Fig. 1

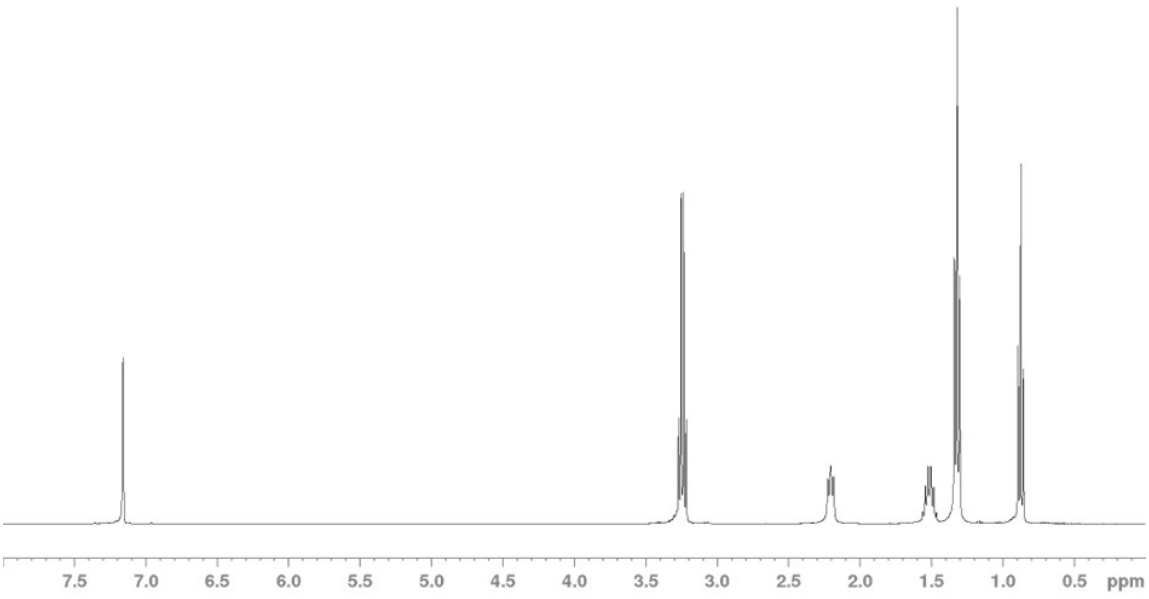

7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

Fig. 2

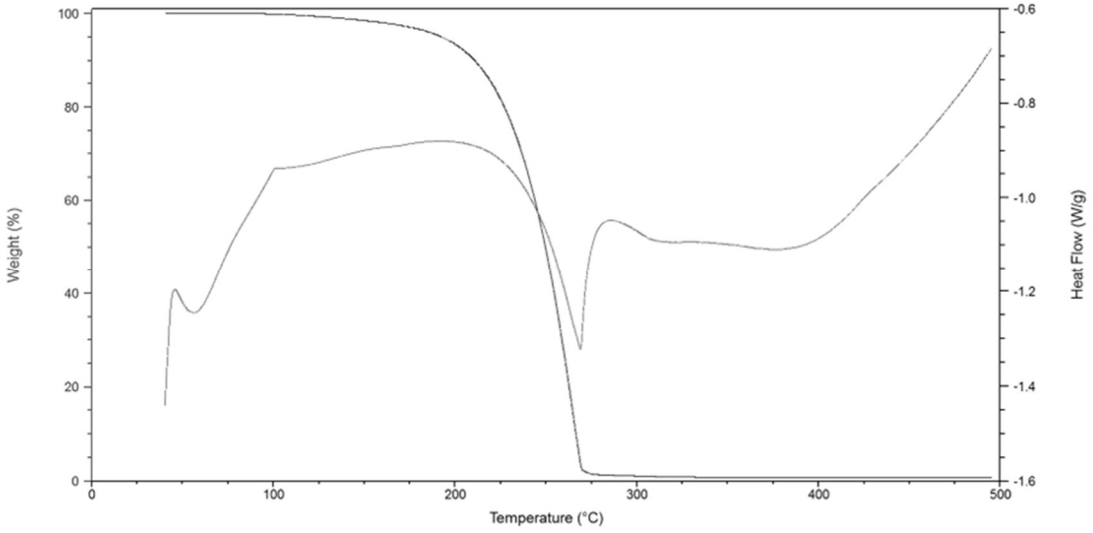

Weight (%)
Heat Flow (W/g)
Temperature (°C)
100
80
60
40
20
0
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
0
100
200
300
400
500

Fig. 3

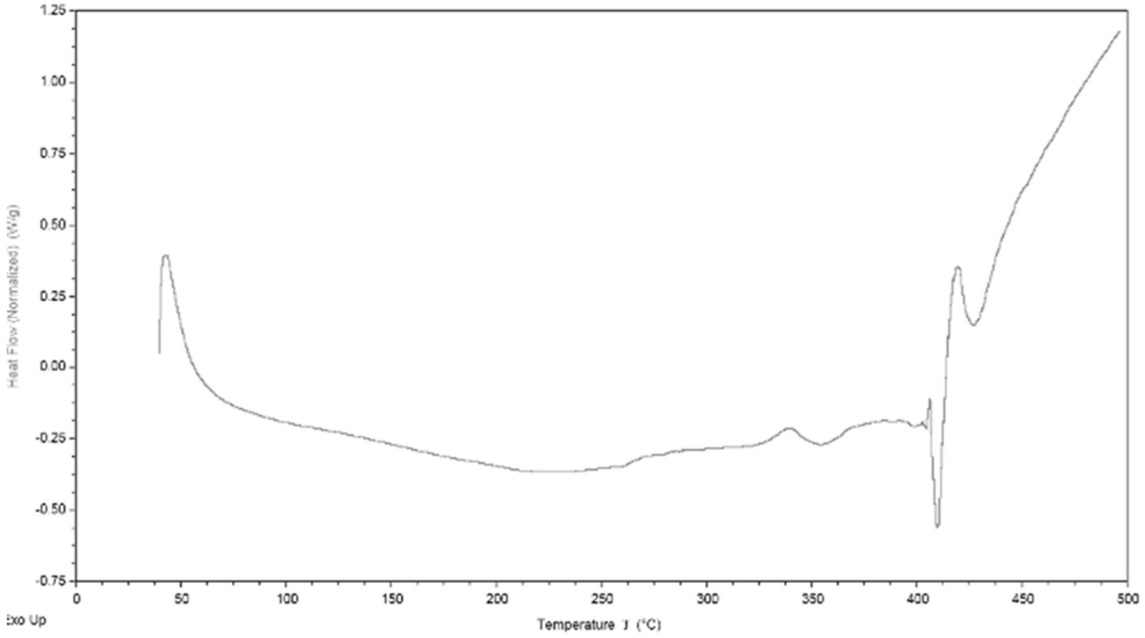

1.25
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
Heat Flow (Normalized) (W/g)
Exo Up
0
50
100
150
200
250
300
350
400
450
500
Temperature T (°C)

Fig. 4

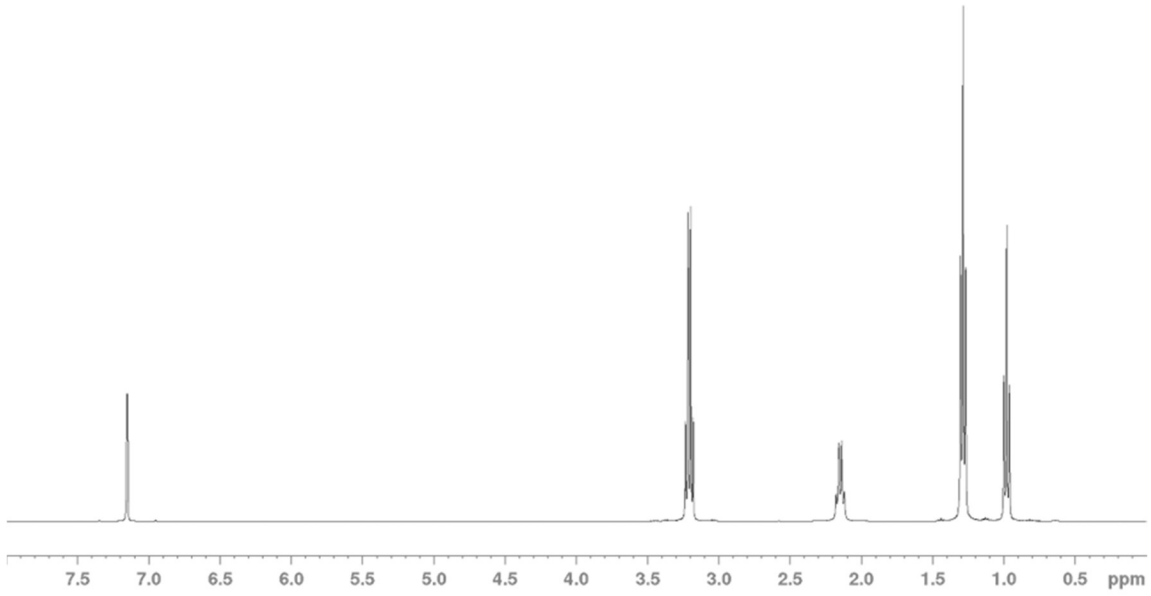

7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

Fig. 5

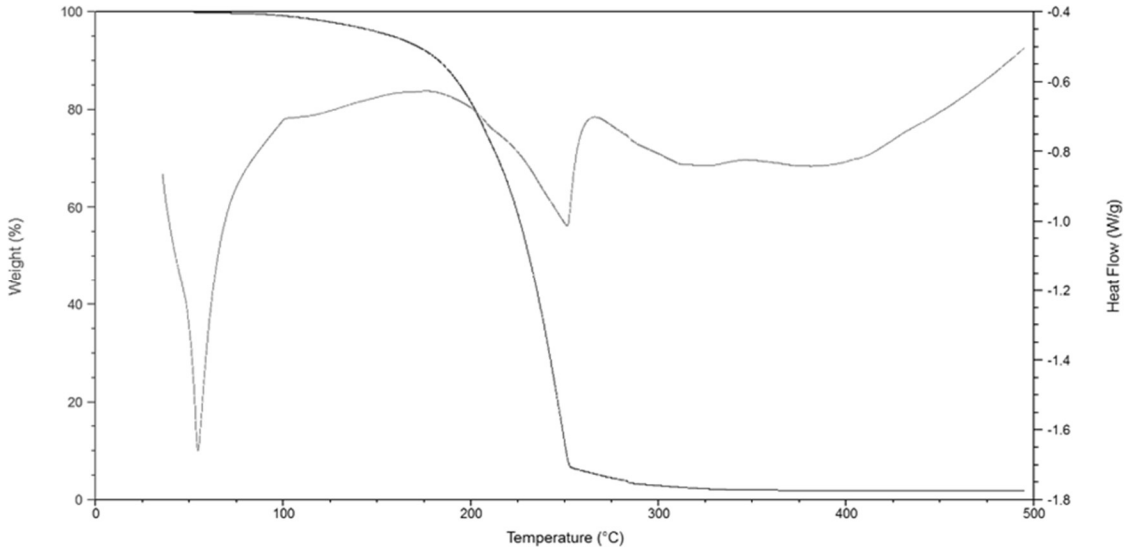

Weight (%)
Heat Flow (W/g)
Temperature (°C)
100
80
60
40
20
0
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
0
100
200
300
400
500

Fig. 6

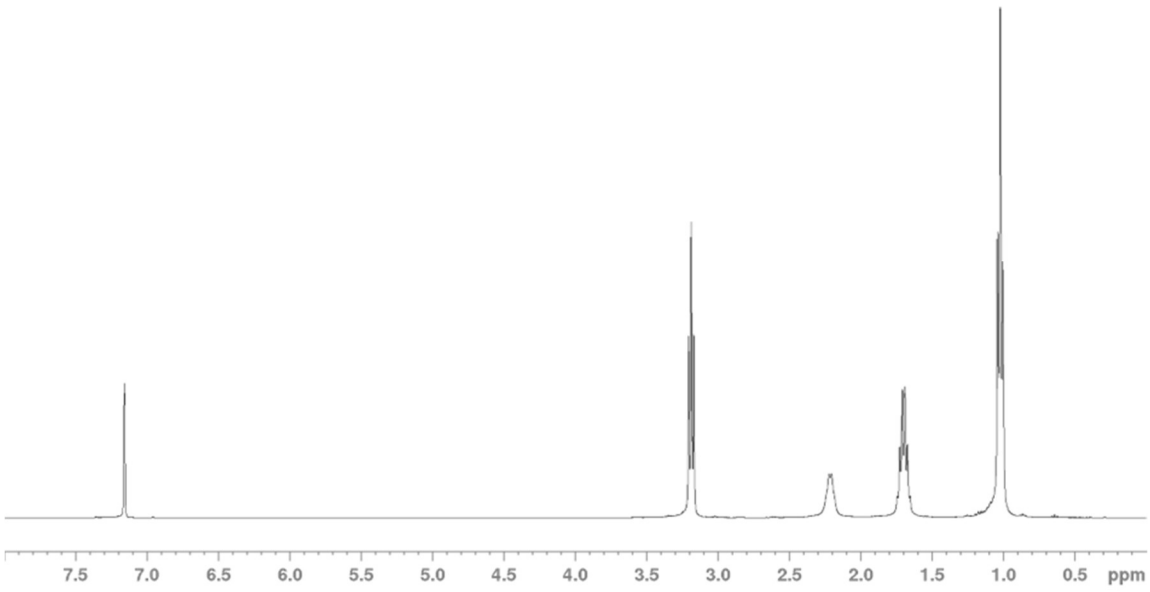

7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

Fig. 7

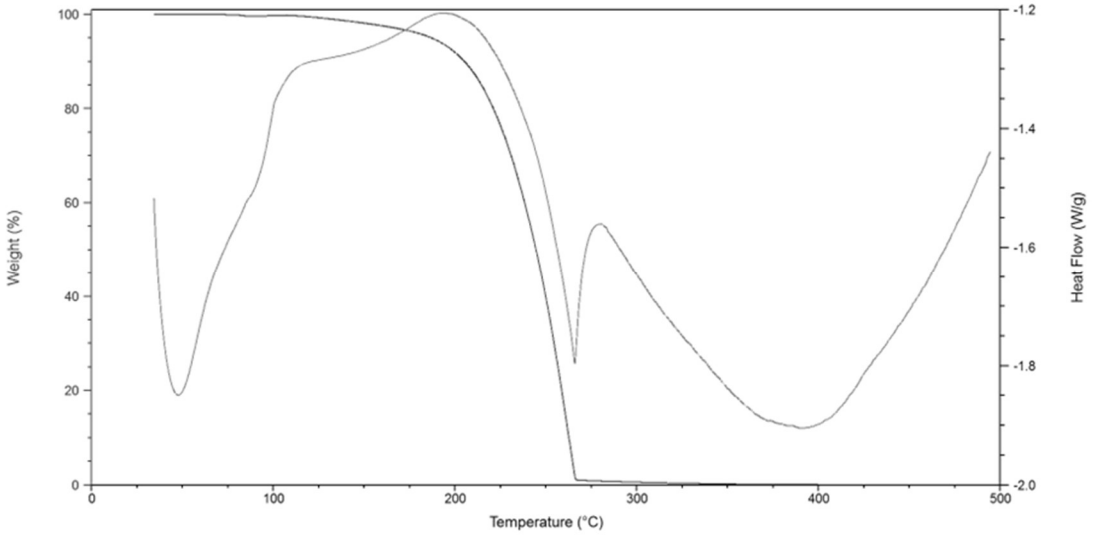

Weight (%)
Heat Flow (W/g)
Temperature (°C)
100
80
60
40
20
0
-1.2
-1.4
-1.6
-1.8
-2.0
0
100
200
300
400
500

Fig. 8

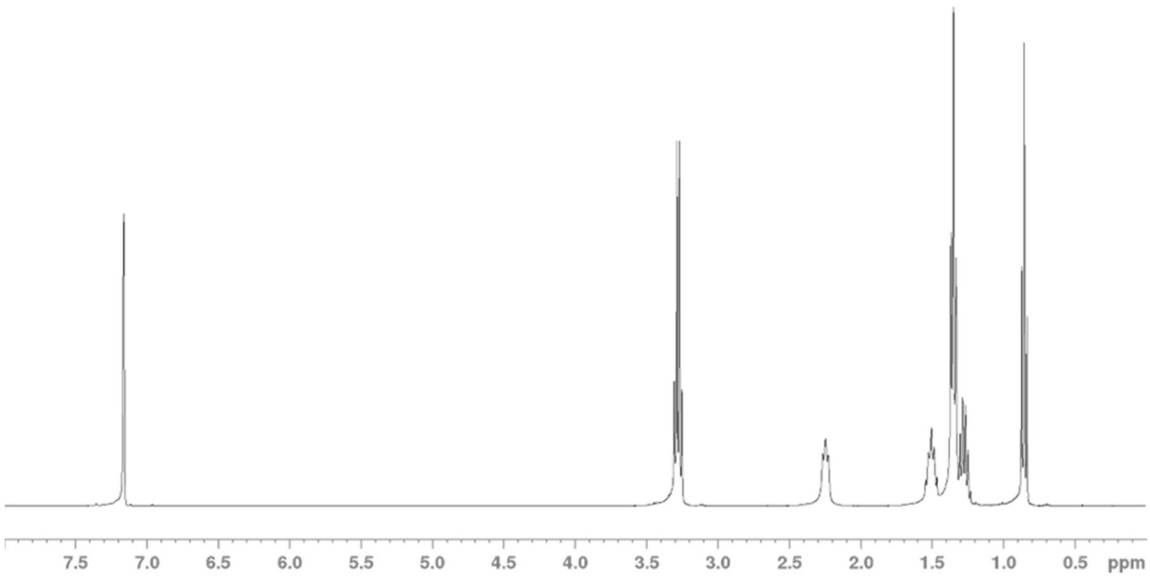

7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

Fig. 9

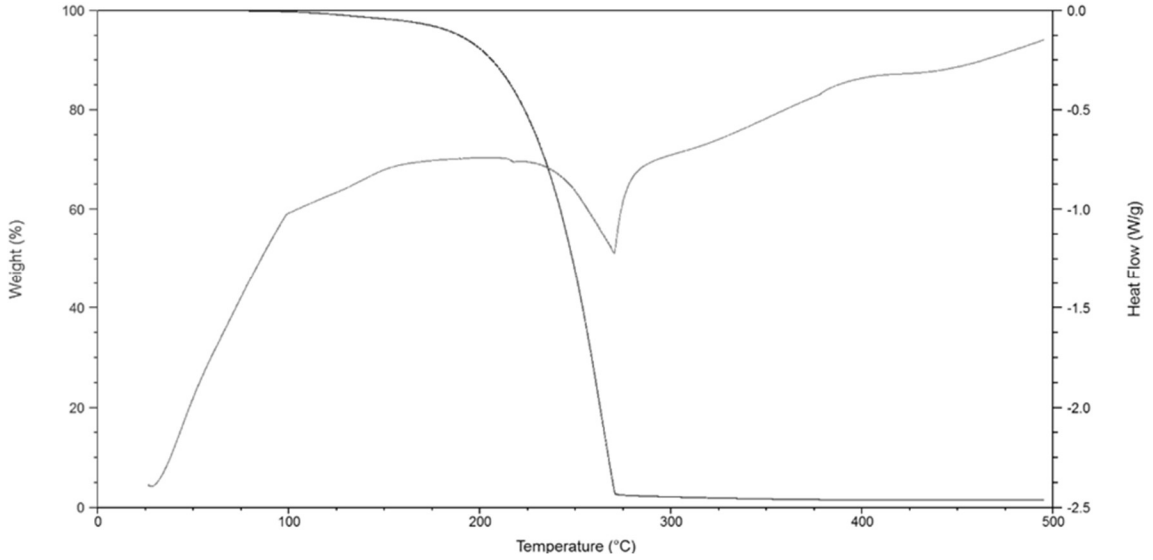

Weight (%)
Heat Flow (W/g)
Temperature (°C)
100
80
60
40
20
0
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
0
100
200
300
400
500

Fig. 10

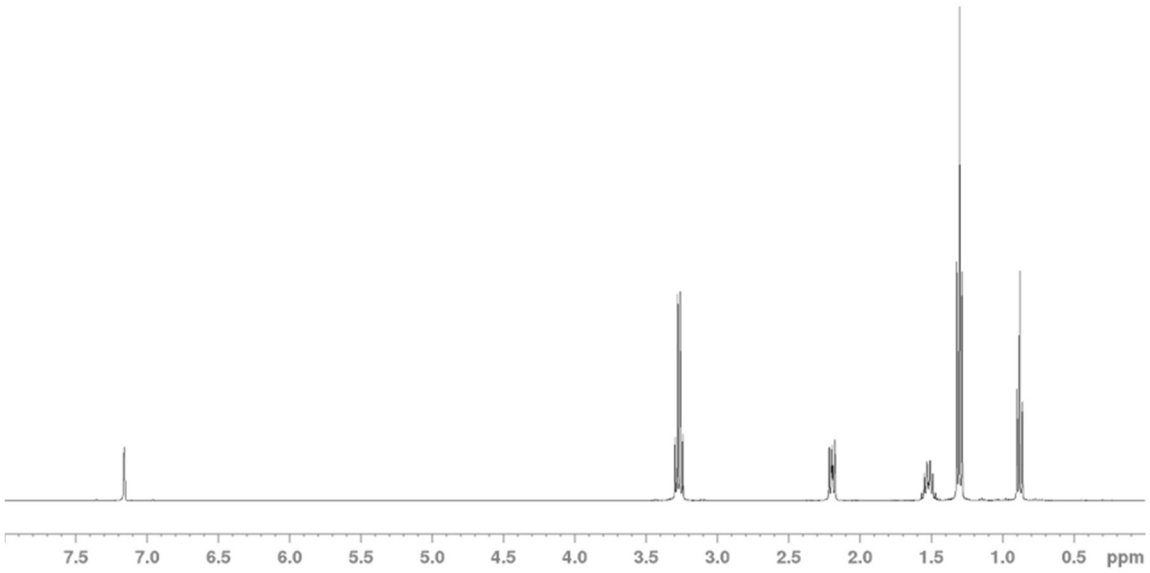

7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

Fig. 11

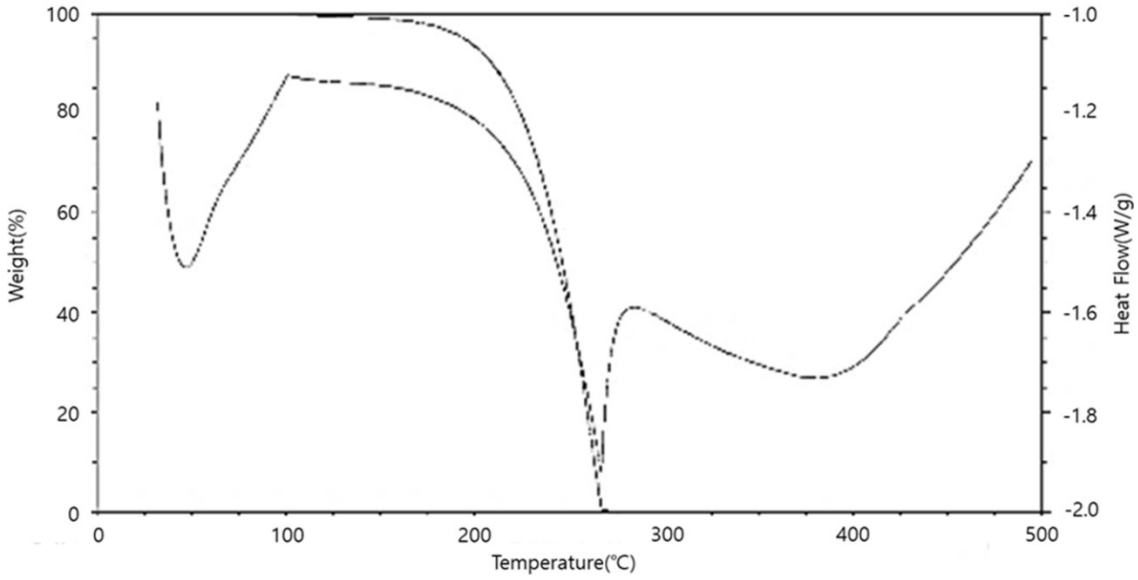

100
80
60
40
20
0
Weight(%)
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
Heat Flow(W/g)
0
100
200
300
400
500
Temperature(℃)

Fig. 12

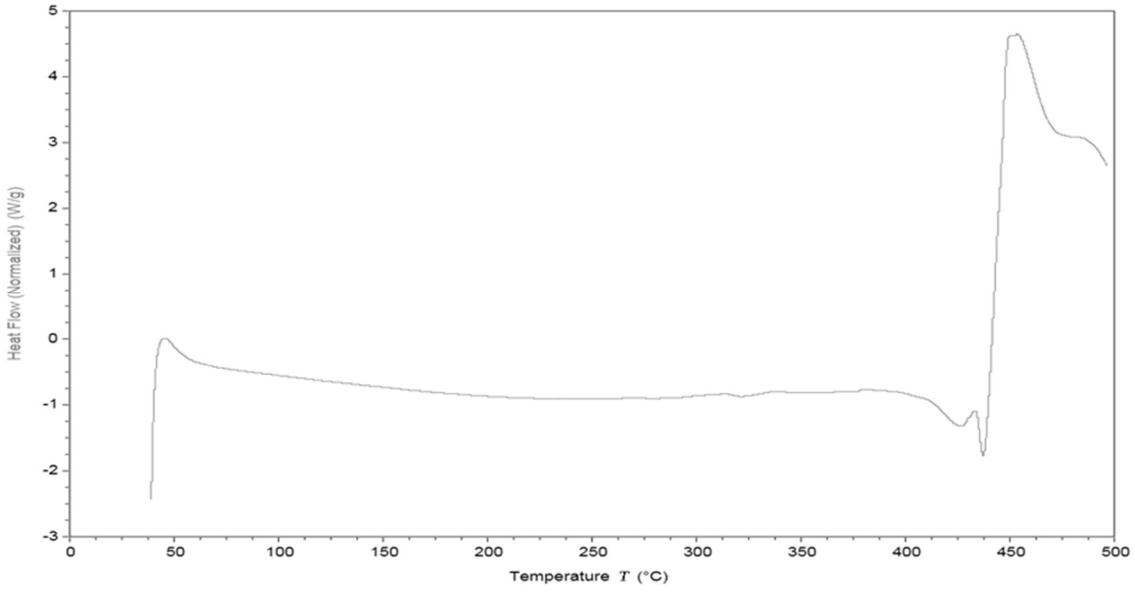

5
4
3
2
1
0
-1
-2
-3
Heat Flow (Normalized) (W/g)
0
50
100
150
200
250
300
350
400
450
500
Temperature T (°C)

Fig. 13

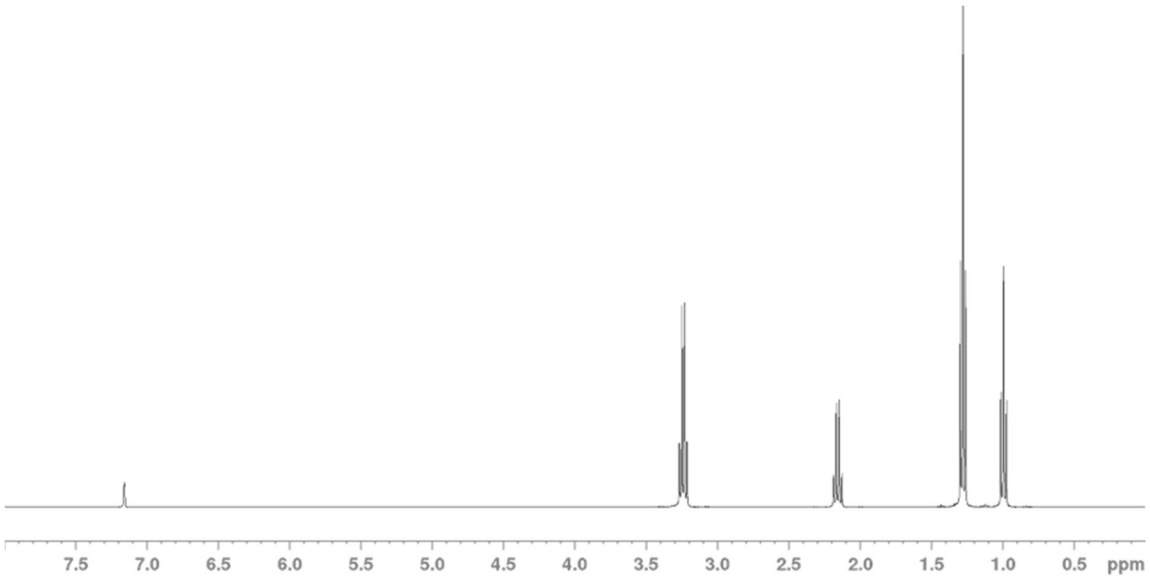

7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

Fig. 14

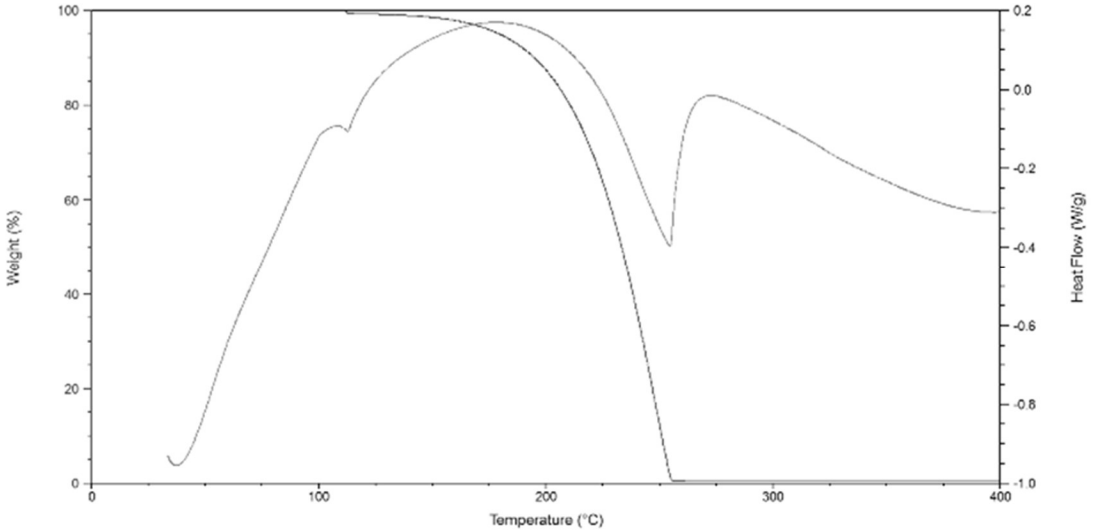

Weight (%)
Heat Flow (W/g)
Temperature (°C)
100
80
60
40
20
0
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
0
100
200
300
400

Fig. 15

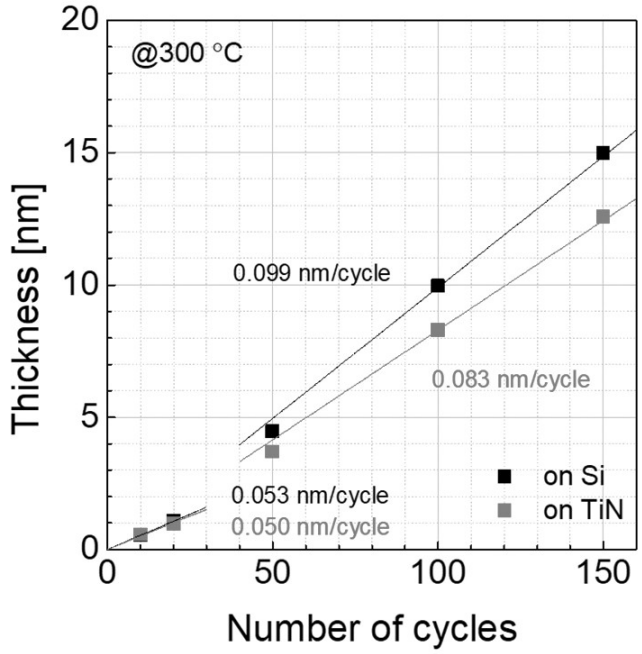

@300 °C
Thickness [nm]
Number of cycles
0.099 nm/cycle
0.083 nm/cycle
0.053 nm/cycle
0.050 nm/cycle
on Si
on TiN
0
5
10
15
20
0
50
100
150

Fig. 16

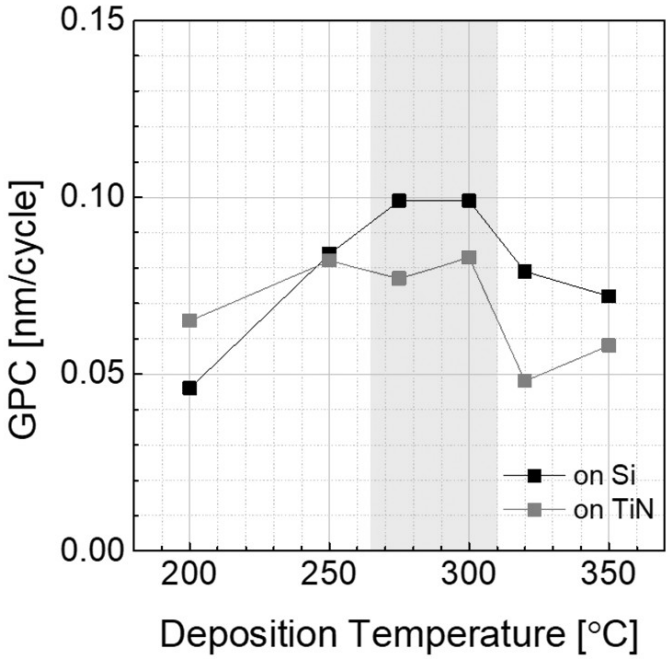

GPC [nm/cycle]
Deposition Temperature [°C]
on Si
on TiN
0.00
0.05
0.10
0.15
200
250
300
350

Fig. 17

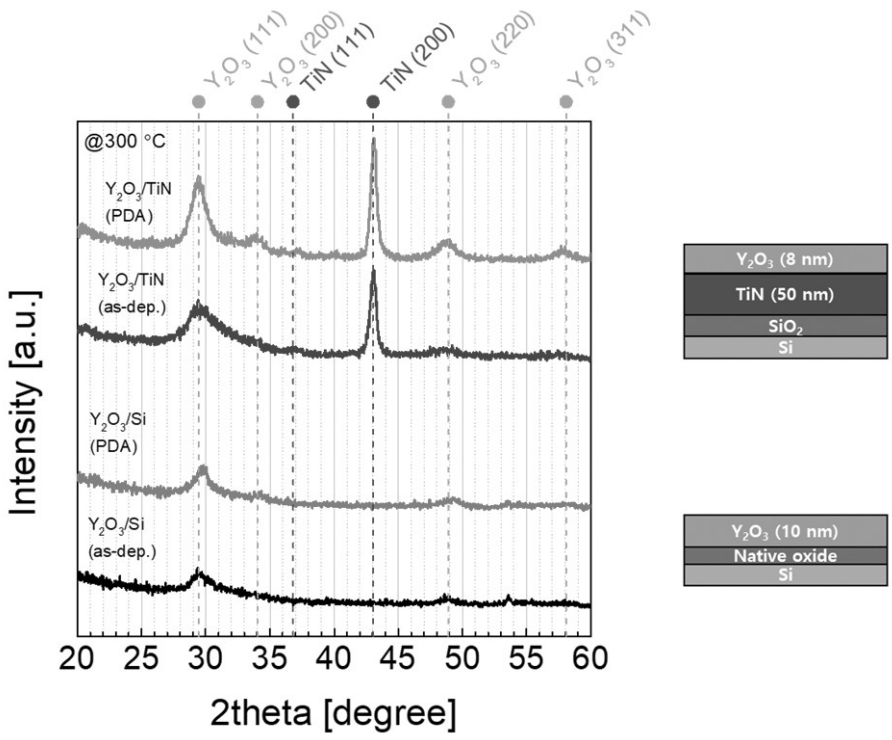

Y2O3 (111)
Y2O3 (200)
TiN (111)
TiN (200)
Y2O3 (220)
Y2O3 (311)
@300 °C
Y2O3/TiN (PDA)
Y2O3/TiN (as-dep.)
Y2O3/Si (PDA)
Y2O3/Si (as-dep.)
Intensity [a.u.]
2theta [degree]
Y2O3 (8 nm)
TiN (50 nm)
SiO2
Si
Y2O3 (10 nm)
Native oxide
Si

Fig. 18

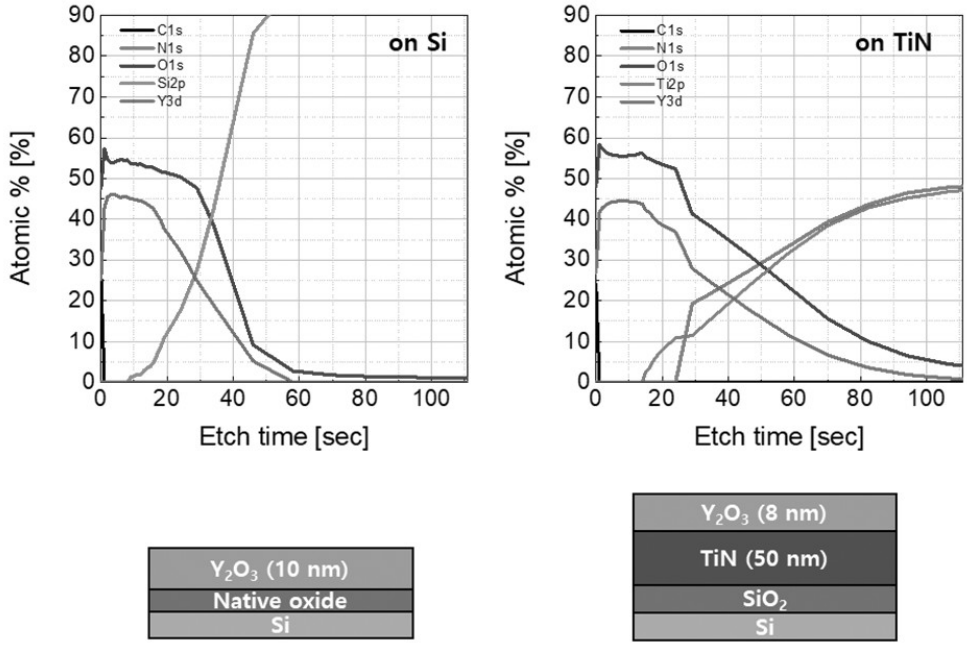
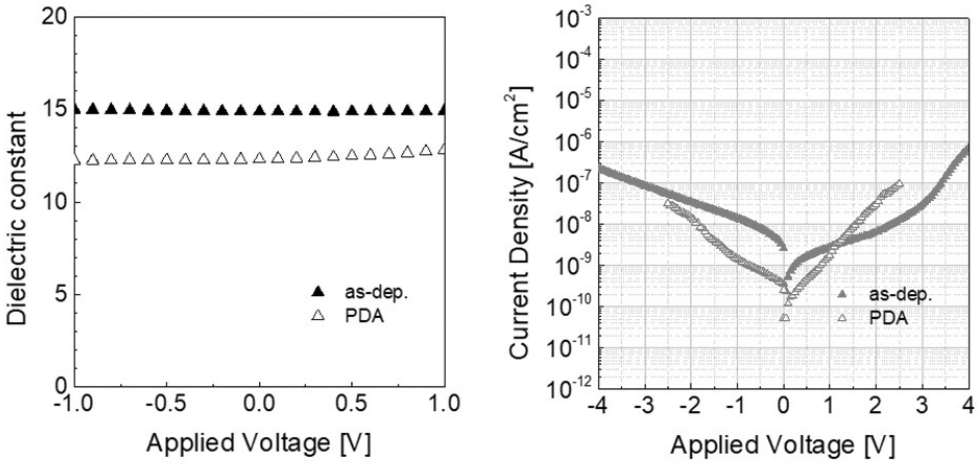
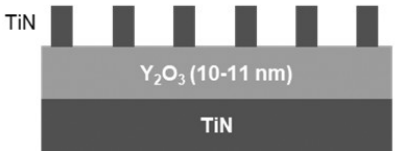

on Si
C1s
N1s
O1s
Si2p
Y3d
Atomic % [%]
Etch time [sec]
on TiN
C1s
N1s
O1s
Ti2p
Y3d
Atomic % [%]
Etch time [sec]
Y2O3 (10 nm)
Native oxide
Si
Y2O3 (8 nm)
TiN (50 nm)
SiO2
Si

Fig. 19


Dielectric constant
Applied Voltage [V]
as-dep.
PDA
Current Density [A/cm^2]
Applied Voltage [V]
as-dep.
PDA


TiN
Y_2O_3 (10-11 nm)
TiN