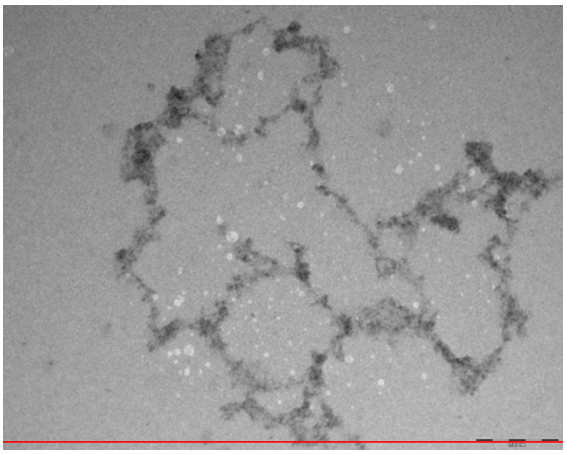
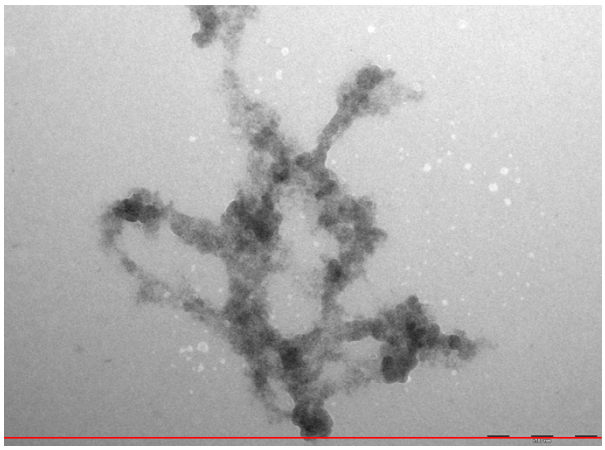
Supporting Information



(a)



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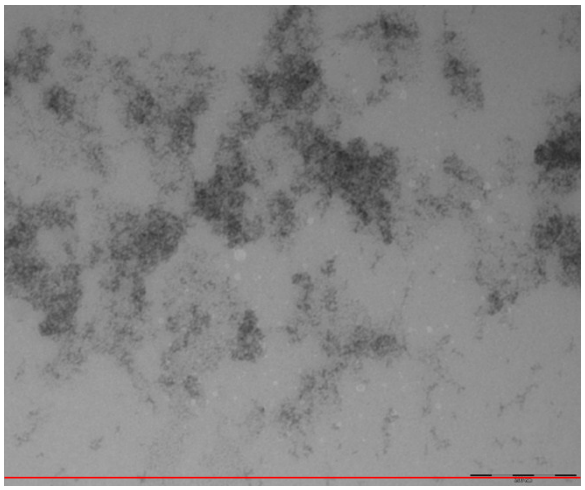

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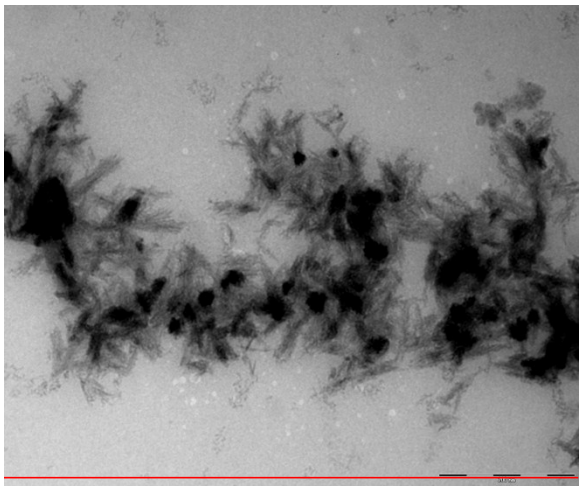

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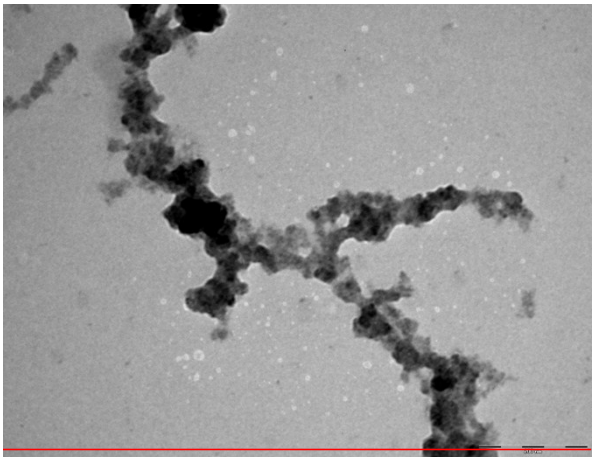

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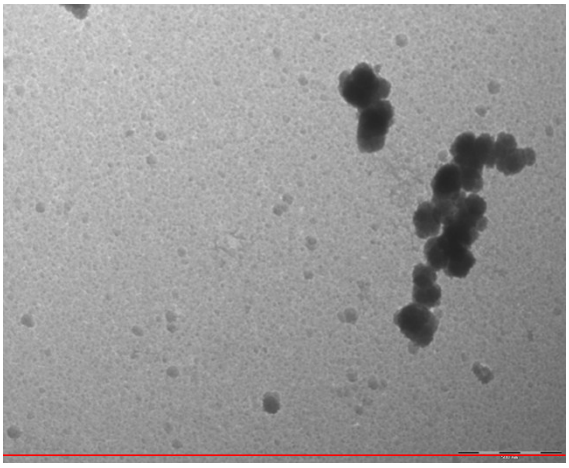
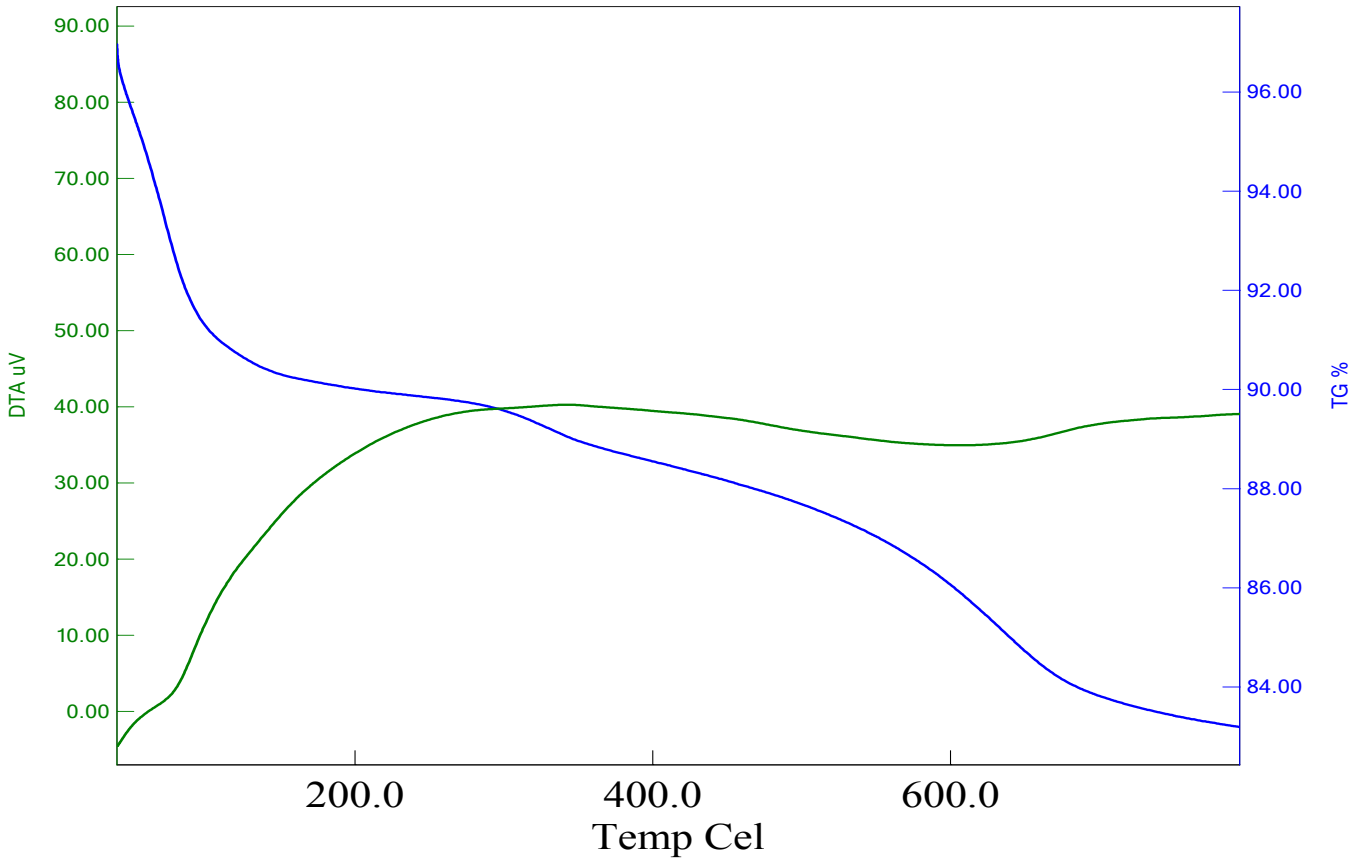


(f)

TEM of (a) Bent-RhB-1:0.25-30°C, (b) Bent:RhB:PCz-1:0.25:0.25-30°C, (c) Bent:RhB:PCz-1:0.5:0.5-30°C,(d) Bent:RhB:PCz-1:0.25: 0.25-50^{0}C,(e) Bent: RhB:PCz-1:0.5:0.5-50°C(f) Bent:RhB-1:1-30°C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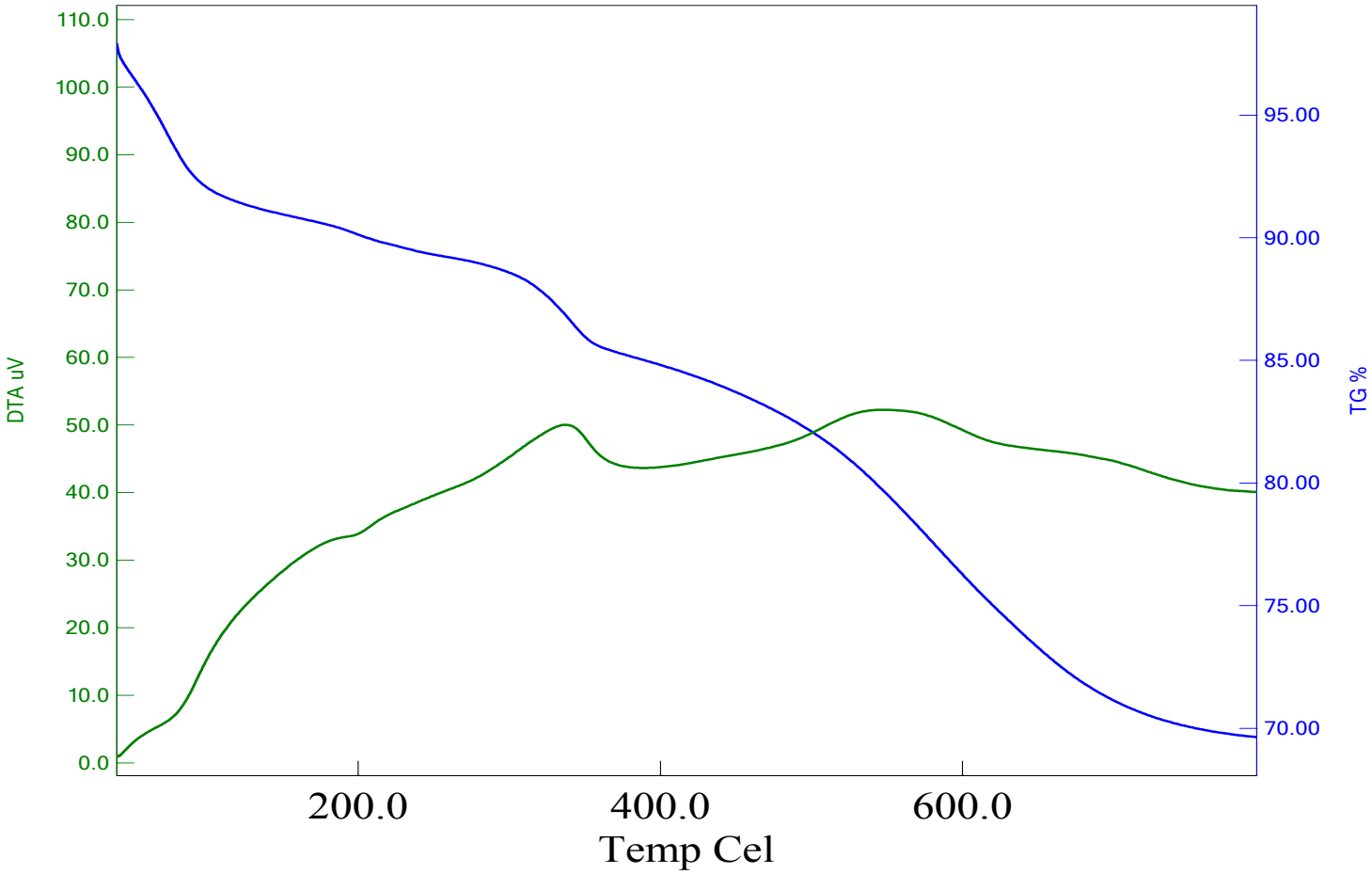
60.00
50.00
40.00
30.00
20.00
10.00
0.00
DTA uV
96.00
94.00
92.00
90.00
88.00
86.00
84.00
TG %
200.0
400.0
600.0
Temp Cel

(a)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0.0
DTA uV
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75.00
70.00
TG %
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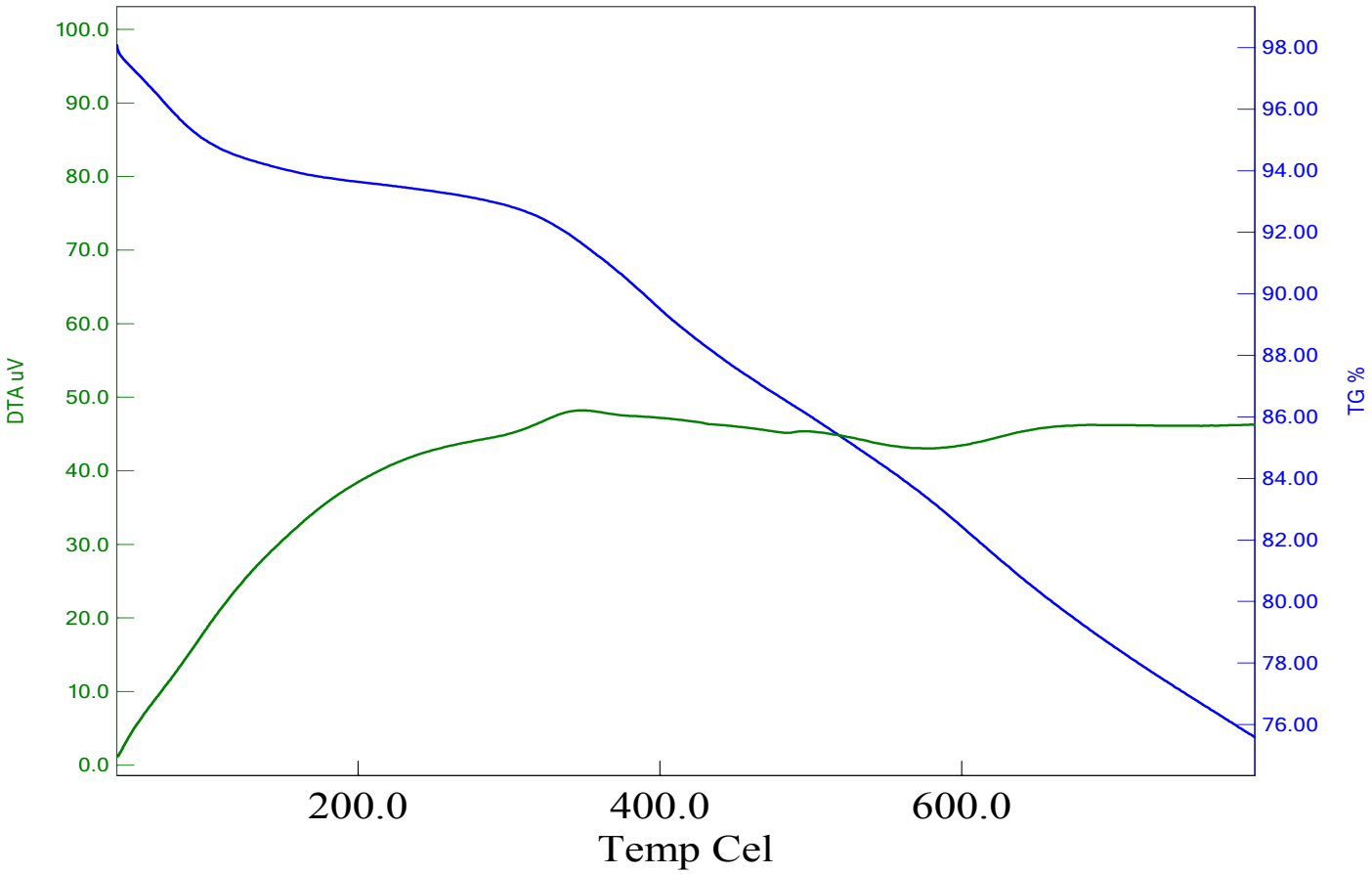
400.0
600.0
Temp Cel

(b)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TG %
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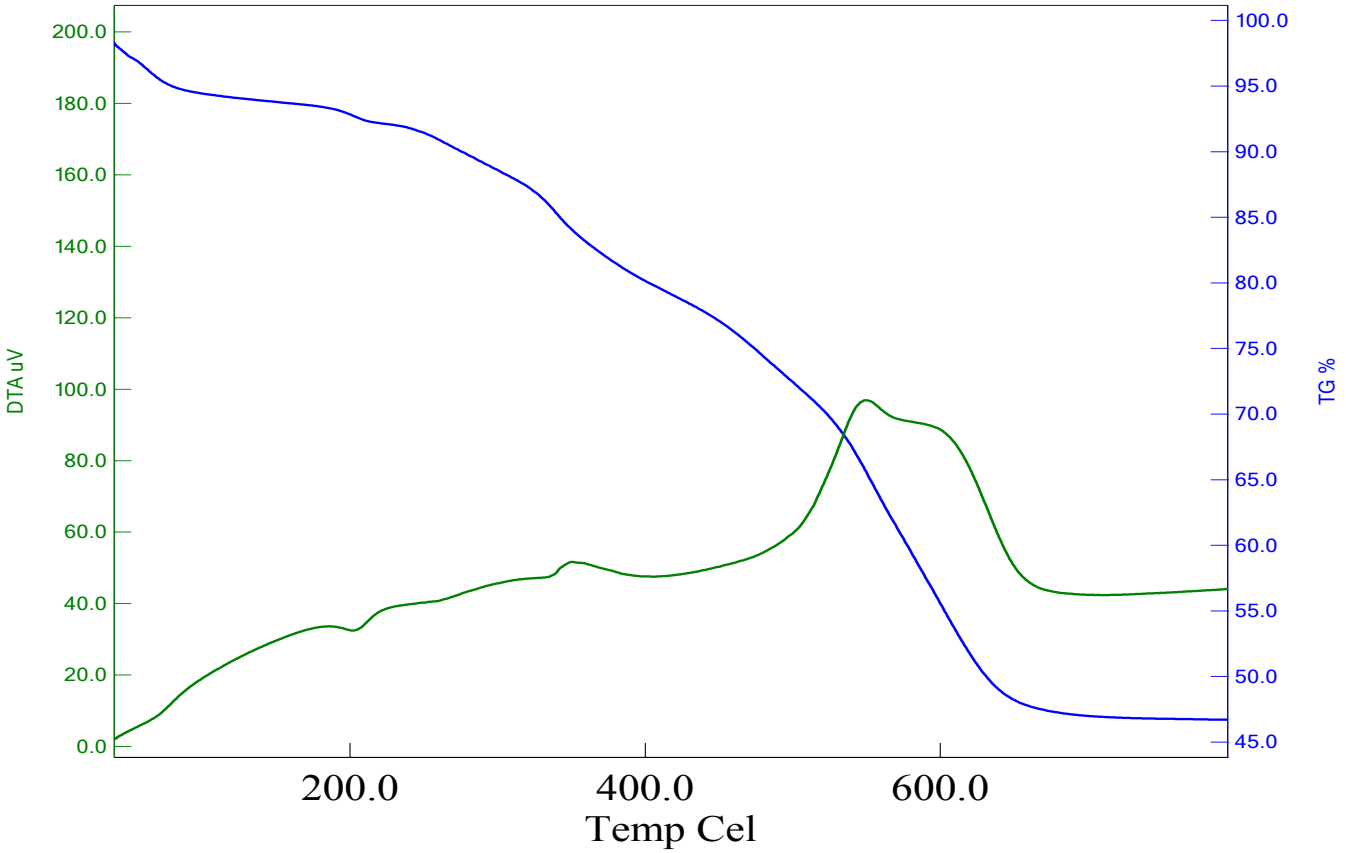
Temp Cel

(c)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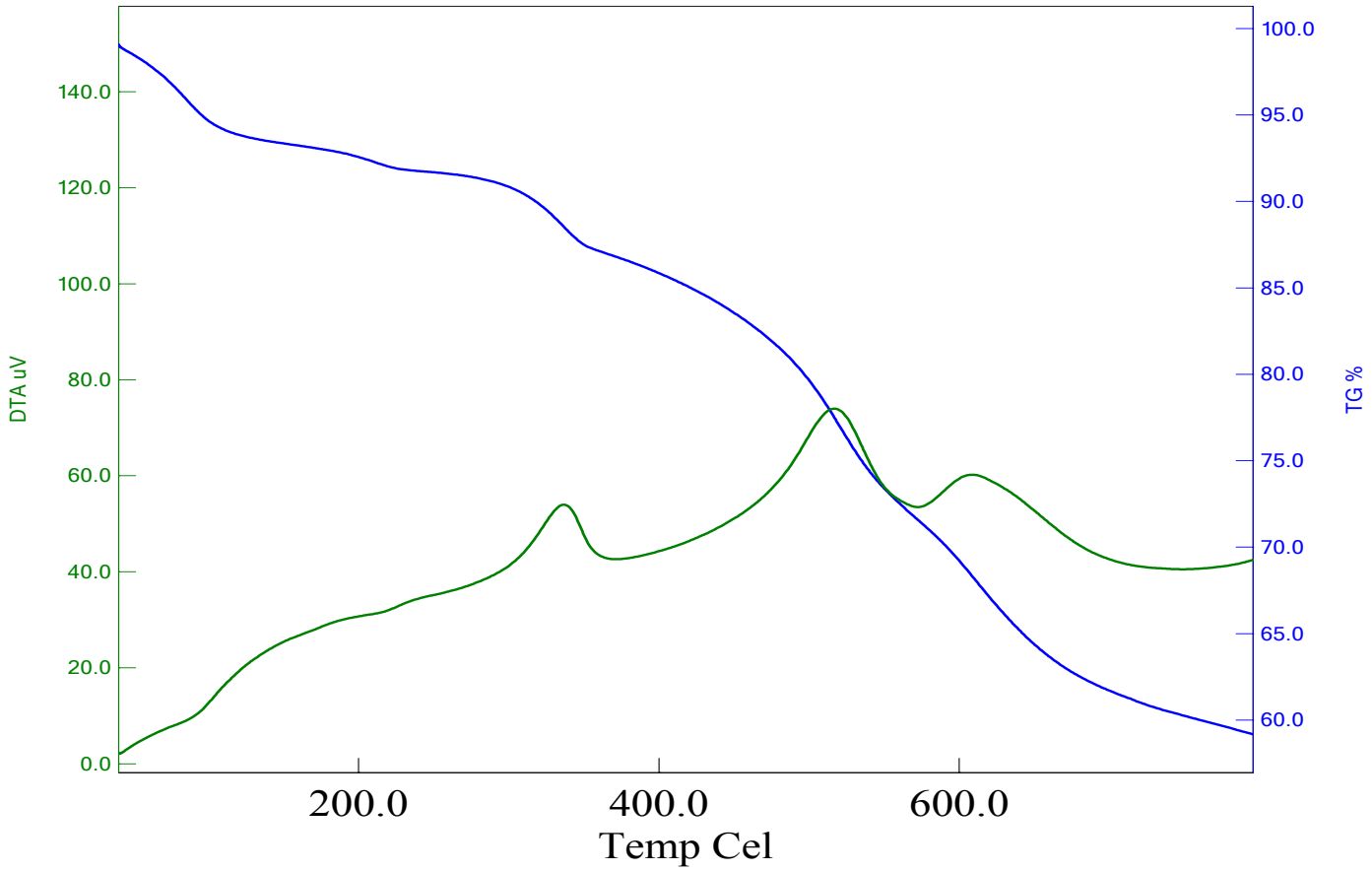
(d)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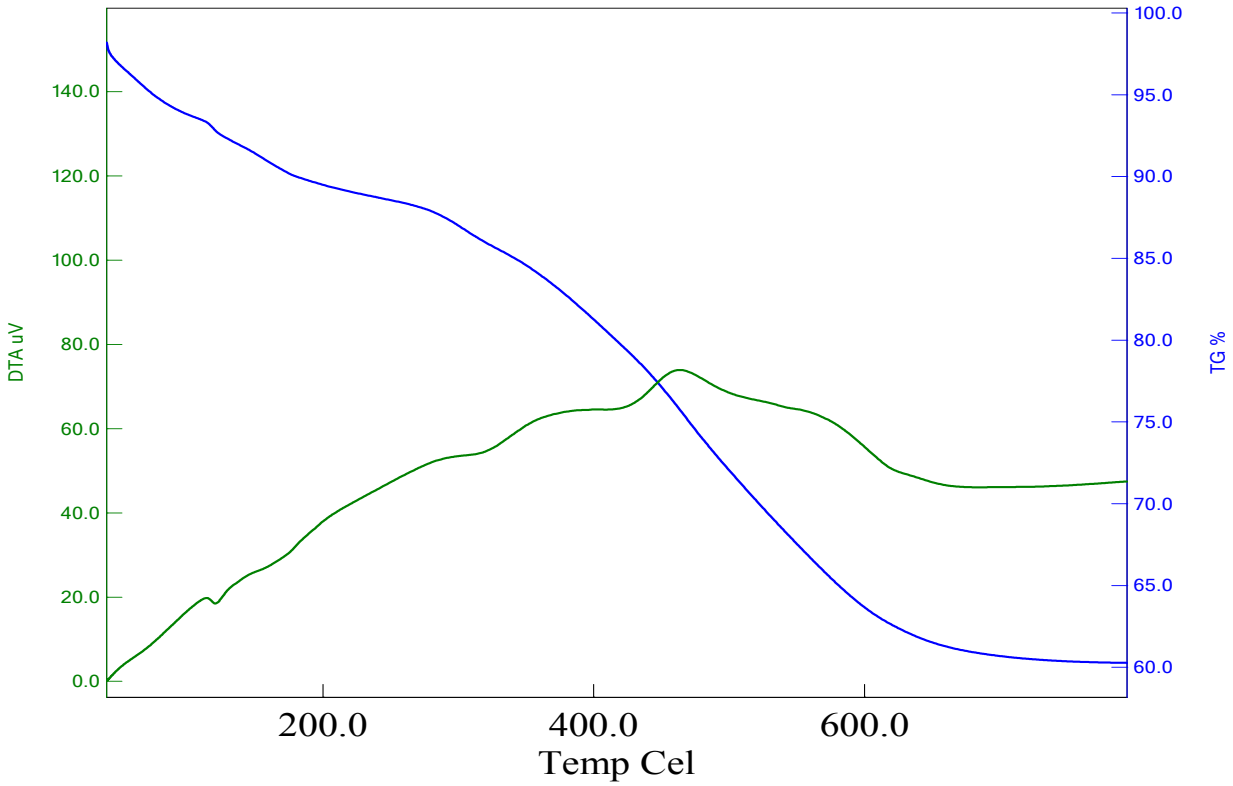
400.0
600.0
Temp Cel

(e)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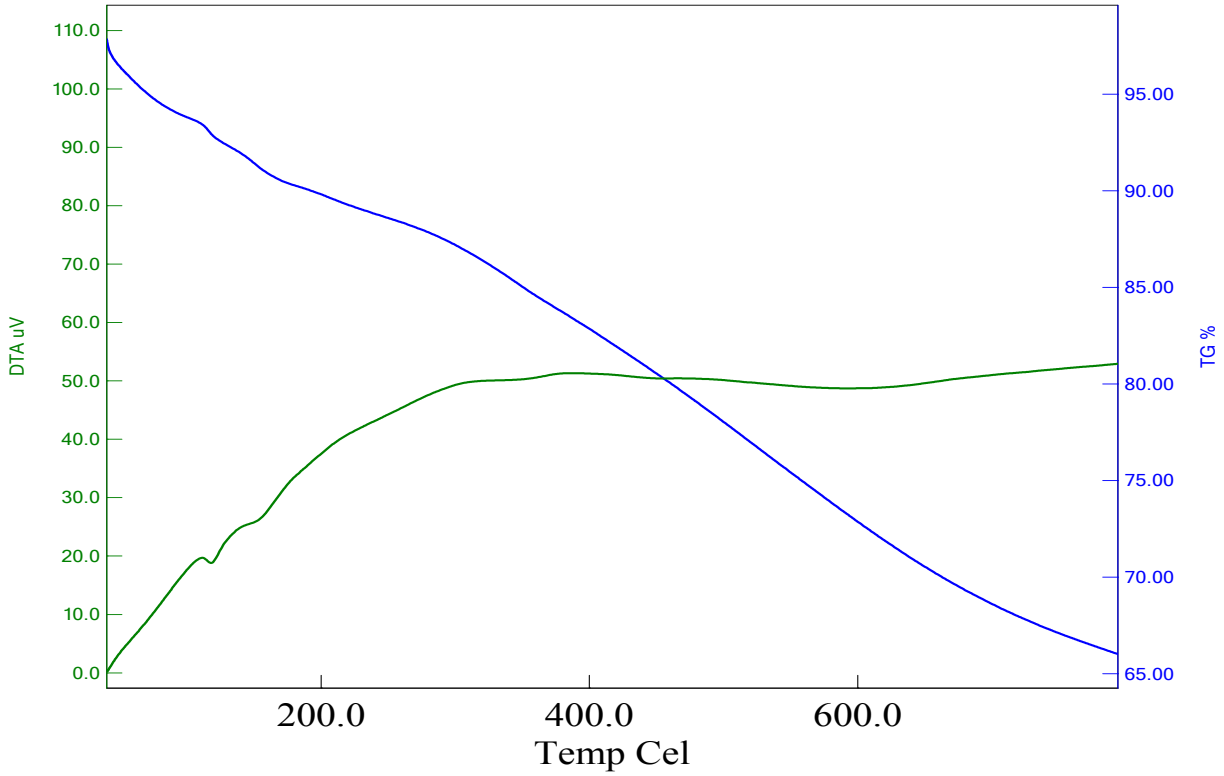
200.0
400.0
600.0
Temp Cel

(f)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40.0
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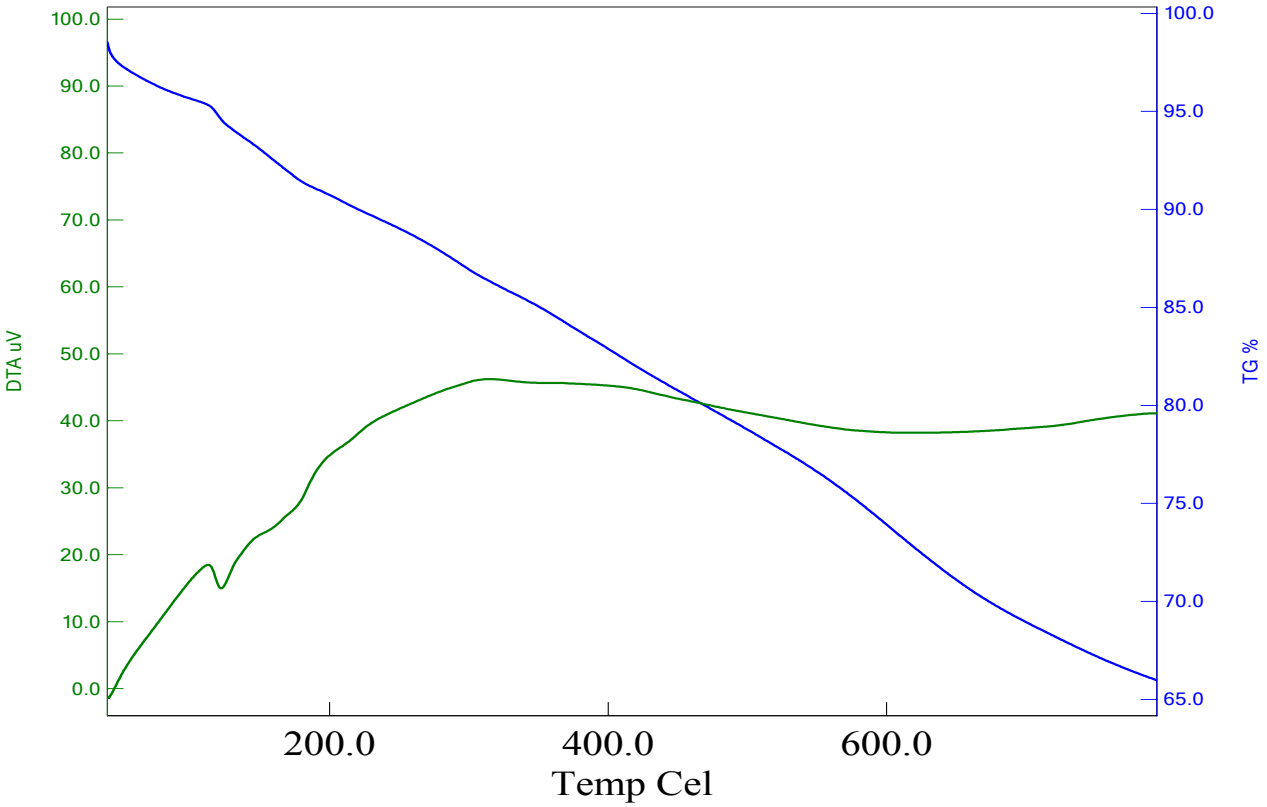
20.0
10.0
0.0
DTA uV
95.00
90.00
85.00
80.00
75.00
70.00
65.00
TG %
200.0
400.0
600.0
Temp Cel

(g)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DTA uV
100.0
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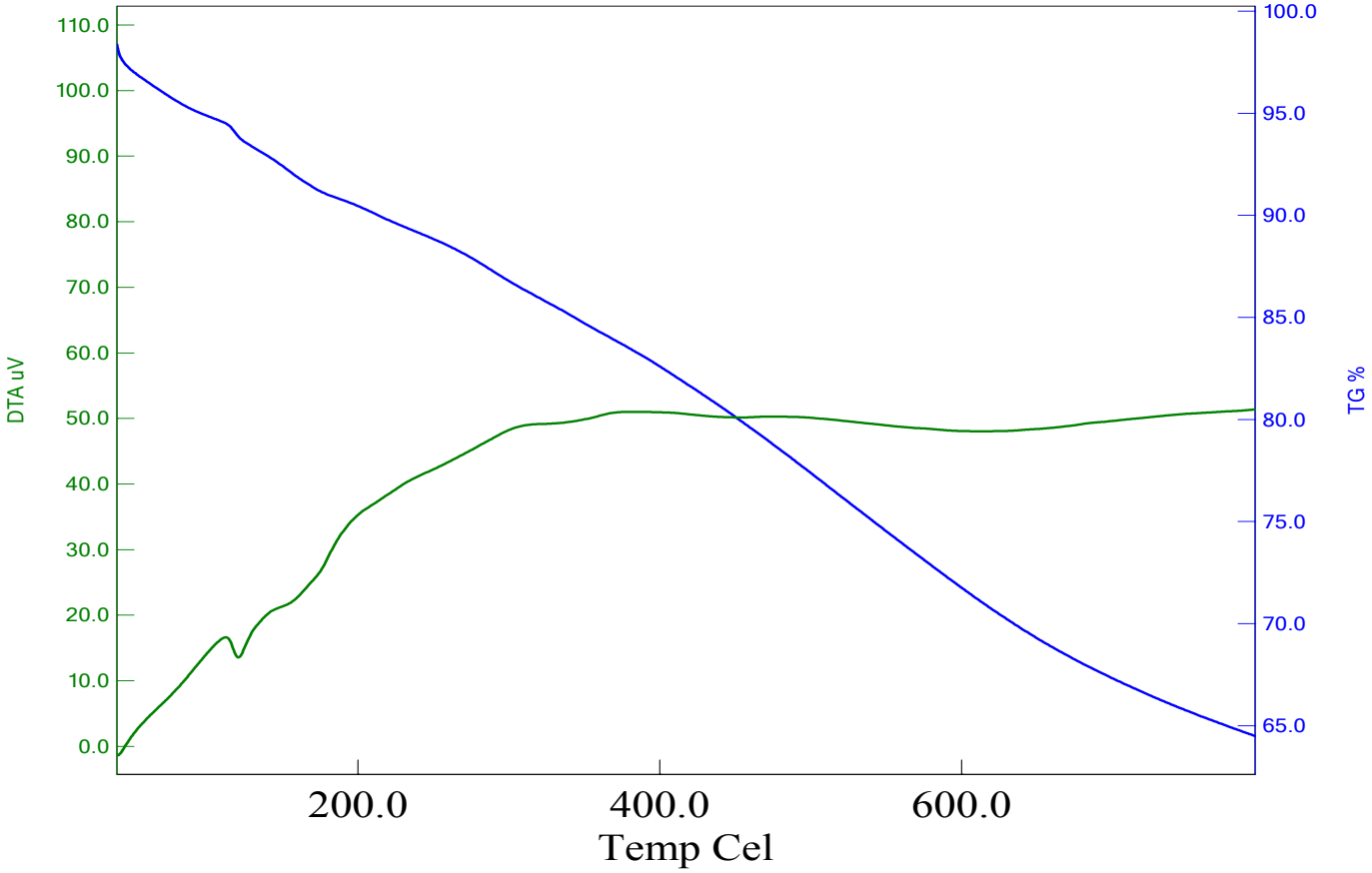
80.0
75.0
70.0
65.0
TG %
200.0
400.0
600.0
Temp Cel

(h)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DTA uV
100.0
95.0
90.0
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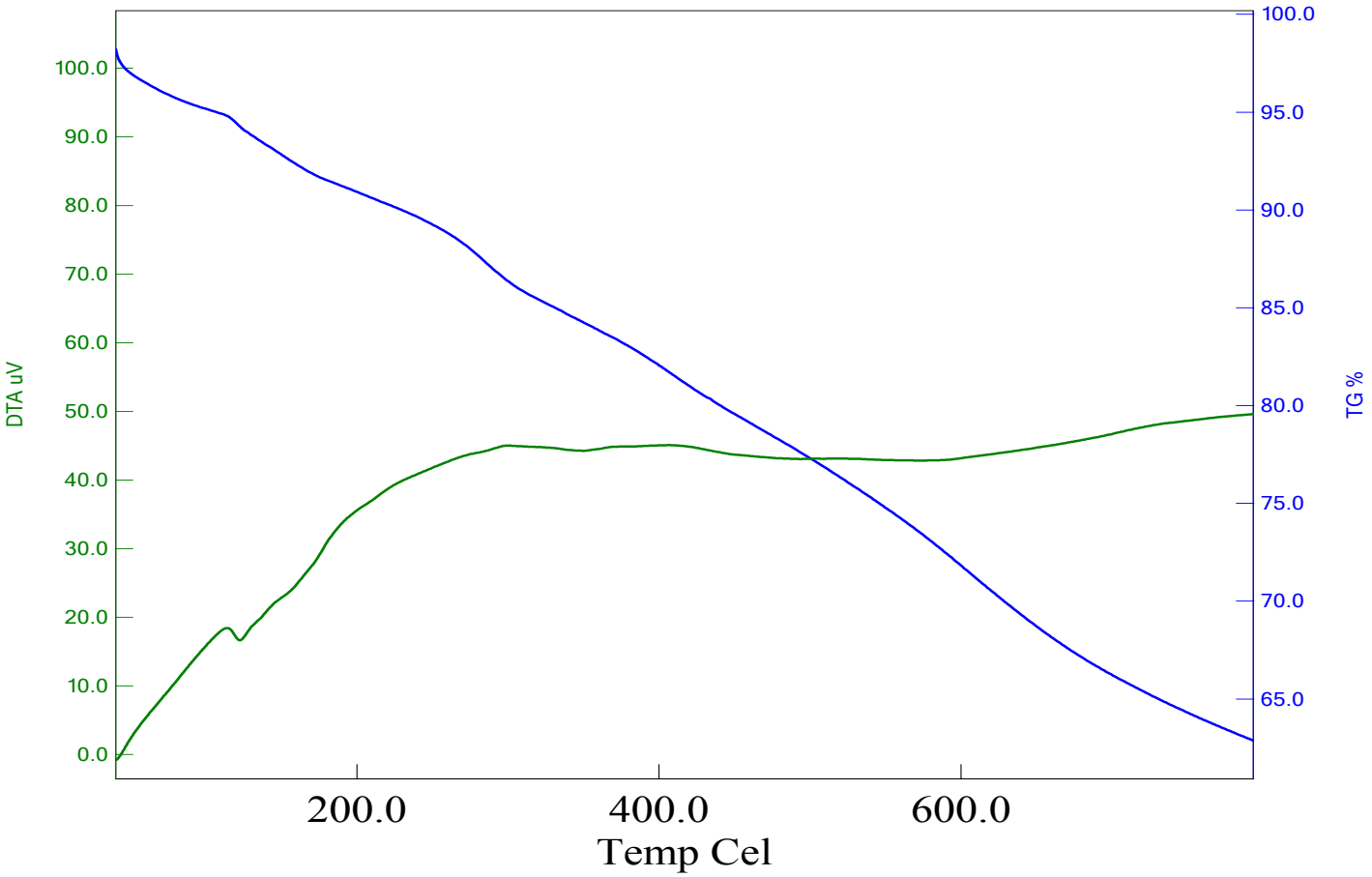
80.0
75.0
70.0
65.0
TG %
200.0
400.0
600.0
Temp Cel

(i)



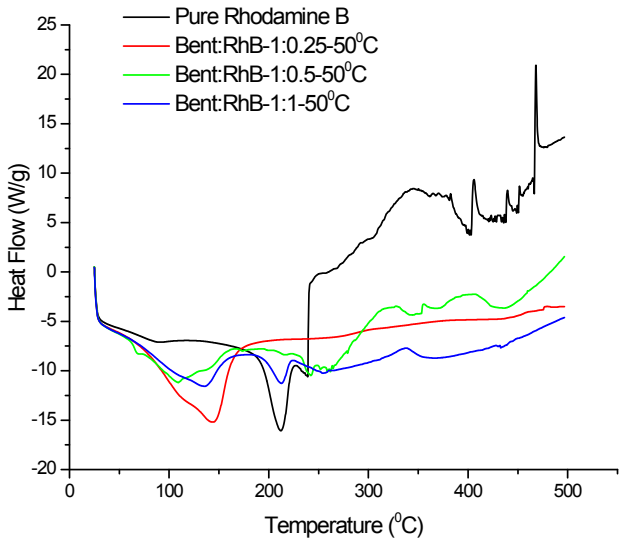
(j)

DTA-TGA thermograms of (a) 1:0.25 RH/Bentonite-30, (b) 1:0.25 RH/Bentonite-50 (c) 1:0.5 RH/Bentonite-30, (d) 1:0.5 RH/Bentonite-50, (e) 1:1 RH/Bentonite-30, (f) 1:0.25 RH/Bentonite/PCz-30, (g) 1:0.25 RH/Bentonite/PC-50, (h) 1:0.5 RH/Bentonite/PC-30 , (i) 1:0.5 RH/Bentonite/PCz-50 , (j) 1:1RH/Bentonite/PC-30

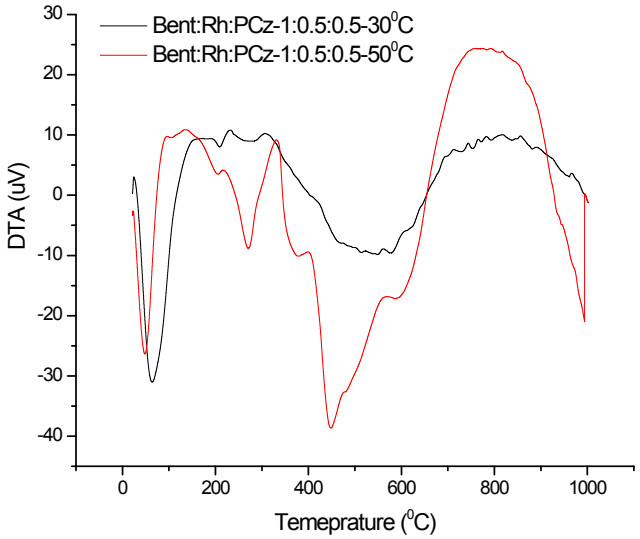
DSC and DTA

DSC and DTA thermograms reveal the thermal characteristics of RhB and PCz in the bentonite clay galleries. DSC thermograms of Bent:RhB nanohybrids ,Figure 3(a), of different composition revealed intercalation of RhB in the interlayer space. DSC thermogram of pure RhB ,Figure 3(a), showed a pronounced endothermic peak at 210°C which was correlated to its melting point. The nanohybrid Bent:RhB-1:0.25-50°C, in which the loading of RhB was 19.8 wt% showed an endothermic depression at 100°C and the other well formed peak at 143○C. The later two peaks were not observed in the RhB's DSC thermogram. Since melting point of RhB is 210°C, the event at 100°C was related to thermal vibration of terminal methyl group of RhB.

The endothermic peak at 143°C is related to disaggregation of the clusters of RhB molecules which were formed during intercalation of RhB in bentonite clay. It thus appeared that the RhB molecules clustered as a physical entity in the Bentonite clay galleries. The nanohybrid Bent:RhB-1:0.5-50°C, Figure 3(a), (loading 32 wt %) showed endothermic peaks at 108°C and 135°C. The first peak was correlated to second order thermal effect of methyl groups vibration and the second was correlated to disaggregation of RhB as was concluded previously. Melting point in this nanohybrid was observed at 235○C instead of 210○C because of some strain in the nanocrystallite. At still higher composition, and loading of 45 wt%, Benti:RhB-1:1-50°C ,Figure 3(a), showed a well formed endothermic peak at 132°C and another well formed endothermic peak at 212°C and a well formed exothermic peak at 333°C. Since the width of the clay gallery in this case was large the RhB molecules could organize themselves as aggregates and miniscule crystals.



(a)

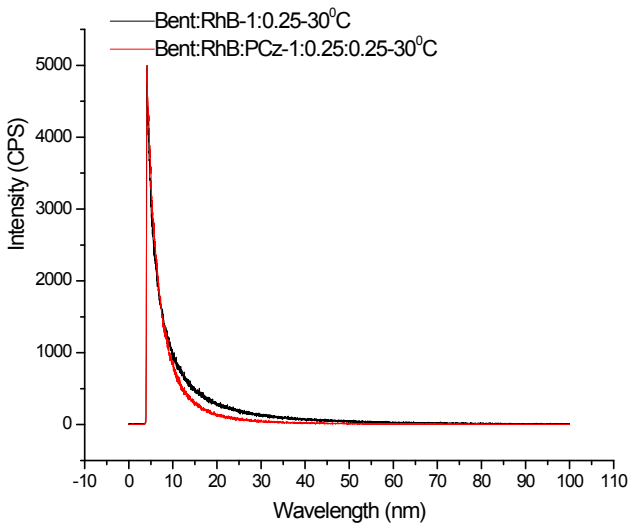


(b)

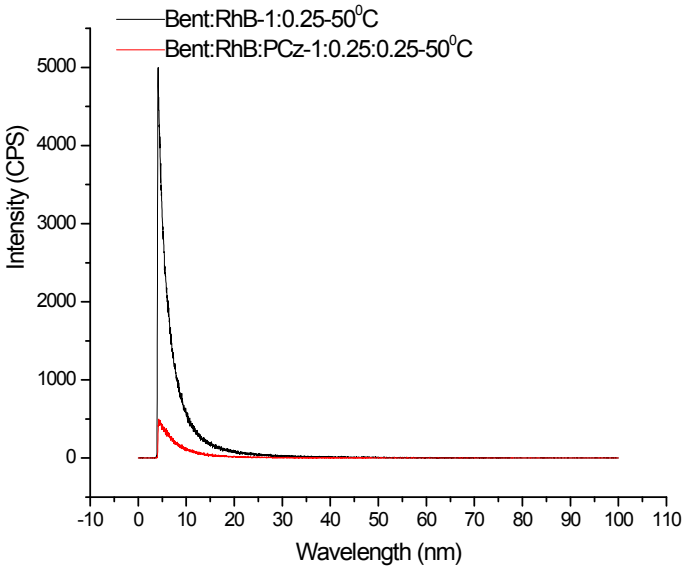
(a) DSC of RhB, Bent:RhB-1:0.25-50°C, Bent:RhB-1:0.5-50°C, Bent:RhB-1:1-50°C (d) DTA of Bent:RhB:PCz-1:0.5:0.5-30°C, Bent:RhB:PCz-1:0.5:0.5-50°C

The disaggregation occurred at 132°C, while RhB crystallites showed melting point at 212°C. These values match with the data of previous nanohybrid. The exothermic event at 333○C is

matching with the pure RhB. The DTA curve of the nanohybrid Bent:RhB:PCz-1:0.5:0.5-30°C ,Figure 3(b), showed several endothermic and exothermic events related to RhB and PCz. An endothermic peak was observed at 64°C and was correlated to evaporation of adsorbed solvent. Very tiny endothermic peak was observed at 210°C attributed to RhB melting point. A new small endothermic peak was noted at 250°C which was correlated to PCz melting. An exothermic peak at 300°C shows decomposition of RhB which was observed in the DSC thermogram of pure RhB at 330°C Another new and well formed endothermic peak at 460°C may be correlated to the structural transformation of PCz polymer immediately followed by a wide decomposition exotherm between 600-1000°C. DTA of the above RhB-PCz nanohybrid however did not reveal disaggregating peak of RhB between 135-143°C. But nano/micro crystallites of RhB were noticed through its melting point at 210°C. It showed that RhB aggregate formation was prevented in presence of PCz. The thermogram therefore showed the presence of RhB and PCz in the clay galleries and the size of endothermic peak at 460°C and the exothermic peak between 600-1000°C indicated appreciable amount of PCz in the bentonite clay galleries. The nanohybrid Bent:RhB-1:0.5:0.5-50°C , Figure 3(b), showed DTA trace with well formed distinct endothermic and exothermic peaks due to RhB and PCz. The peaks noted were well formed endothermic peak at 210°C attributed to melting of RhB, and another endothermic peak at 260°C due to melting of PCz as was observed in the previous nanohybrid. The exothermic peak at 333°C due to decomposition of RhB, endothermic peak at 460○C due to the structural transformation of PCz and exothermic peak at 600-1000°C due to decomposition of PCz were observed. The presence of endothermic and exothermic peaks of RhB and PCz clearly established double intercalation of the two moieties and nanocrystallite formation of RhB in the interlayer space of bentonite clay.



(a)



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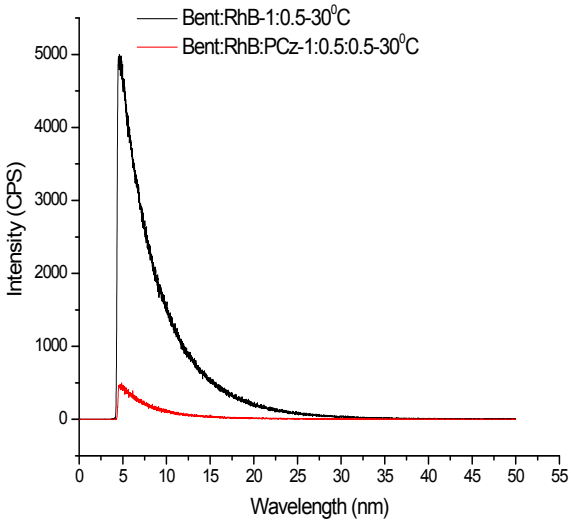

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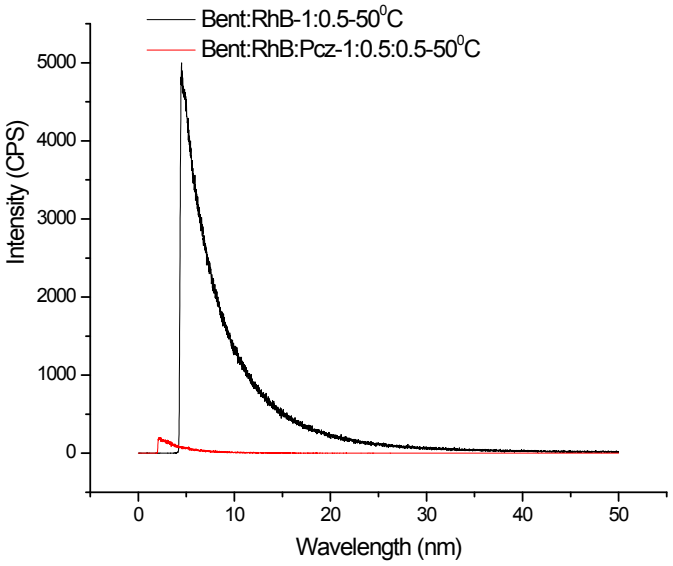
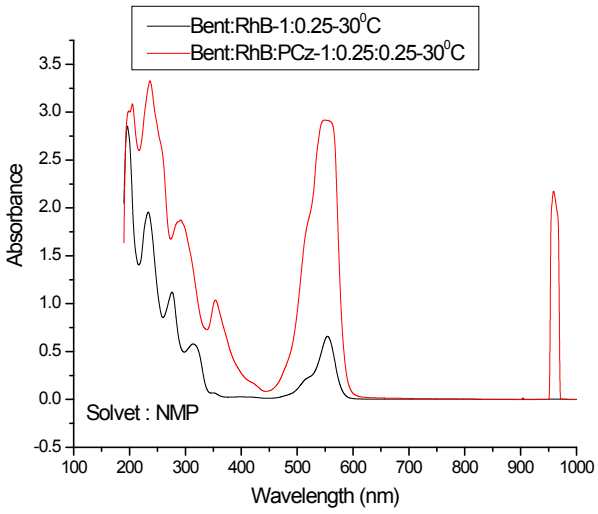
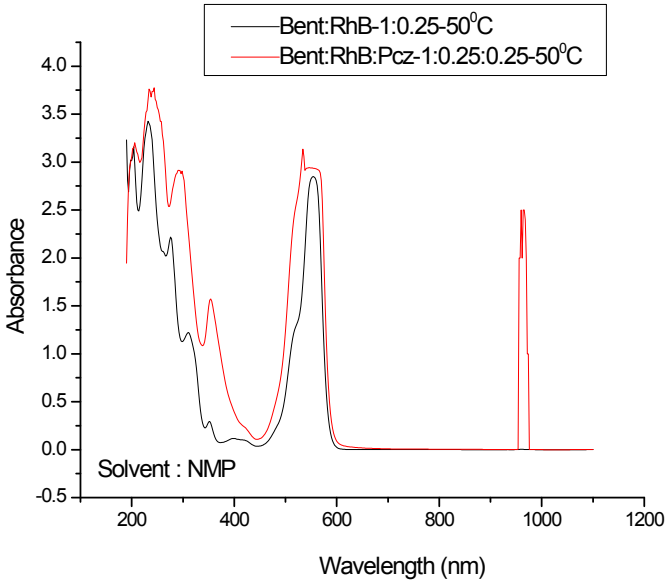


(d)

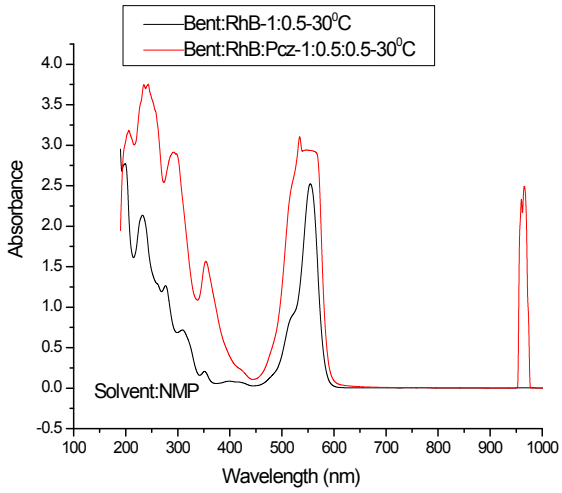
Time resolved spectra of Bent:RhB and Bent:Rhb:PCz nanohybrids


Bent:RhB-1:0.25-30°C
Bent:RhB:PCz-1:0.25:0.25-30°C
Absorbance
Solvet : NMP
Wavelength (nm)

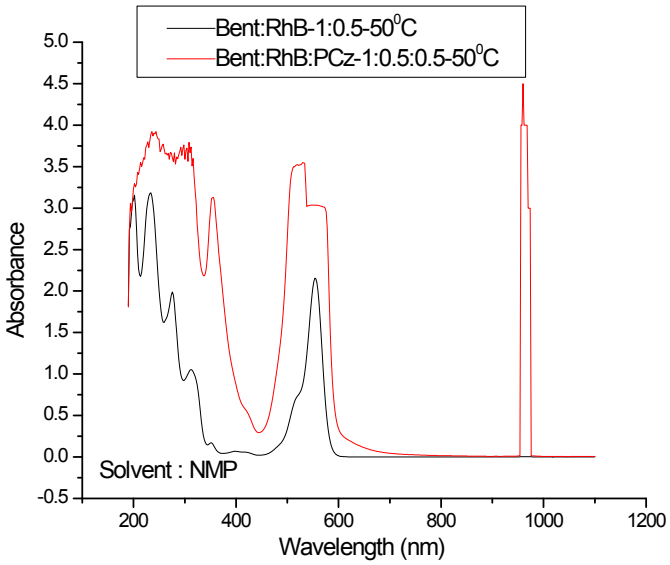
(a)


Bent:RhB-1:0.25-50°C
Bent:RhB:Pcz-1:0.25:0.25-50°C
Absorbance
Solvent : NMP
Wavelength (nm)

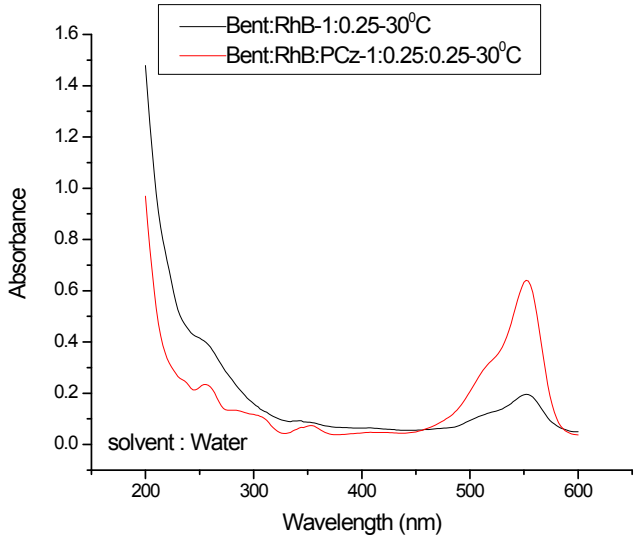
(b)


Bent:RhB-1:0.5-30°C
Bent:RhB:Pcz-1:0.5:0.5-30°C
Absorbance
Solvent:NMP
Wavelength (nm)

(c)


Bent:RhB-1:0.5-50°C
Bent:RhB:PCz-1:0.5:0.5-50°C
Absorbance
Solvent : NMP
Wavelength (nm)

(d)



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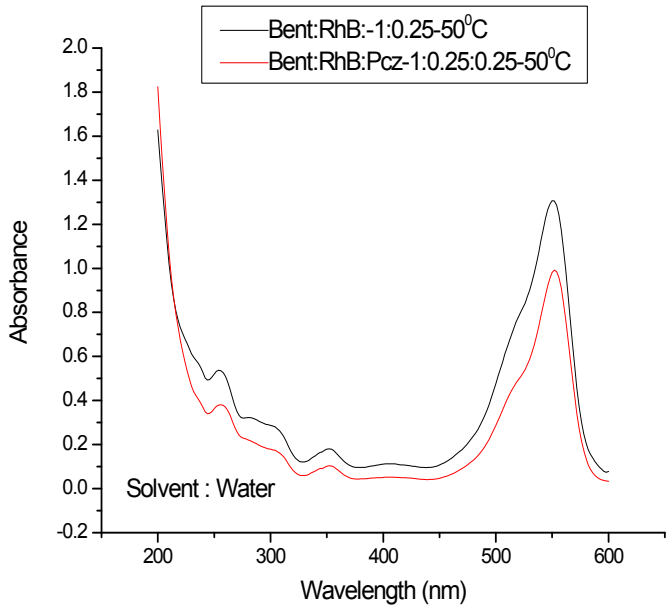

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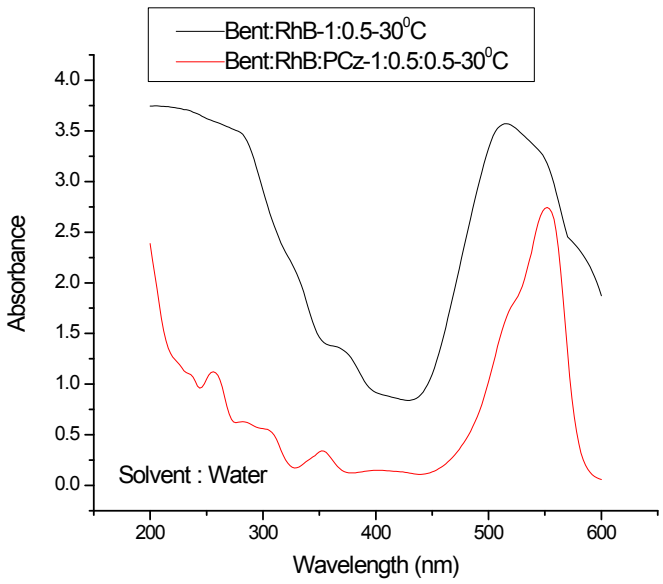

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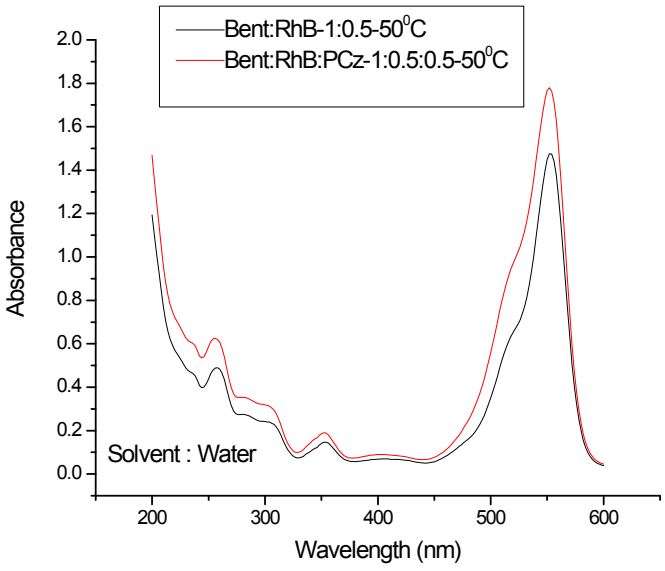

(h)

UV-visible spectra of Bent:RhB and Bent:RhB:PCz nanohybrids