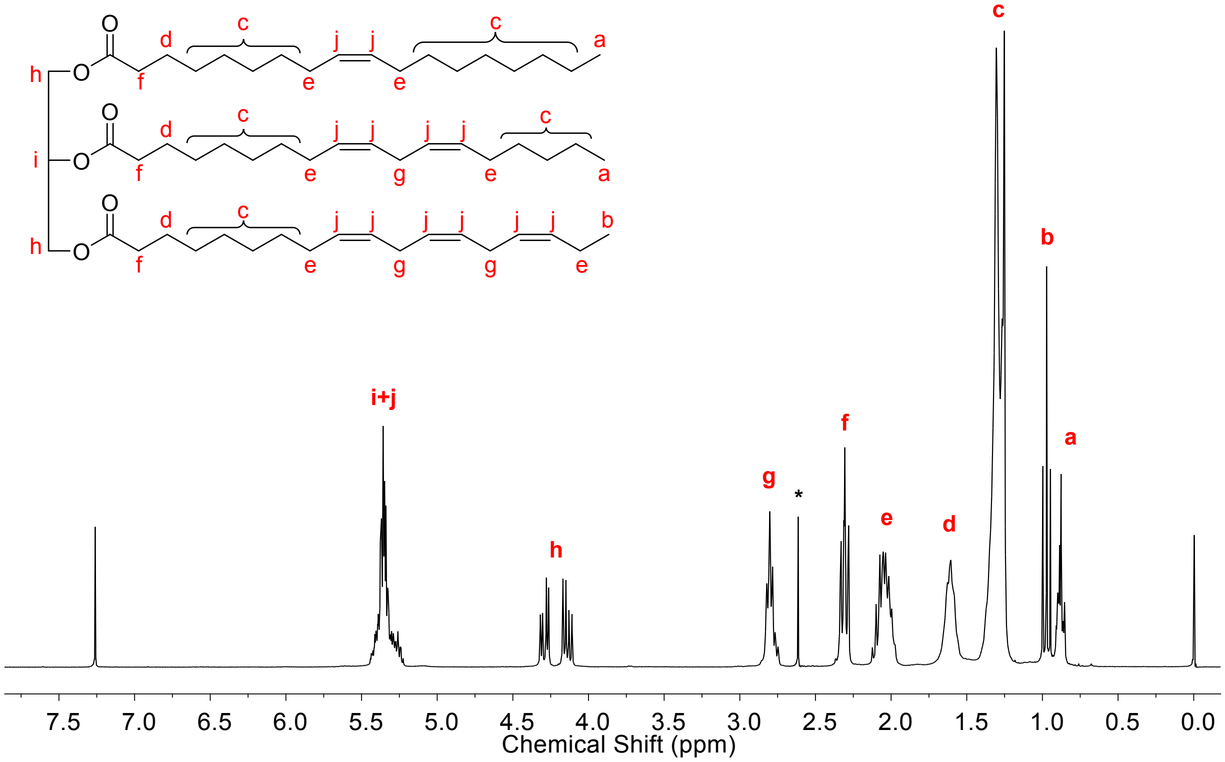
Entry	Cat.	Temp. (°C)	Conv. (%)	Yield (%)	
				CM	SM
13[a]	**GII**	40	94	85	6
14[a]	**GII**	50	93	84	6
15[a,b]	**GII**	60	92	82	7
16[a]	**GII**	reflux	90	77	12
17	**HGII**	50	82	57	21
17[b]	**HGII**	60	88	69	15
19	**HGII**	reflux	82	60	20
20[b]	**IndII**	60	90	73	13
21[b]	**Um42**	60	56	14	41
22	**Um42**	reflux	60	17	42

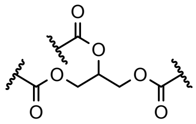
Conditions: **MO**:**MA-H** molar ratio = 1:2 (**MO** = 1.77 mmol); **Cat.** = 0.05 mol%; THF = 1.5 mL; purification method D. Isomerization products complete the mass balance. [a] values plotted in Figure 6. [b] Values plotted in Figure 7.

Table S2 Composition of the vegetable oils used.

Oil	%[a]						
	C18:1	C18:2	C18:3	C16:1	C18:0	C16:0	Others
Canola	62.5	21.5	8.7	0.2	2.4	4.7	7.1
Linseed	22.3	15	52.8	0.1	4.1	5.7	9.8
Sunflower	40.1	47.7	1.5	0.1	3.1	7.6	10.6
Grapeseed	20.5	68.2	0.3	0.1	3.7	7.2	10.9
Corn	34.2	51.3	0.8	0.1	0.9	12.7	13.6
Soybeam	23.2	55.9	6.4	0	3	11.5	14.5
Olive	78.3	6.2	0	0.7	3	11.7	14.8
Peanut	52.3	31.9	0	0.2	3	12.5	15.6
Rice	41.6	35.5	1.8	0.1	1.6	19.4	21
Cottonseed	15.3	59	0.1	0.4	2	23.2	25.2
Palm	55.4	12.7	0	0.2	3	28.7	31.7

[a] Calculated by GC.



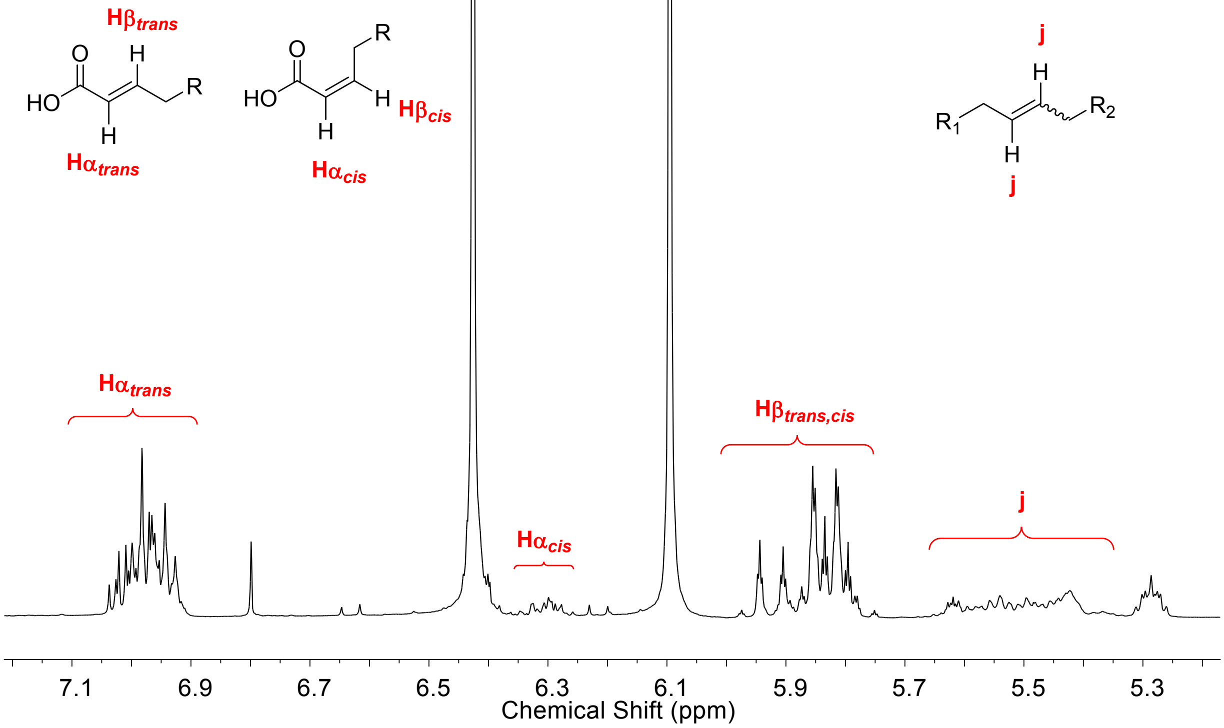


$$\textbf{MW:}\ \overset{-CH_3}{15.03((\Sigma_{a,b})/3Ap)} + \overset{-CH_2-}{14.03((\Sigma_{c\text{-}g})/2Ap)} + \overset{-CH=CH-}{26.02((i+j - Ap)/2Ap)} \quad + \quad 173.1$$

Ap: h/4

Number of C=C: (i+j)/(2*Ap)

Figure S3 Typical ^{1}H NMR spectrum of a vegetable oil with the signal attributions and the formulae used to calculate the molecular weight and number of C-C double bonds per triglyceride. * Residual water.

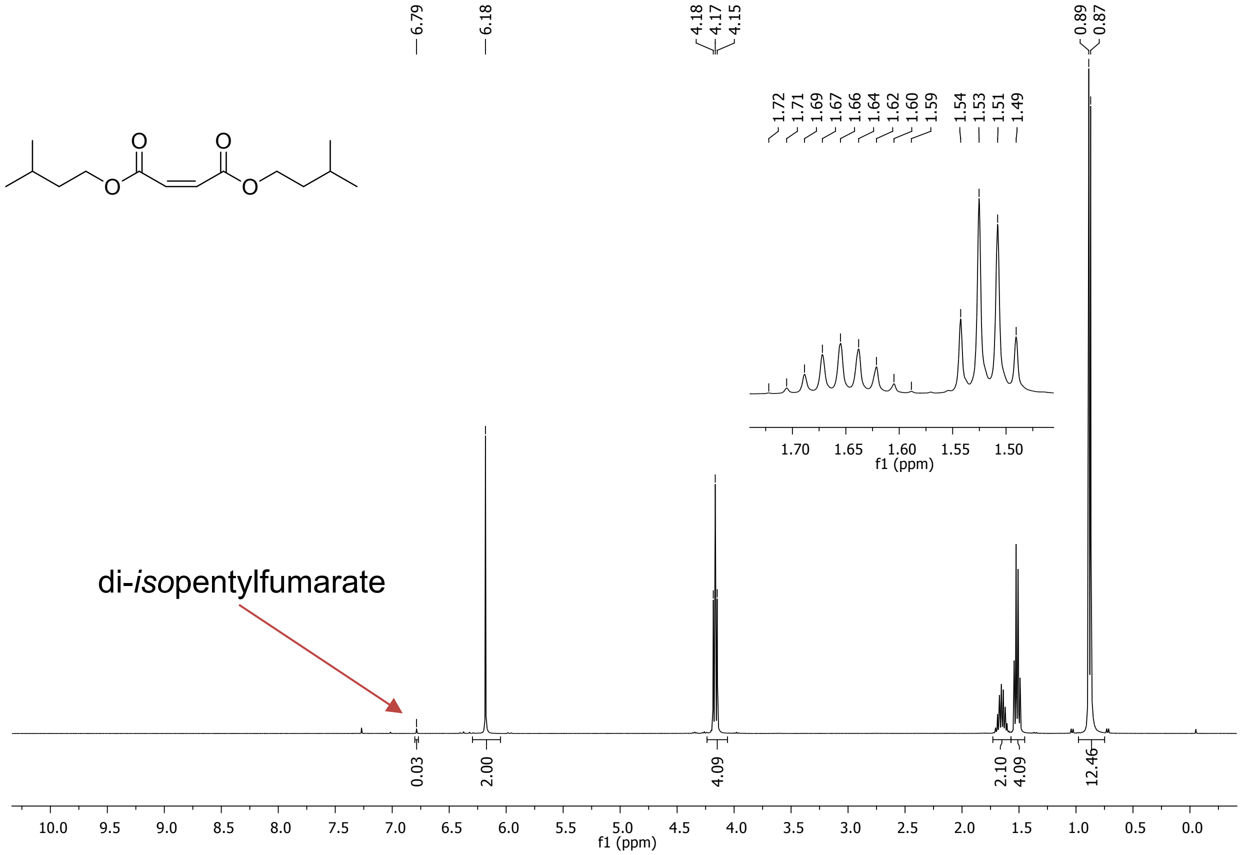


Yield CM: $(H\alpha_{trans}+H\alpha_{cis}+H\beta_{trans,cis})/(H\alpha_{trans}+H\alpha_{cis}+H\beta_{trans,cis} + j)$

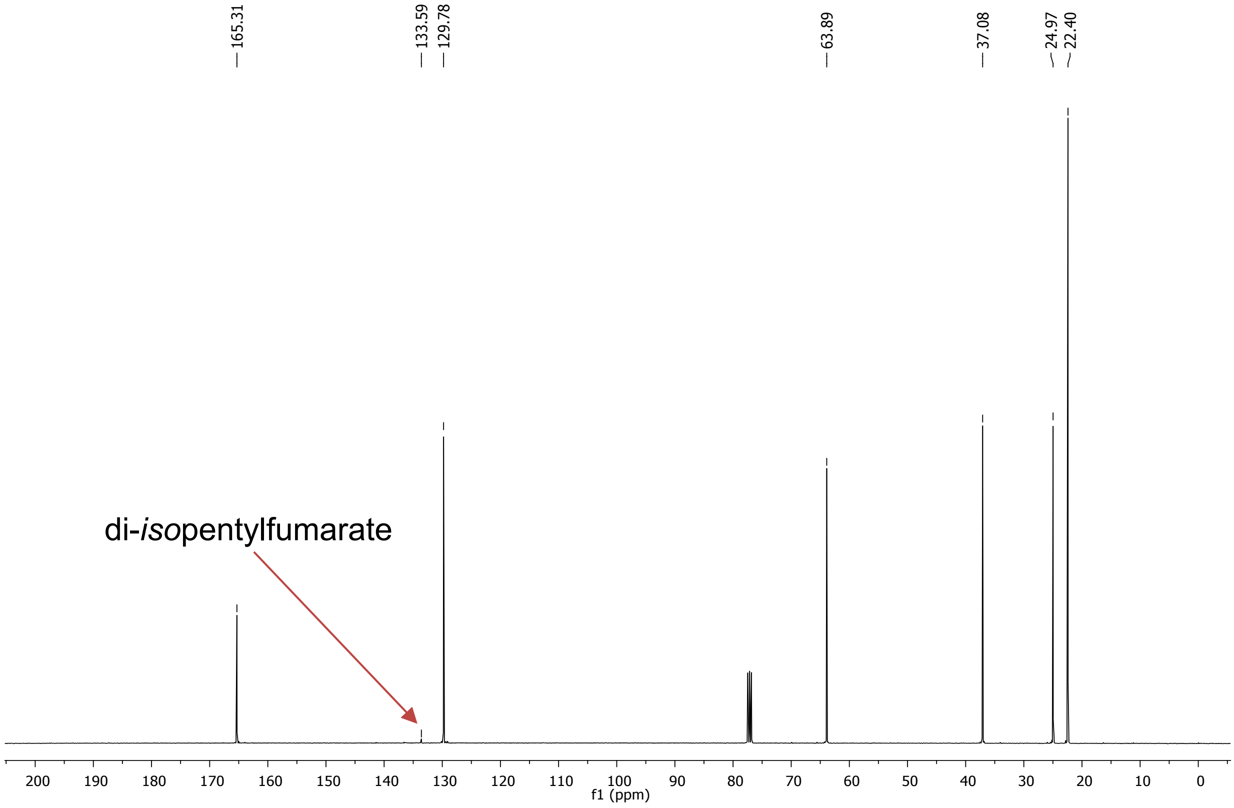
Figure S4 Inset of the olefinic region of a typical ^{1}H NMR spectrum of the CM of vegetable oils with **MA-H** with the signal attributions and the formula used to calculate the yield of cross-metathesis products.

Spectra

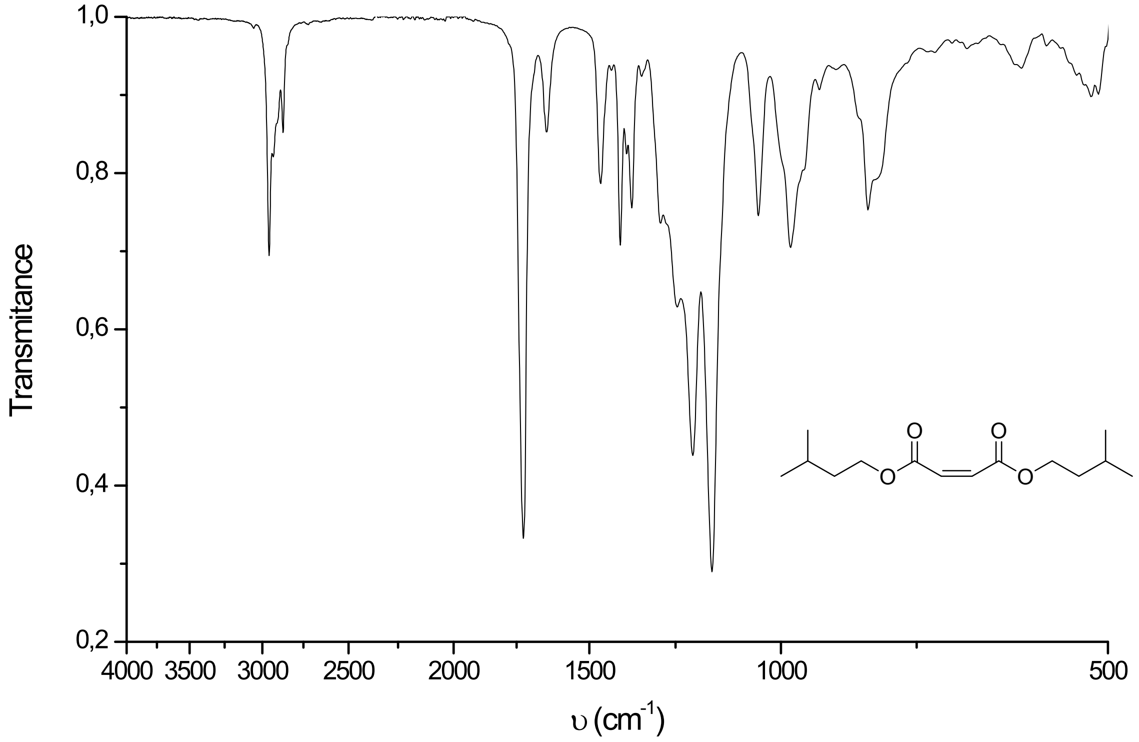
MA-^{i}Pent



di-*iso*pentylfumarate



di-*iso*pentylfumarate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0,6
0,4
0,2
Transmitance
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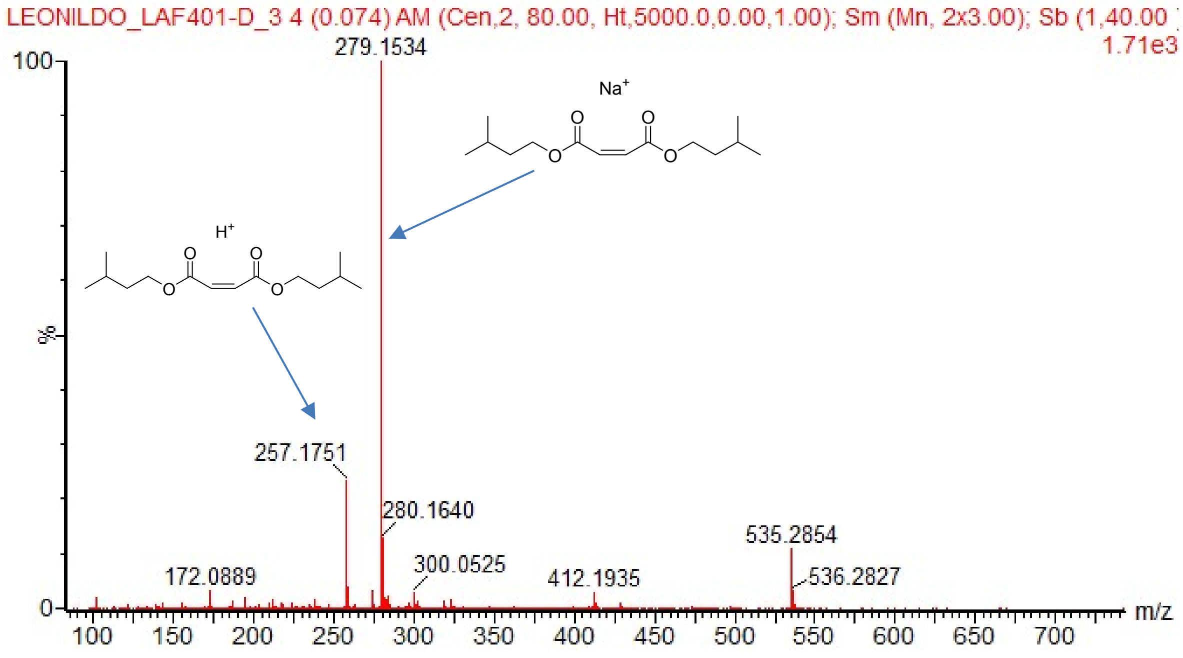
3500
3000
2500
2000
1500
1000
500
υ (cm-1)
O
O
O
O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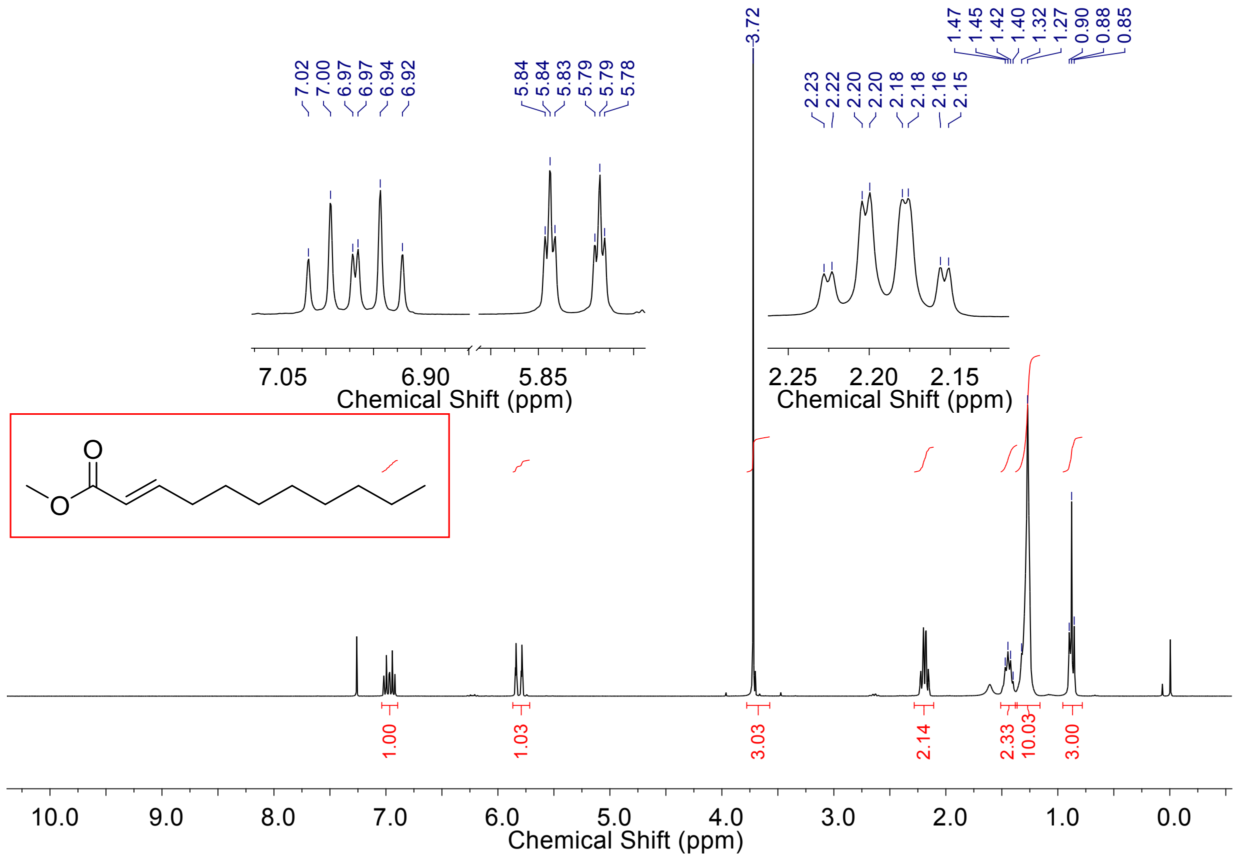
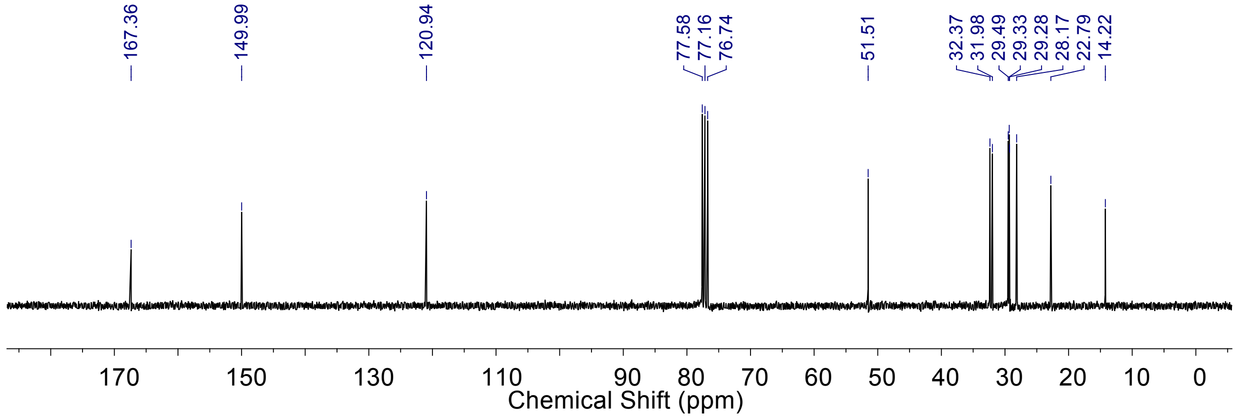
1.71e3
279.1534
100
%
0
Na+
H+
O
O
O
O
257.1751
280.1640
300.0525
172.0889
412.1935
535.2854
536.2827
m/z
100
150
200
250
300
350
400
450
500
550
600
650
700

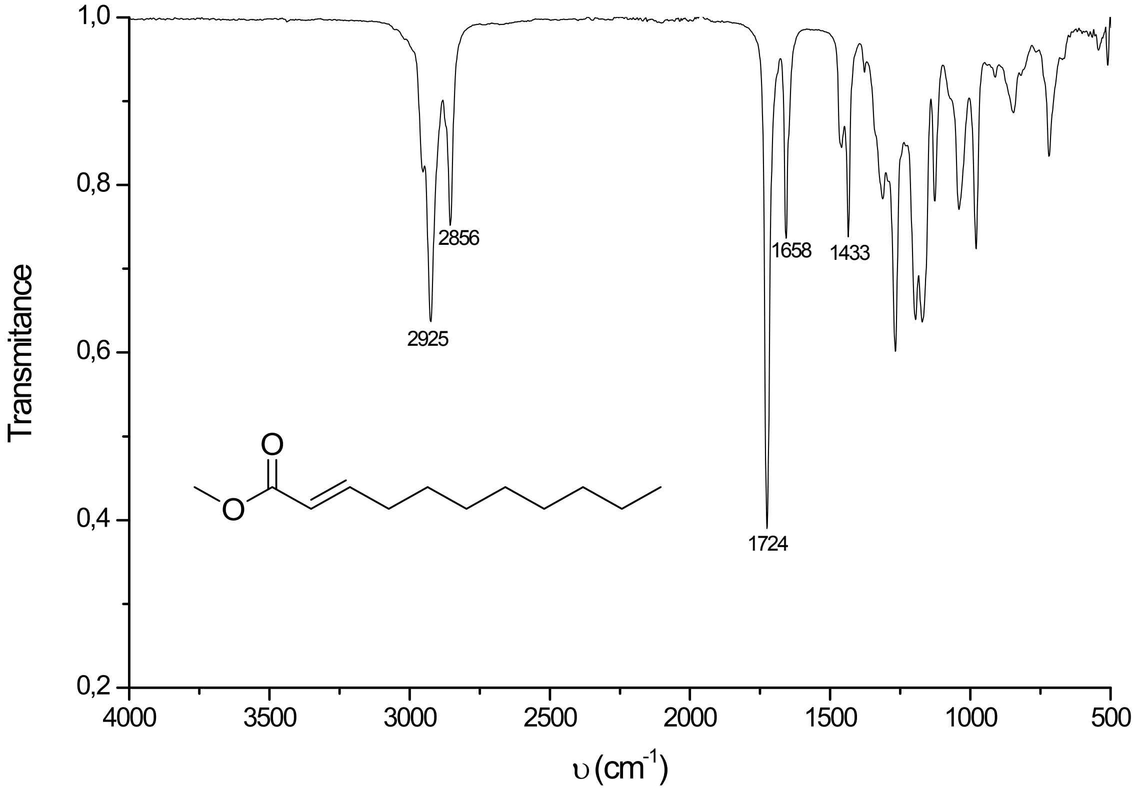
Methyl (*E*)-undec-2-enoate



^{1}H NMR (300 MHz, CDCl$_3$) δ 6.97 (dt, *J* = 15.6, 7.0 Hz, 1H), 5.81 (dt, *J* = 15.6, 1.5 Hz, 1H), 3.72 (s, 3H), 2.19 (qd, *J* = 7.0, 1.5 Hz, 2H), 1.51 – 1.36 (m, 2H), 1.38 – 1.16 (m, 10H), 0.88 (t, *J* = 6.7 Hz, 3H).



^{13}C NMR (75 MHz, CDCl$_3$) δ 167.36, 149.99, 120.94, 51.51, 32.37, 31.98, 29.49, 29.33, 29.28, 28.17, 22.79, 14.22.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0,2
Transmitance
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υ (cm-1)
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2925
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1433
1724
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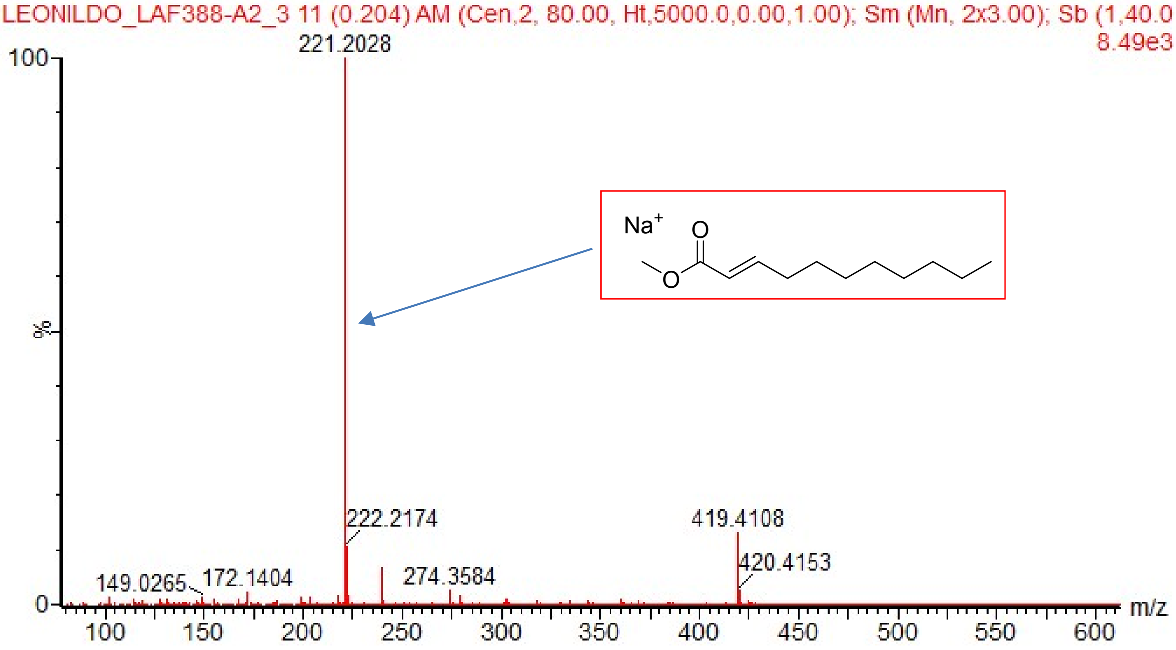
O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221.2028
100
%
0
222.2174
419.4108
420.4153
149.0265
172.1404
274.3584
100
150
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300
350
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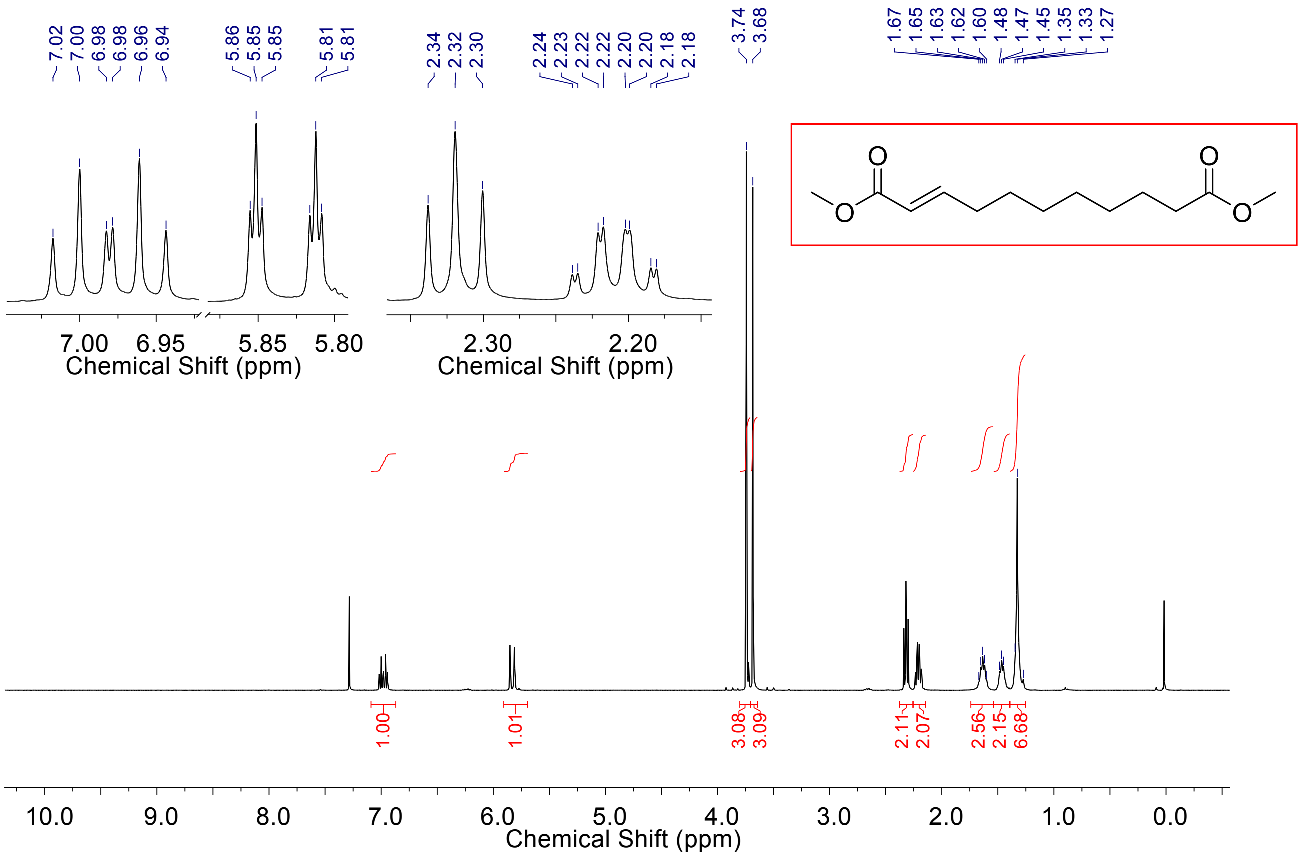
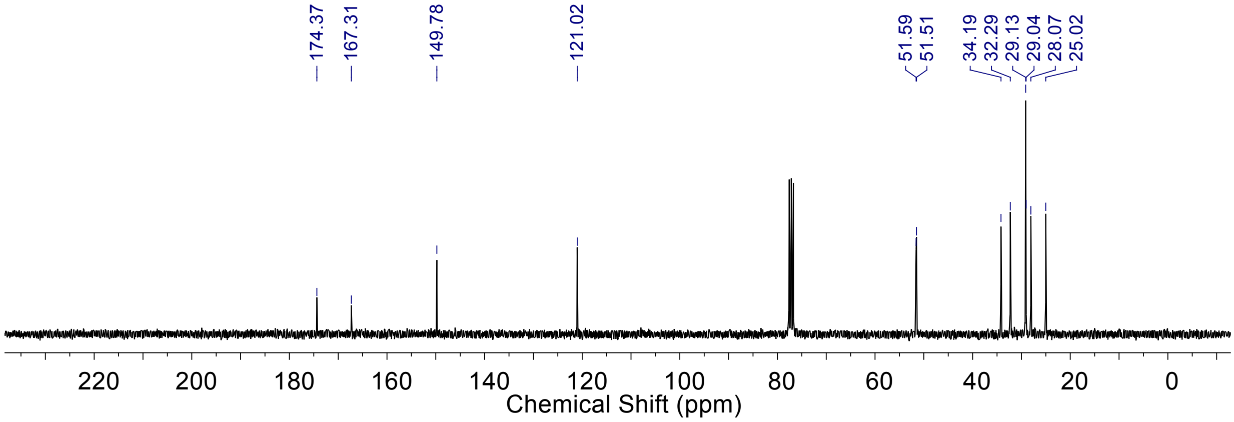
450
500
550
600
m/z
Na+
O
O

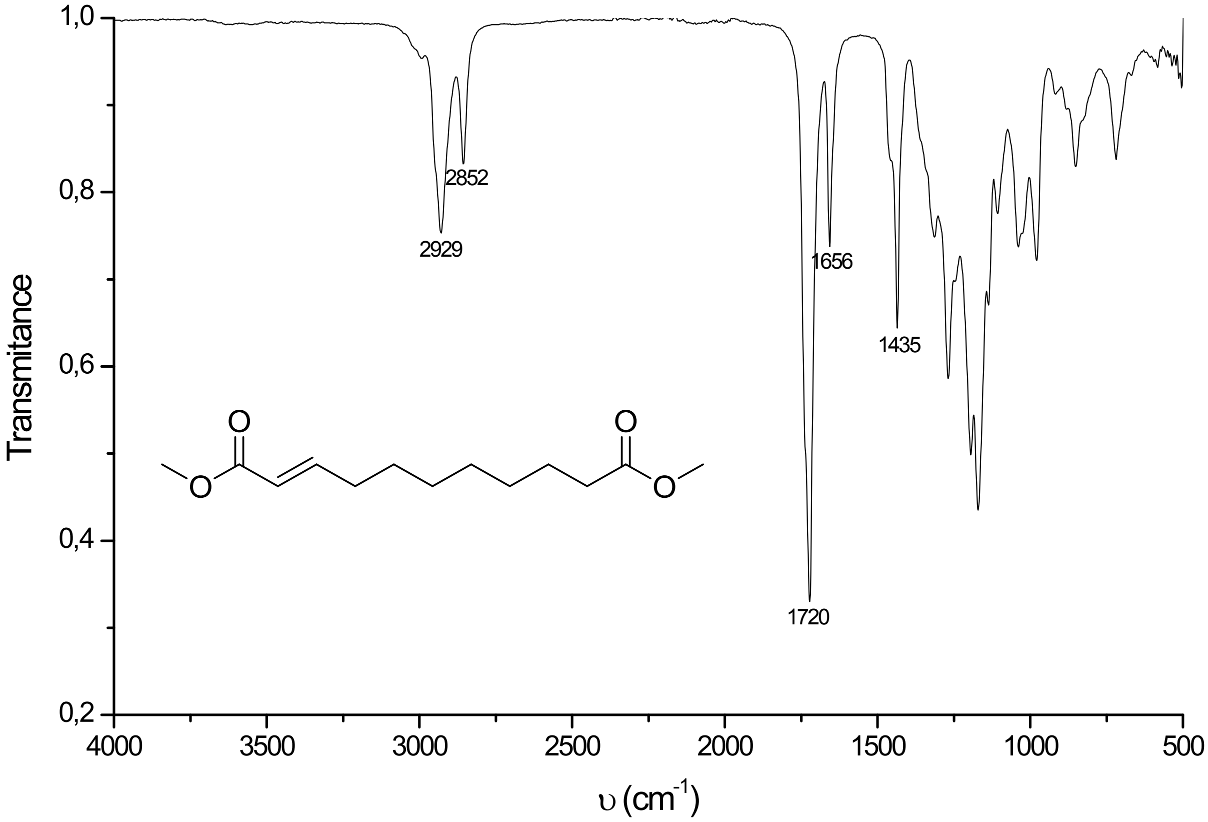
Dimethyl (*E*)-undec-2-enedioate



^{1}H NMR (400 MHz, $CDCl_3$) δ 6.98 (dt, *J* = 15.6, 7.0 Hz, 1H), 5.83 (dt, *J* = 15.6, 1.6 Hz, 1H), 3.74 (s, 3H), 3.68 (s, 3H), 2.32 (t, *J* = 7.5 Hz, 2H), 2.21 (qd, *J* = 7.0, 1.6 Hz, 2H), 1.74 – 1.54 (m, 2H), 1.54 – 1.39 (m, 2H), 1.39 – 1.25 (m, 6H).



^{13}C NMR (75 MHz, $CDCl_3$) δ 174.37, 167.31, 149.78, 121.02, 51.59, 51.51, 34.19, 32.29, 29.13, 29.04, 28.07, 25.02.


1,0
0,8
0,6
0,4
0,2
Transmitance
4000
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1000
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υ (cm-1)
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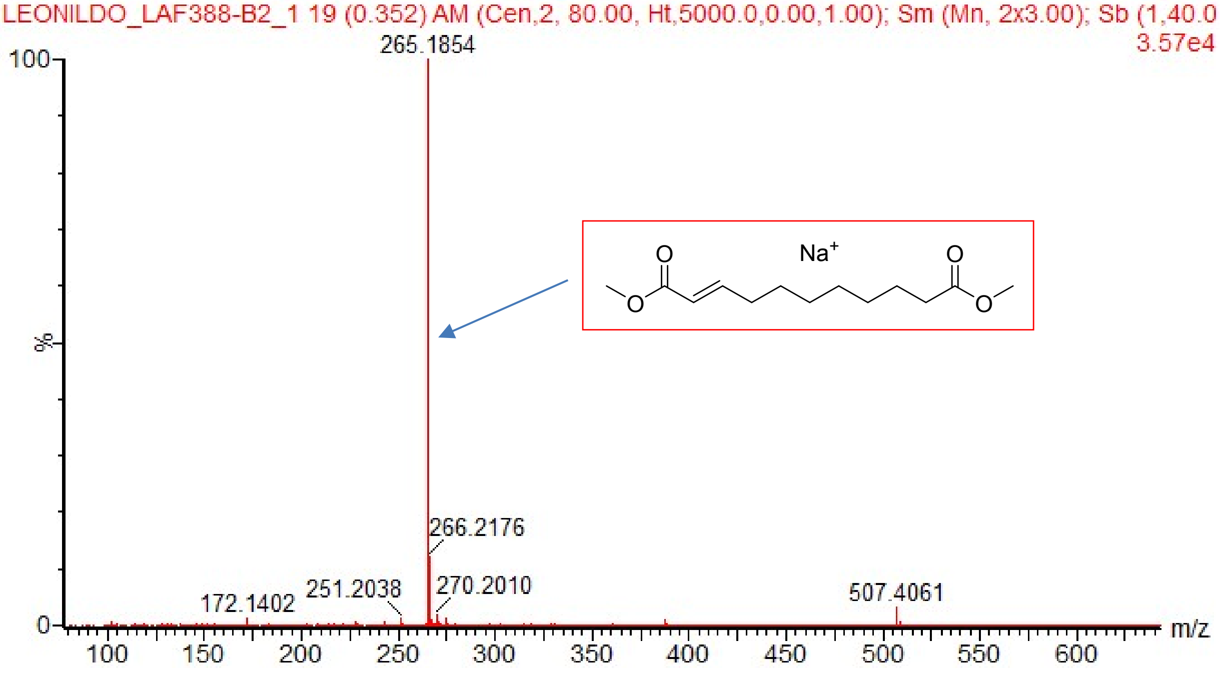
2852
1720
1656
1435
O
O
O
O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3.57e4
100
%
0
265.1854
266.2176
270.2010
251.2038
172.1402
507.4061
100
150
200
250
300
350
400
450
500
550
600
m/z
Na+
O
O
O
O