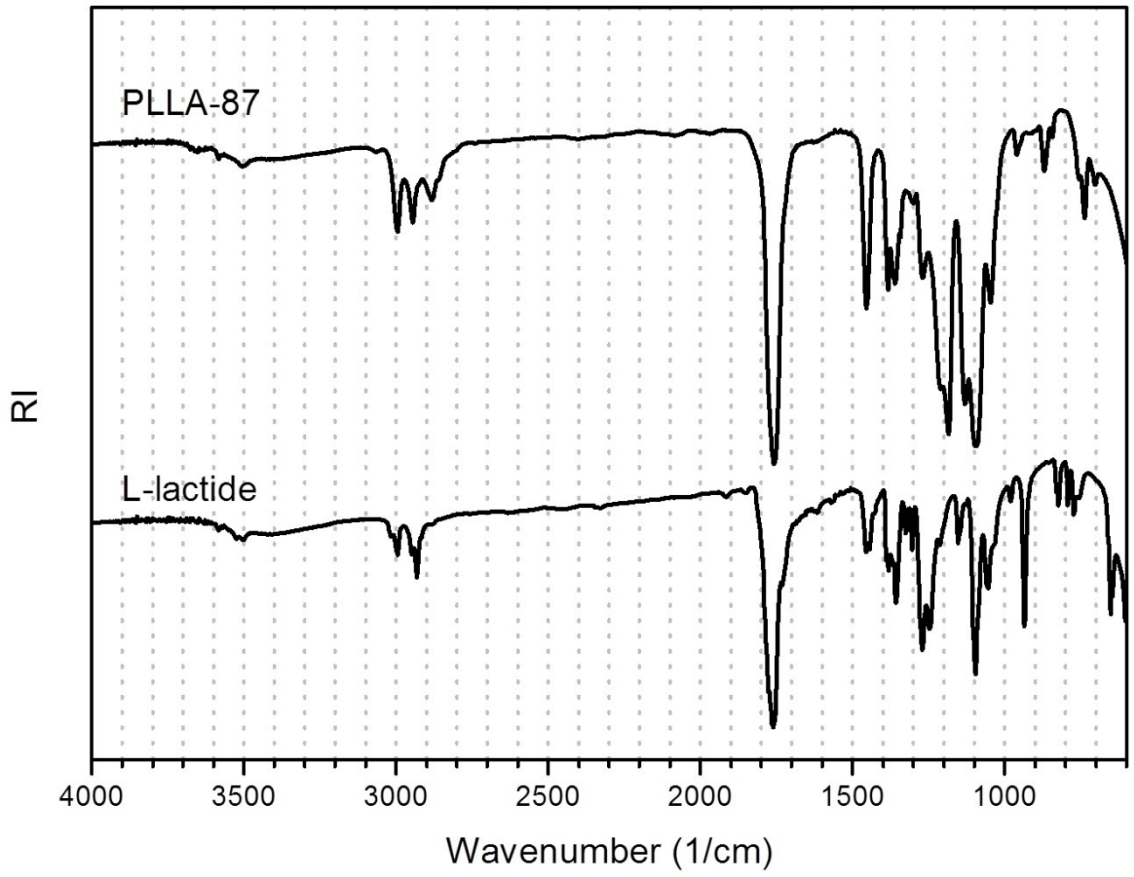
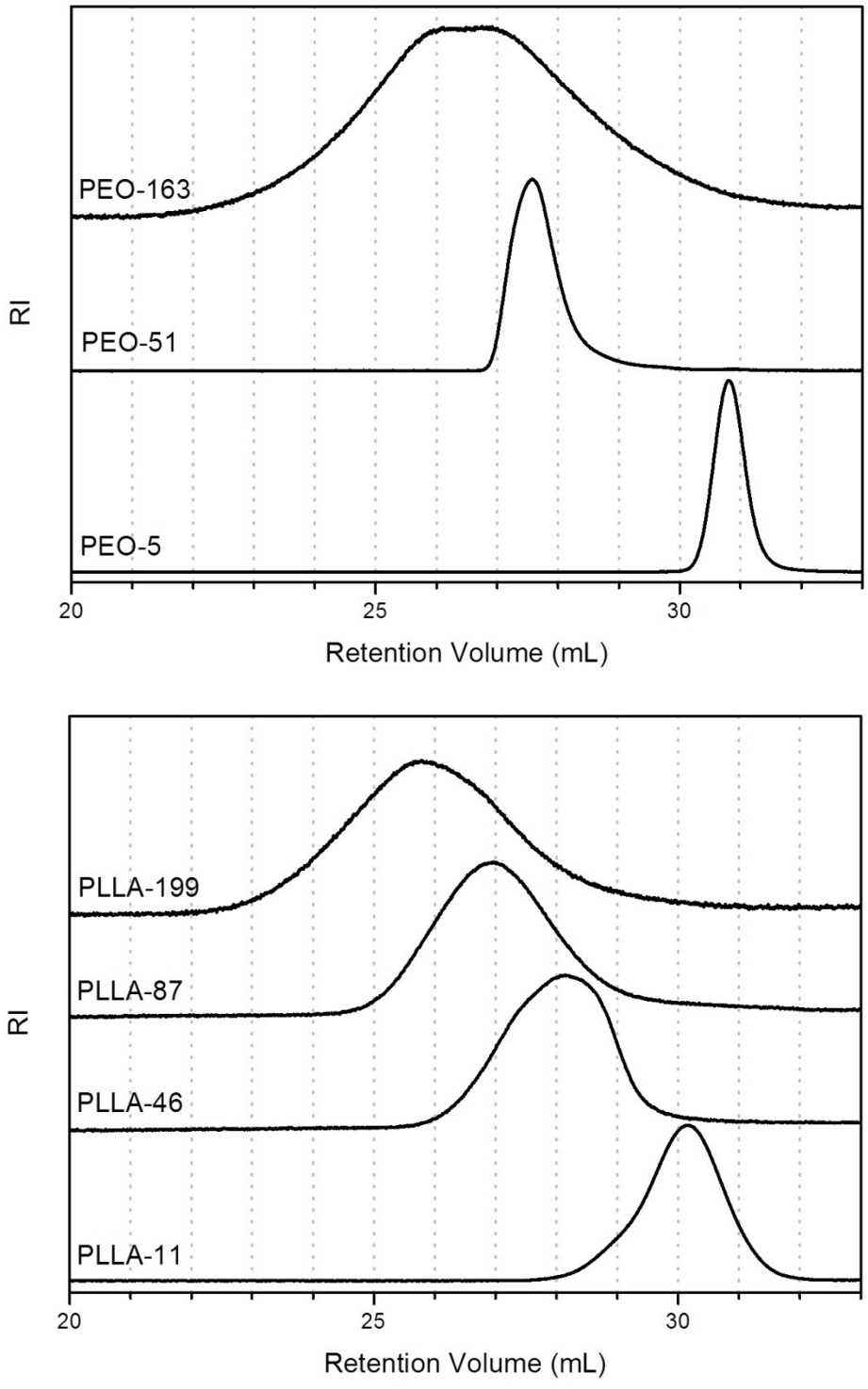
Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information 01



SI 01: FTIR spectra for L-lactide and poly(L-lactide) with weight average molar mass equal 87 kg/mol (PLLA-87). The others synthetic PLLA presented the same FTIR profile.

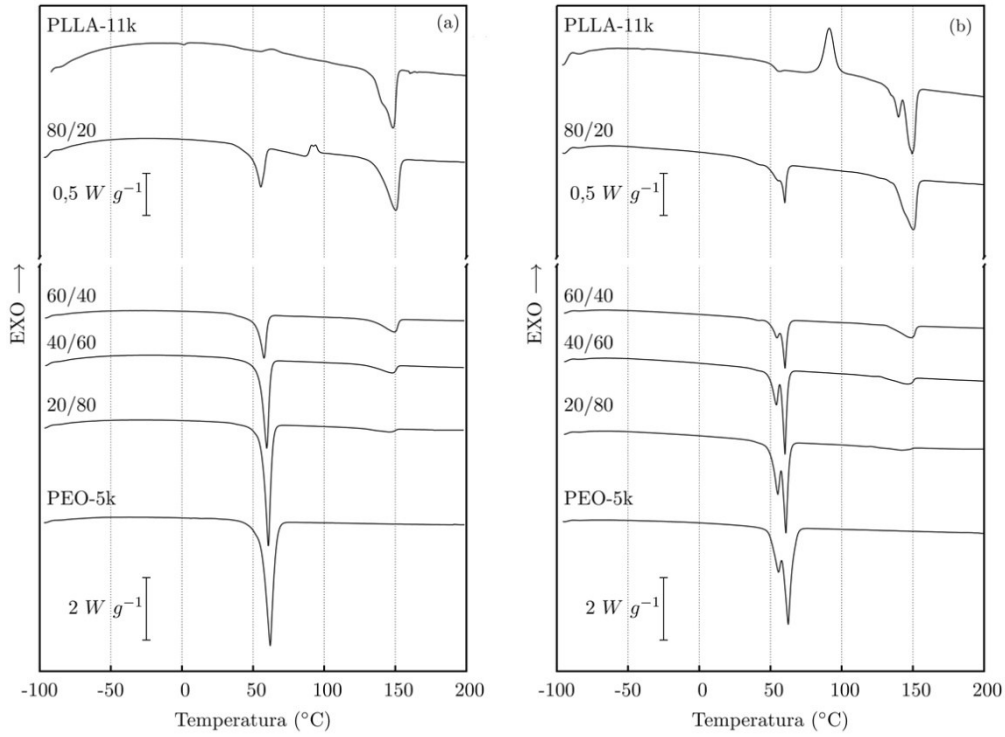
Supporting Information 02

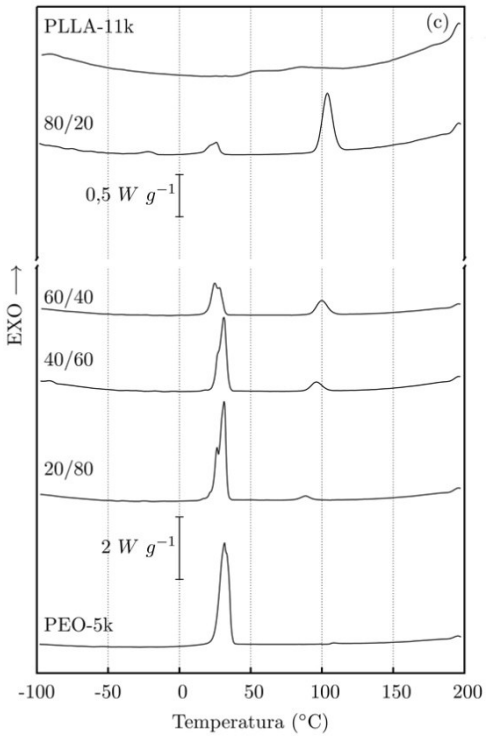


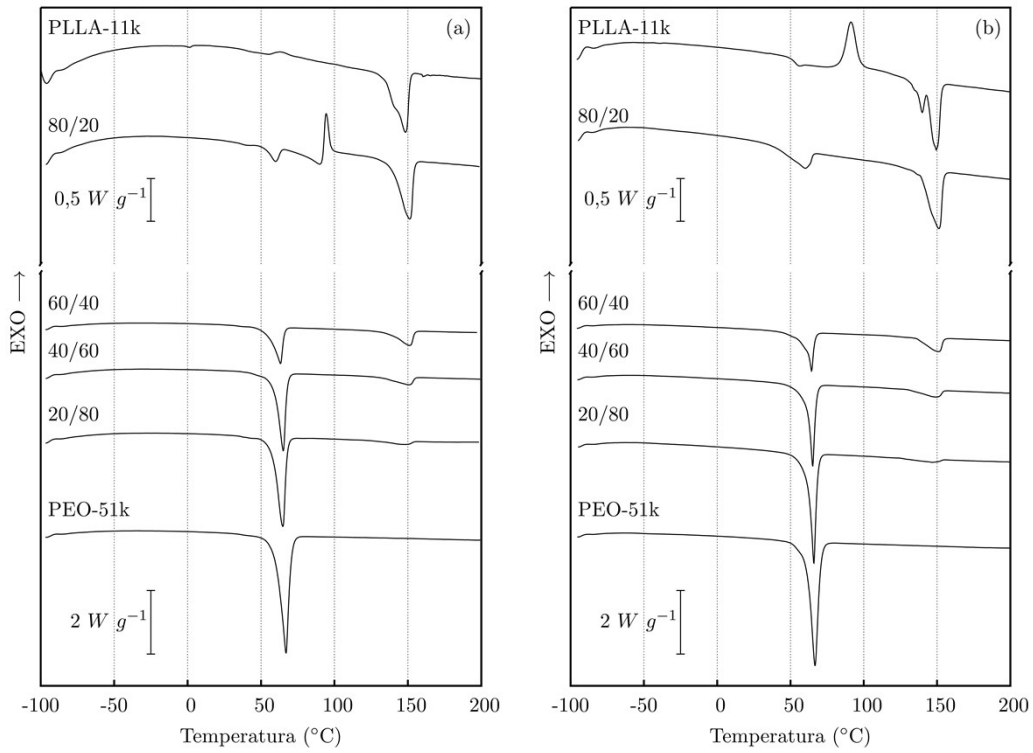
SI 02: GPC chromatograms for homopolymers. [Top] PEO homopolymers, [Bottom] PLLA homopolymers.

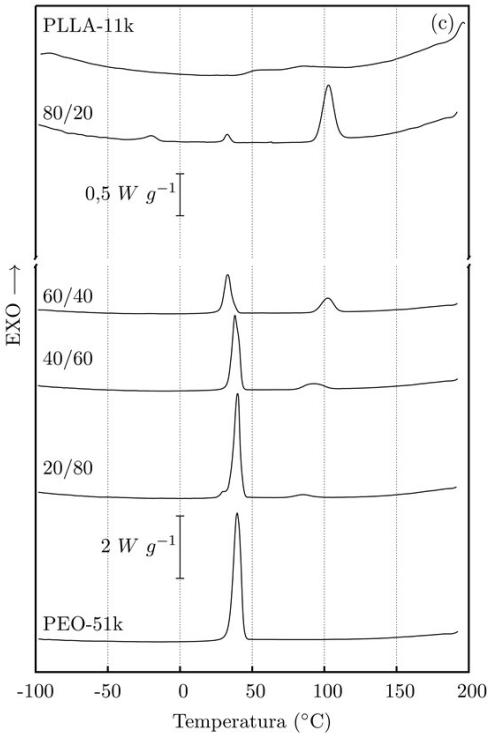
Supporting Information 03

SI 03: DSC curves for (a) 1st and (b) 2nd heating, and (c) cooling.






PLLA-11k
(a)
80/20
0,5 W g−1
EXO ⟶
60/40
40/60
20/80
PEO-51k
2 W g−1
-100 -50 0 50 100 150 200
Temperatura (°C)
PLLA-11k
(b)
80/20
0,5 W g−1
EXO ⟶
60/40
40/60
20/80
PEO-51k
2 W g−1
-100 -50 0 50 100 150 200
Temperatura (°C)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(c)
80/20
0,5 W g−1
EXO ⟶
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20/80
2 W g−1
PEO-51k
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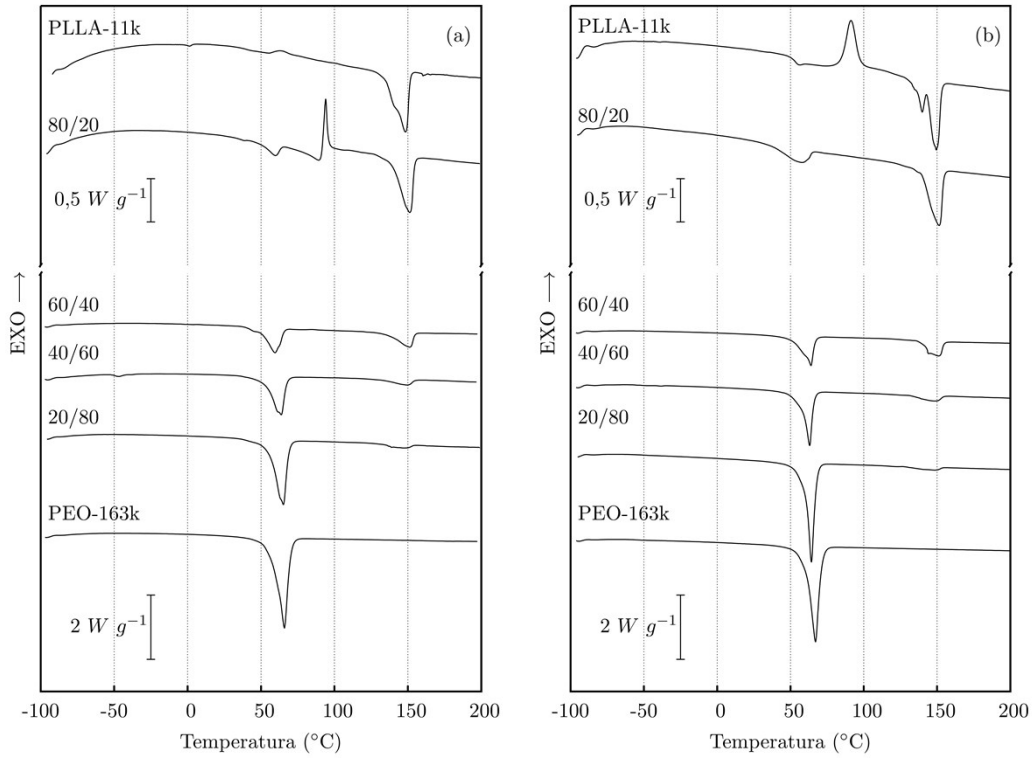
Temperatura (°C)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20/80
PEO-163k
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Temperatura (°C)
PLLA-11k
(b)
80/20
0,5 W g−1
EXO ⟶
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20/80
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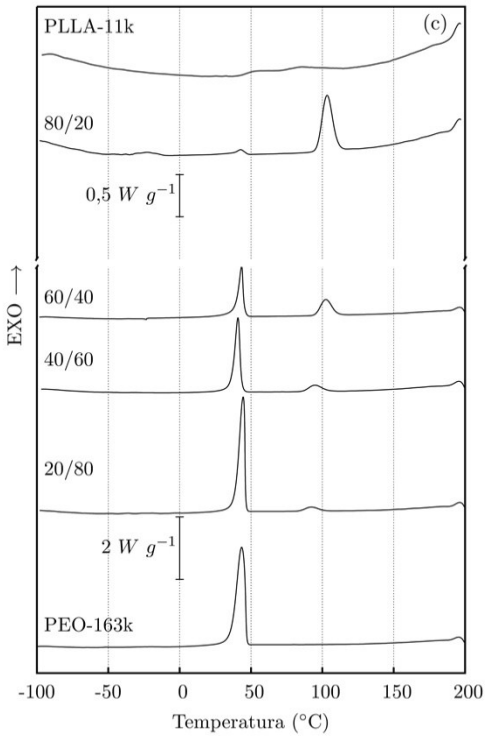
Temperatura (°C)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(c)
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20/80
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PEO-163k
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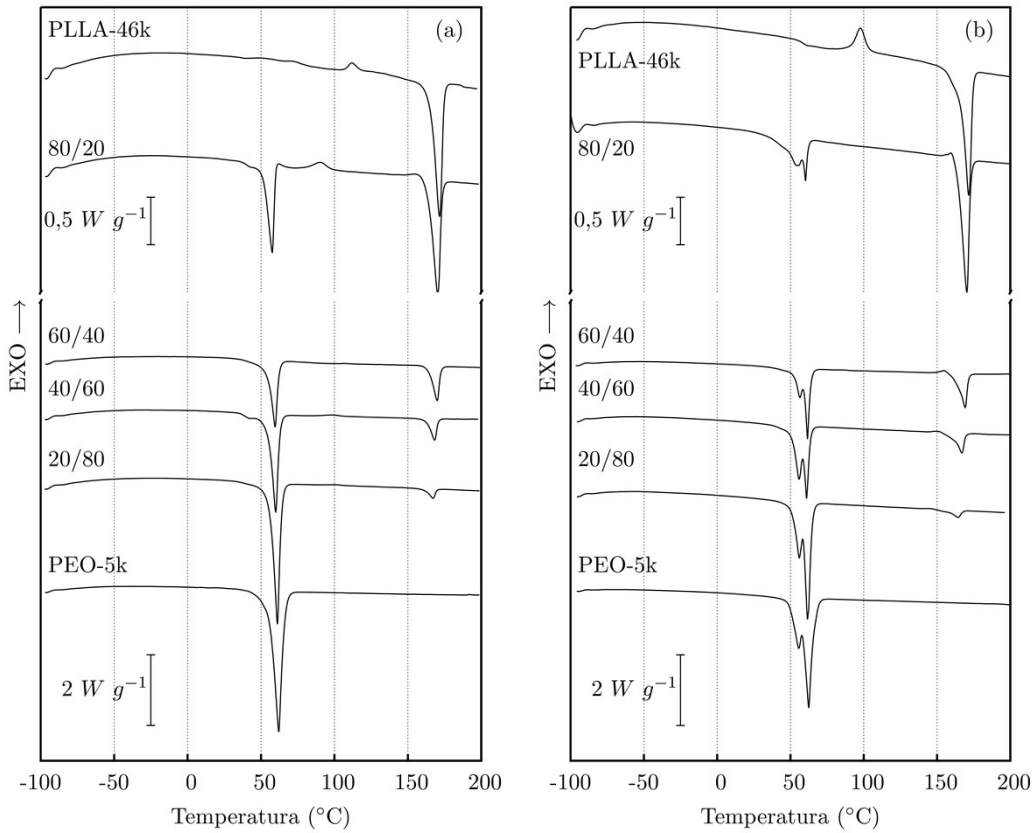
Temperatura (°C)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20/80
PEO-5k
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Temperatura (°C)
PLLA-46k
(b)
80/20
0,5 W g−1
EXO ⟶
60/40
40/60
20/80
PEO-5k
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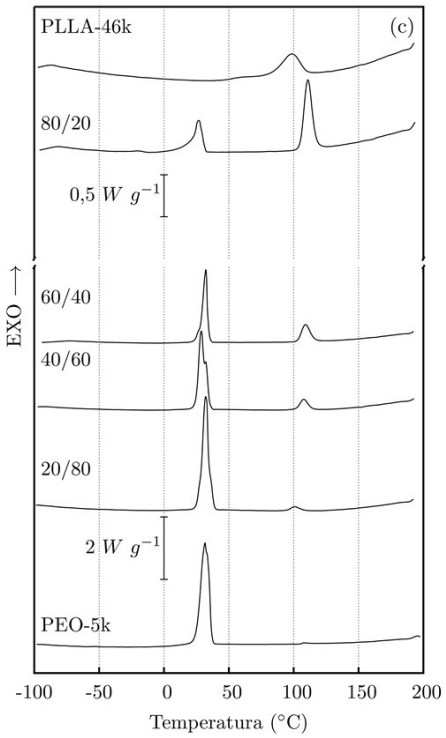
Temperatura (°C)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20/80
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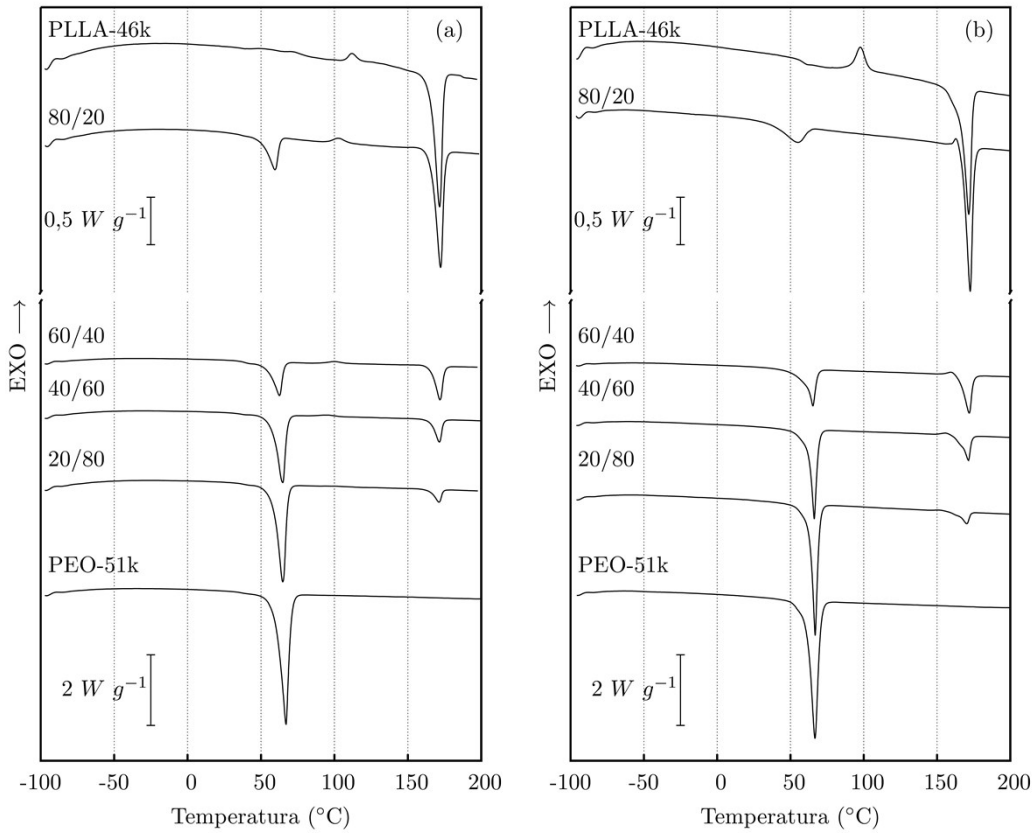
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60/40
40/60
20/80
PEO-51k
2 W g−1
EXO ⟶
-100 -50 0 50 100 150 200
Temperatura (°C)
PLLA-46k
(b)
80/20
0,5 W g−1
60/40
40/60
20/80
PEO-51k
2 W g−1
EXO ⟶
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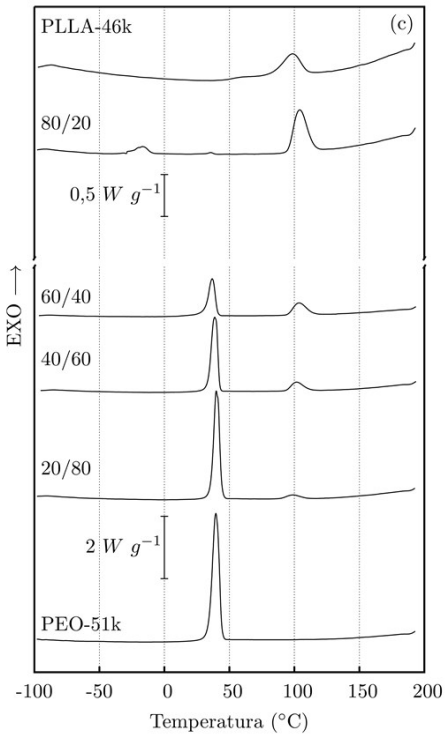
Temperatura (°C)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20/80
2 W g−1
PEO-51k
EXO ⟶
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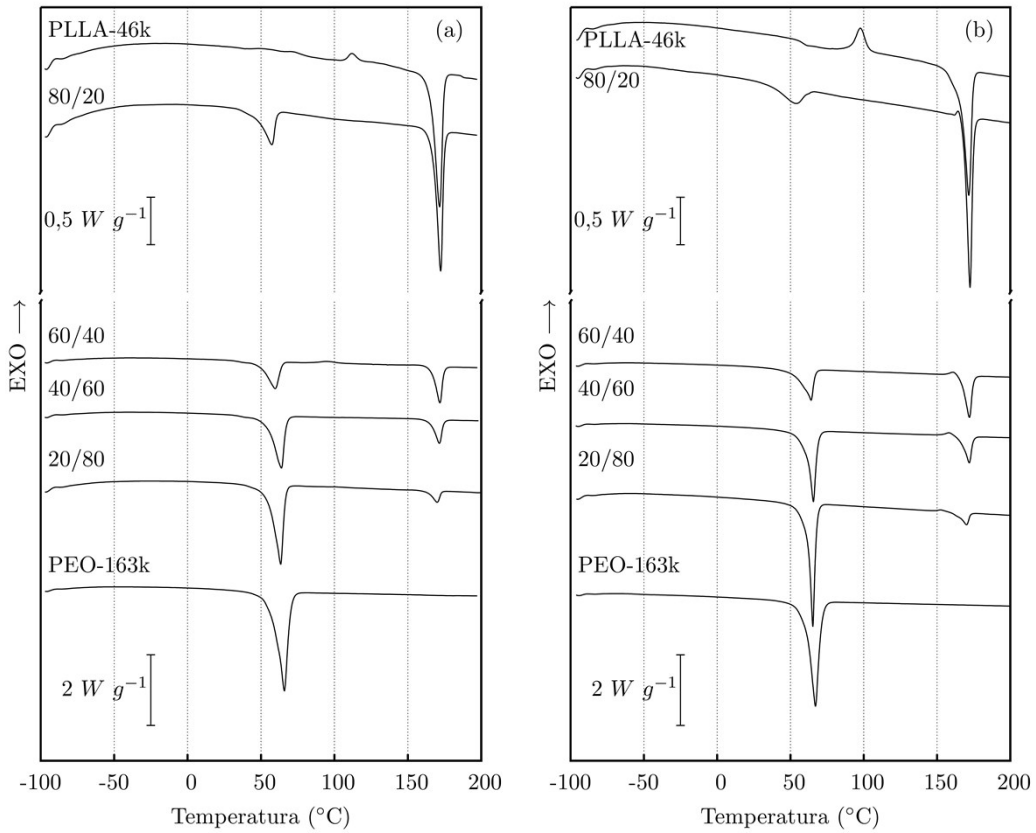
Temperatura (°C)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40/60
20/80
PEO-163k
2 W g−1
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Temperatura (°C)
PLLA-46k
(b)
80/20
0,5 W g−1
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40/60
20/80
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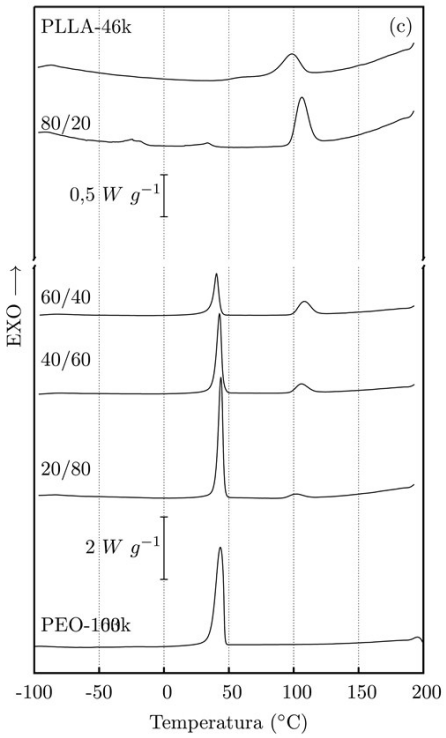
Temperatura (°C)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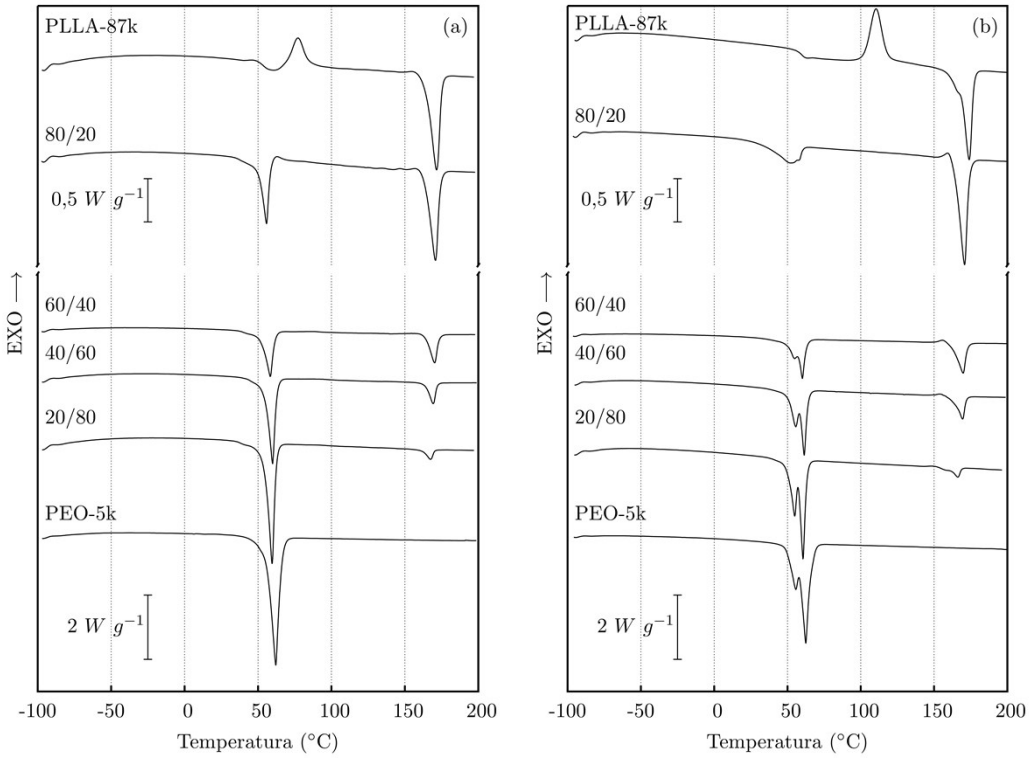
Temperatura (°C)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20/80
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2 W g−1
EXO ⟶
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Temperatura (°C)
PLLA-87k
(b)
80/20
0,5 W g−1
60/40
40/60
20/80
PEO-5k
2 W g−1
EXO ⟶
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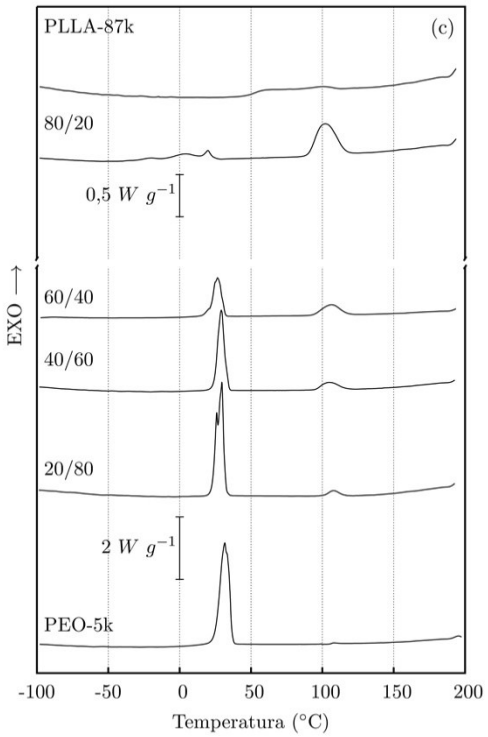
Temperatura (°C)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2 W g−1
PEO-5k
EXO ⟶
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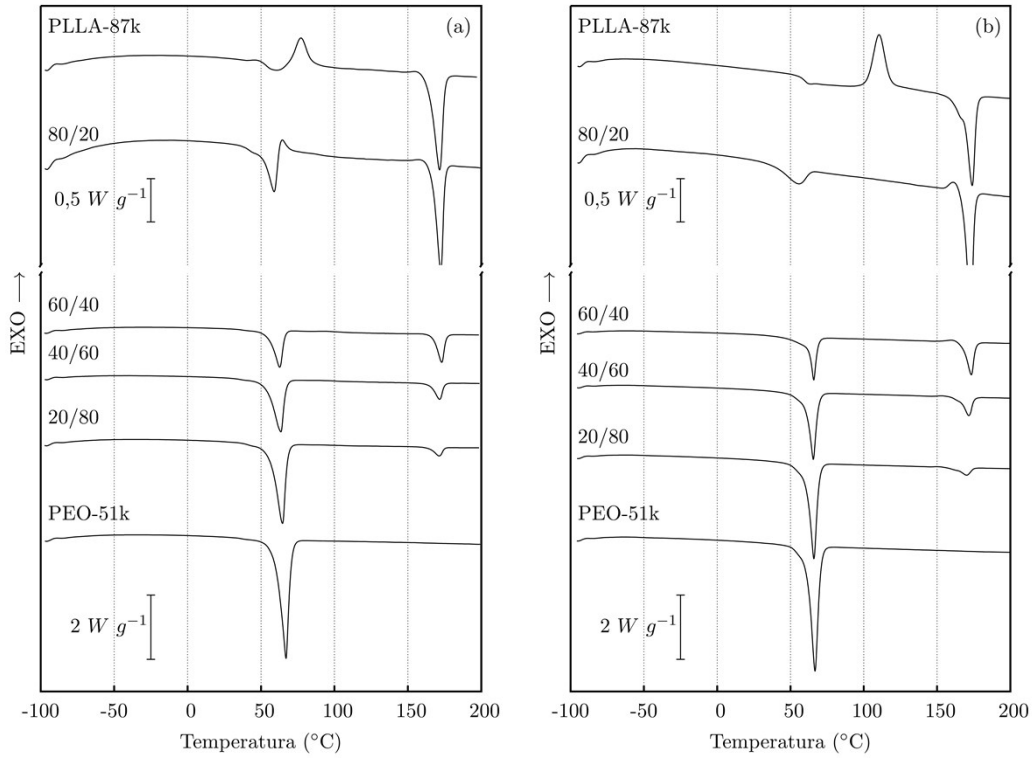
Temperatura (°C)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60/40
40/60
20/80
PEO-51k
2 W g−1
EXO ⟶
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Temperatura (°C)
PLLA-87k
(b)
80/20
0,5 W g−1
60/40
40/60
20/80
PEO-51k
2 W g−1
EXO ⟶
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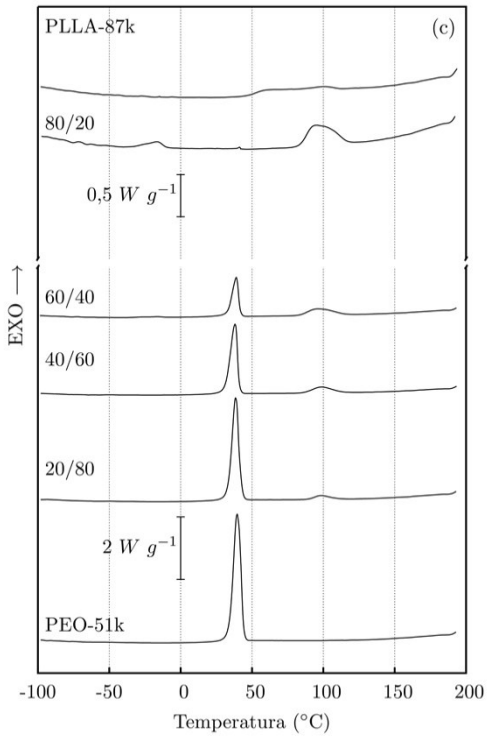
Temperatura (°C)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EXO ⟶
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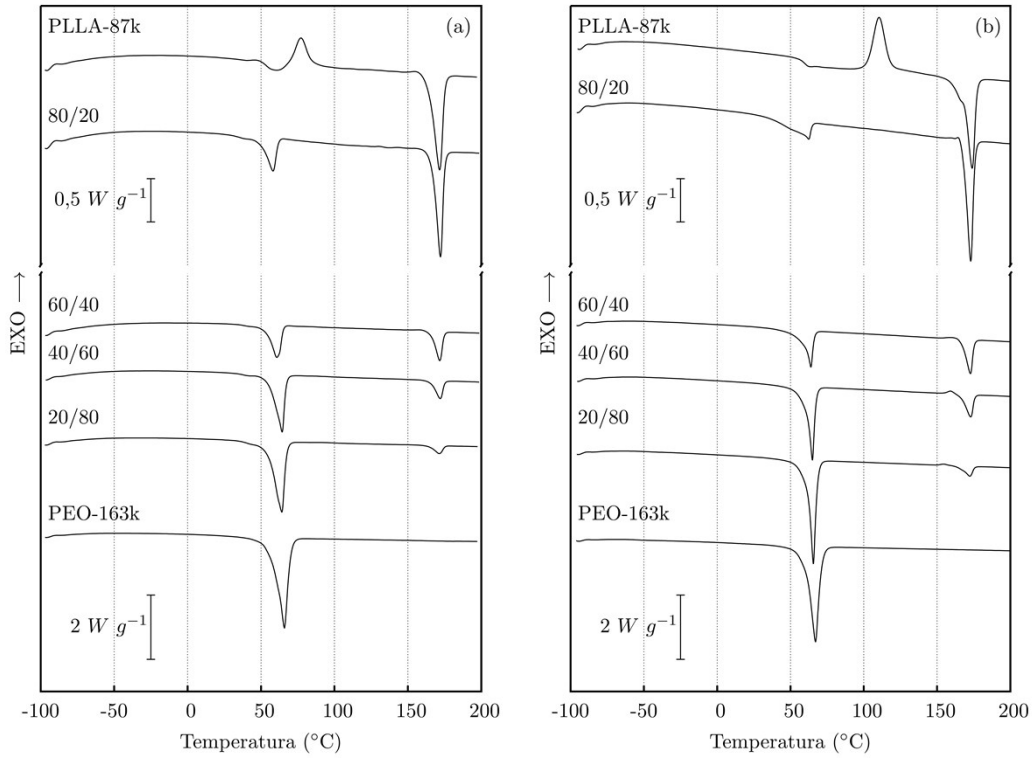
Temperatura (°C)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40/60
20/80
PEO-163k
2 W g−1
EXO ⟶
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Temperatura (°C)
PLLA-87k
(b)
80/20
0,5 W g−1
60/40
40/60
20/80
PEO-163k
2 W g−1
EXO ⟶
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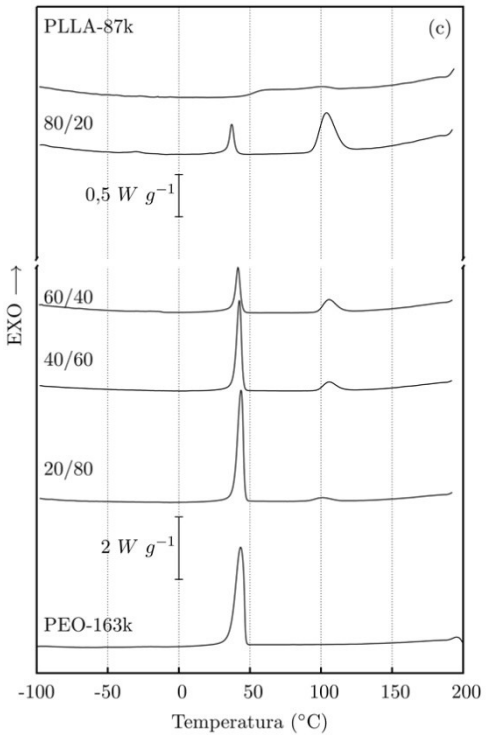
Temperatura (°C)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20/80
2 W g−1
PEO-163k
EXO ⟶
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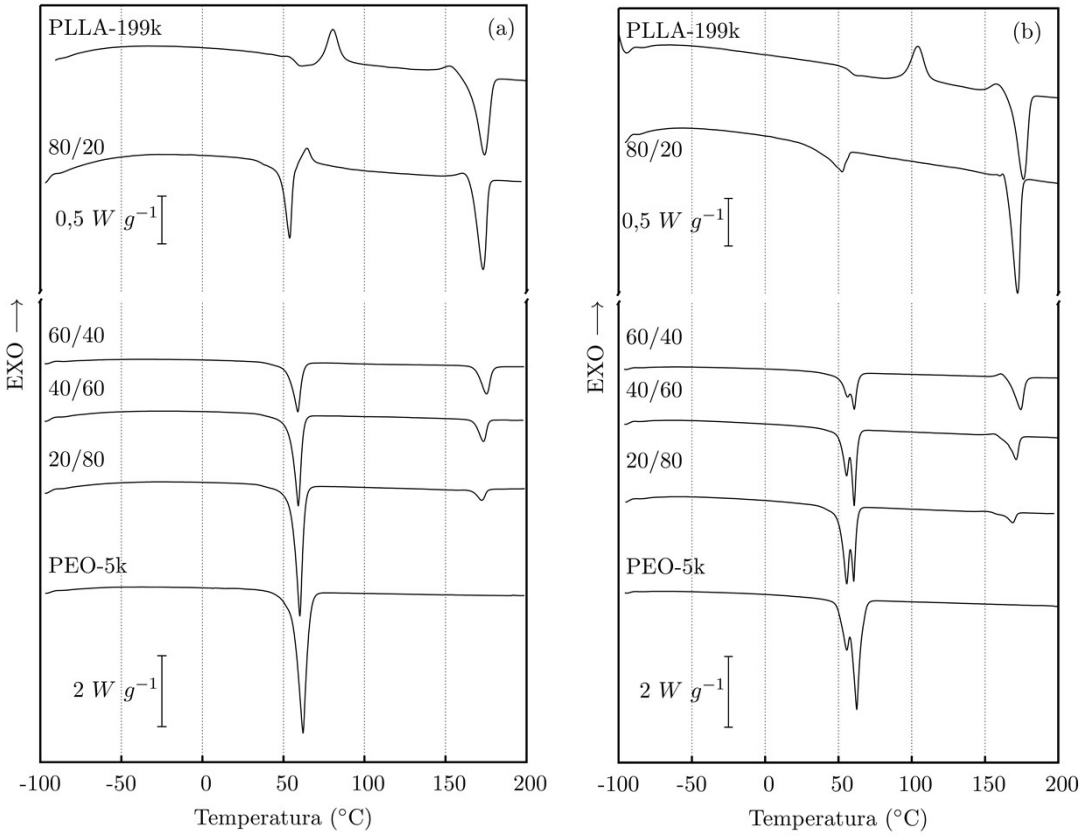
Temperatura (°C)


PLLA-199k
(a)
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60/40
40/60
20/80
PEO-5k
2 W g−1
EXO ⟶
-100 -50 0 50 100 150 200
Temperatura (°C)
PLLA-199k
(b)
80/20
0,5 W g−1
60/40
40/60
20/80
PEO-5k
2 W g−1
EXO ⟶
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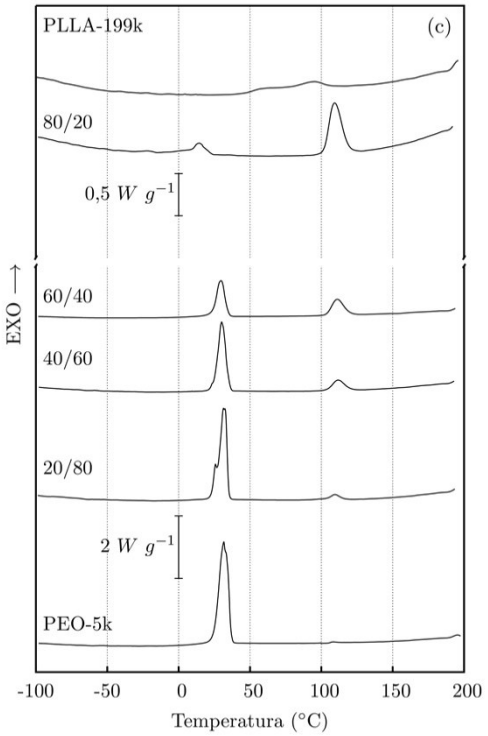
Temperatura (°C)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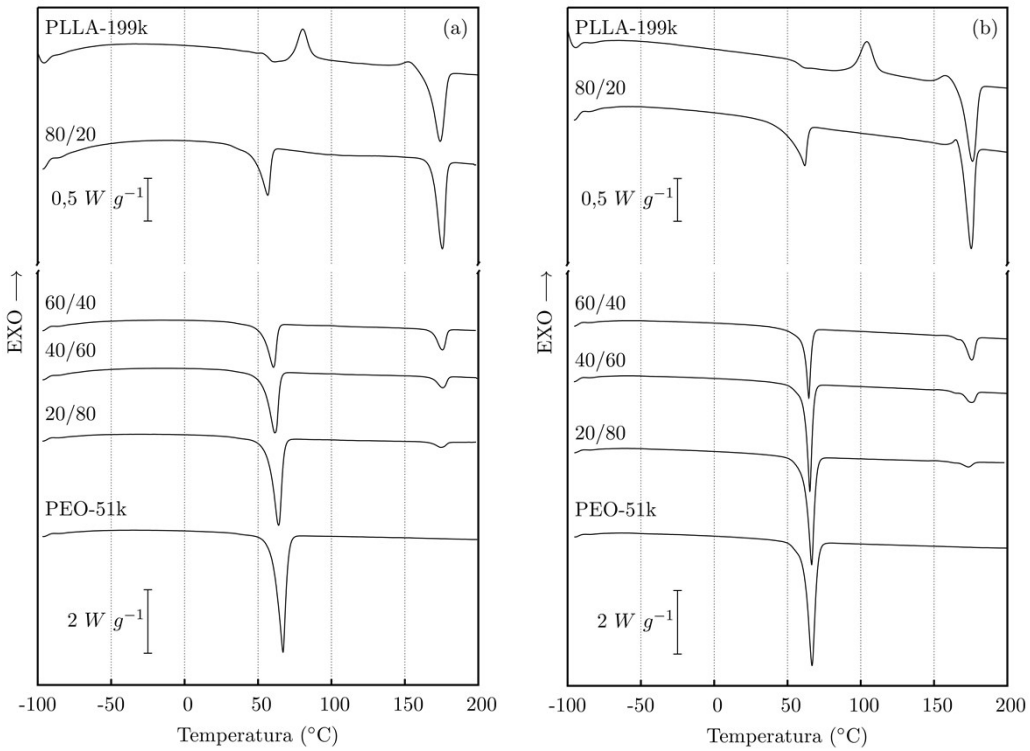
2 W g−1
PEO-5k
EXO ⟶
-100 -50 0 50 100 150 200
Temperatura (°C)


PLLA-199k
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80/20
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EXO ⟶
60/40
40/60
20/80
PEO-51k
2 W g−1
-100
-50
0
50
100
150
200
Temperatura (°C)
PLLA-199k
(b)
80/20
0,5 W g−1
EXO ⟶
60/40
40/60
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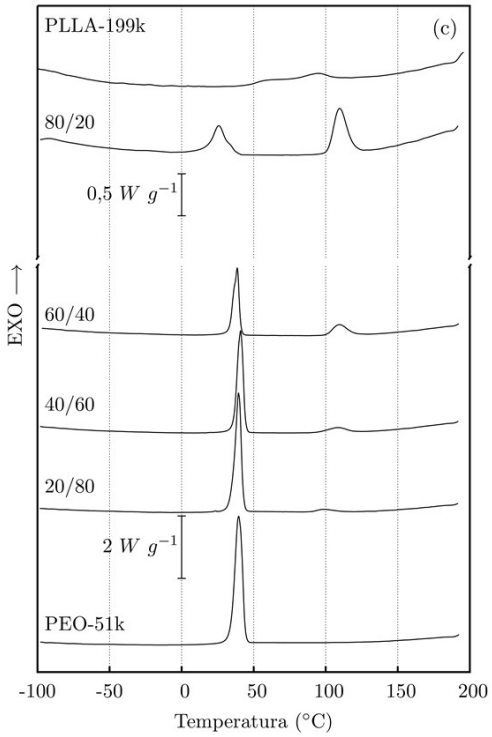
200
Temperatura (°C)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2 W g−1
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-50
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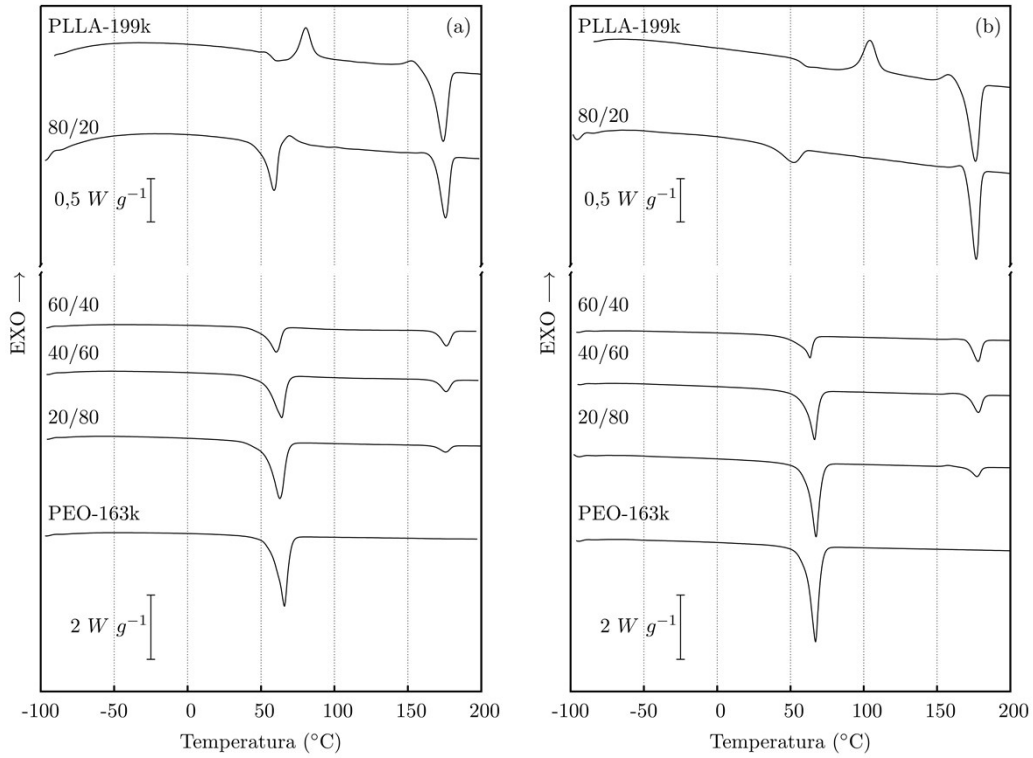
200
Temperatura (°C)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20/80
PEO-163k
2 W g−1
EXO ⟶
-100 -50 0 50 100 150 200
Temperatura (°C)
PLLA-199k
(b)
80/20
0,5 W g−1
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20/80
PEO-163k
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EXO ⟶
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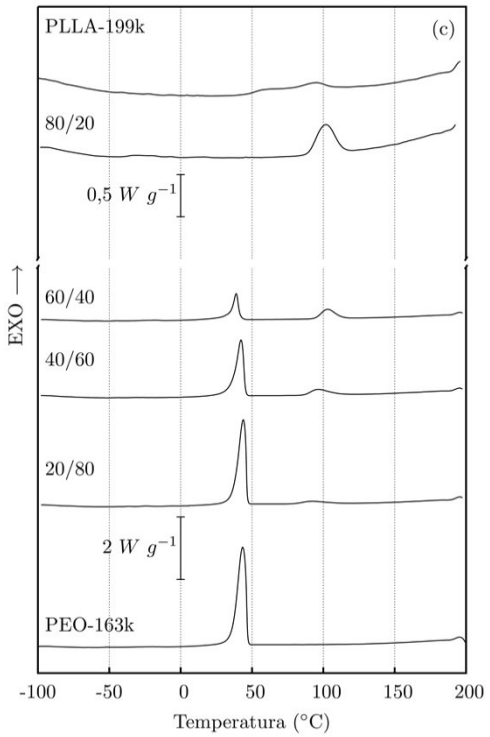
Temperatura (°C)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40/60
20/80
2 W g−1
PEO-163k
EXO ⟶
-100 -50 0 50 100 150 200
Temperatura (°C)

Supporting Information 04

Link for POM video of the crystallization of PEO-51/PLLA-46 80/20 blend:

[current] https://www.youtube.com/watch?v=Ms_v1F85f-8

or

[LINK OF THE VIDEO TO BE PROVIDED BY THE JOURNAL]

Supporting Information 05

Figure SI 05 contains images of the surface of the PEO-51/PLLA-46 blends containing 40 wt % (images a, b and c) and 60 wt % of PEO (images d, e and f) before and after water-etching. Images (a) and (d) show no contrast between phase PEO and phase PLLA. As reported by Yang *et al.*[51], the electron density of crystalline and amorphous phases of PEO are too close, 406 and 345 e/nm^3, respectively, while the electron density of the crystalline phase of PLLA is 410 e/nm^3. Because of this, the phase contrast in the SEM or TEM images is poor. As reported previously for immiscible PEO/PLLA blends, there is no contrast enough for identifying phase separation[22]. However, SEM images also reflect the sample's topography. Thus, we subjected the blends to PEO etching with water during 5 min. After etching, SEM images revealed the topography of the samples with very well defined spherulites. The extraction of PEO resulted in empty spaces inside and around the PLLA spherulites, as can be seen in images (b), (c), (e), and (f). These results reinforce our conclusion that PEO is entrapped between PLLA lamellae and spherulites.

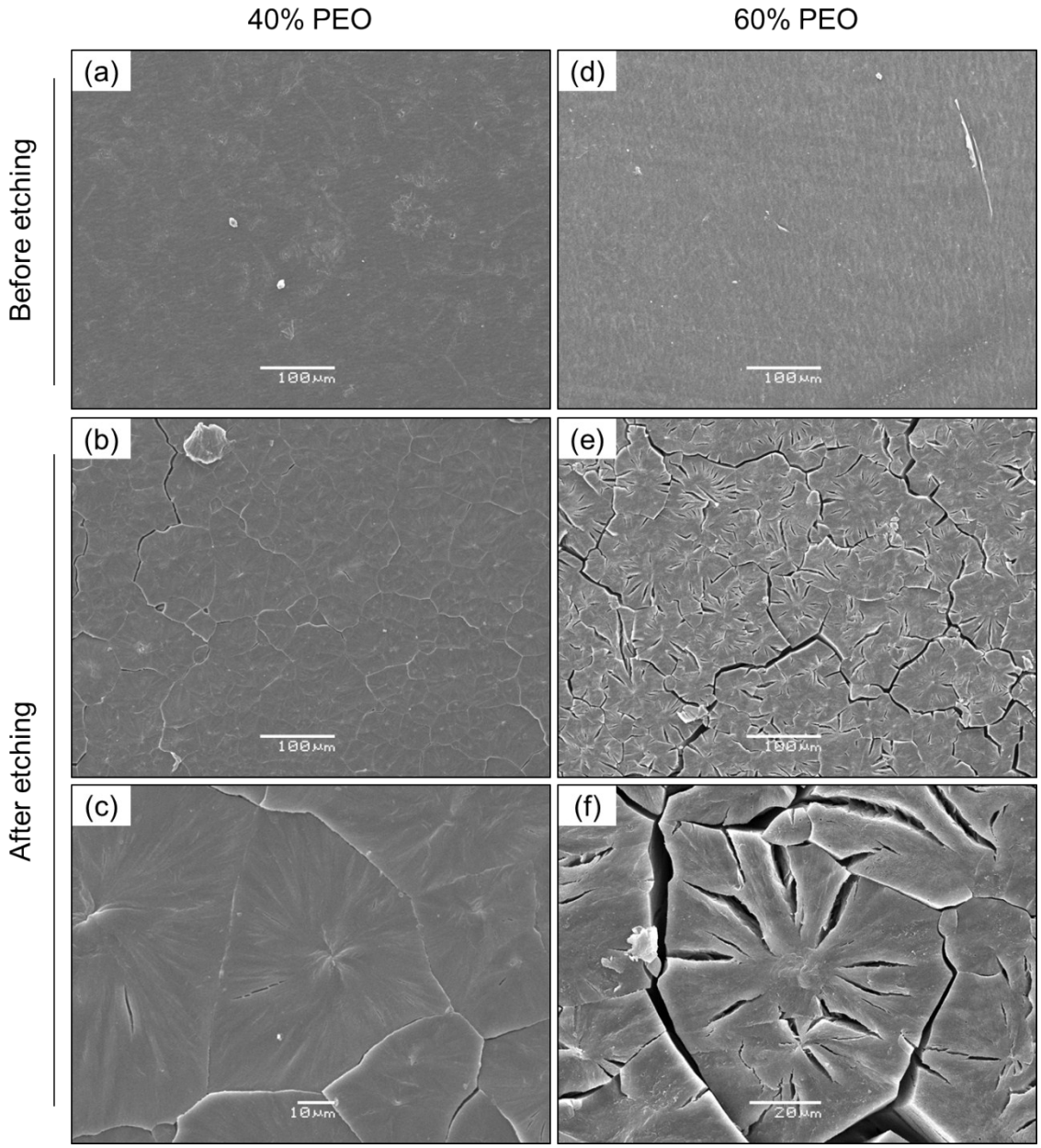


Figure SI 05: SEM images for PEO-51/PLLA-46 blends. (a-c) 40 wt % PEO, and (d-f) 60 wt % PEO. Images (a) and (d) before water-etching, and the others after water etching.

Supporting Information 06

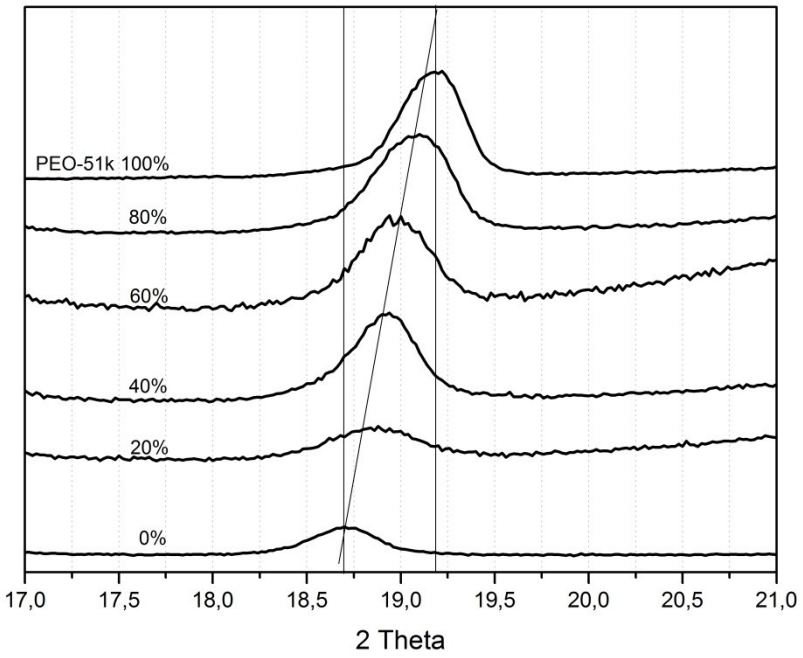
Link for POM video of the 2nd heating of PEO-51/PLLA-46 80/20 blend:

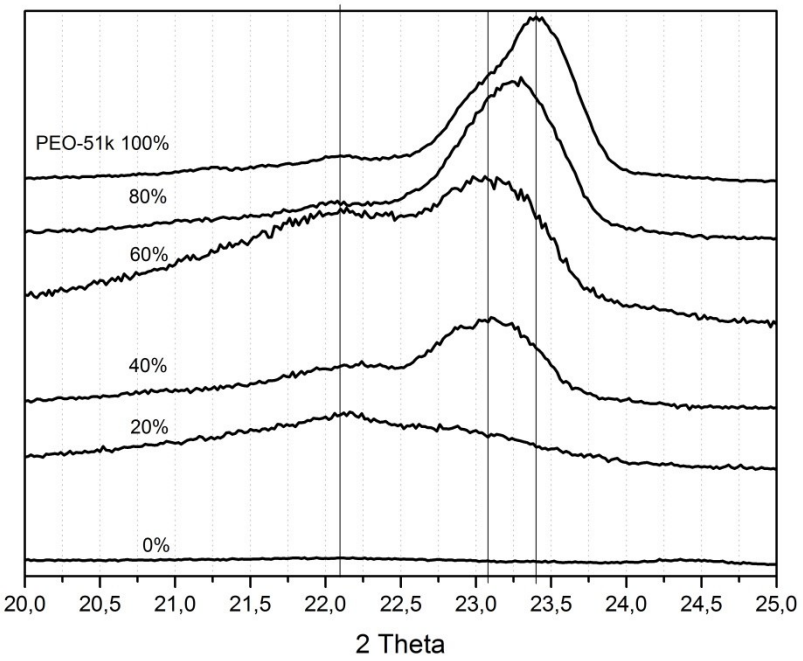
[current] https://www.youtube.com/watch?v=9MKA7S_vNVA

or

[LINK OF THE VIDEO TO BE PROVIDED BY THE JOURNAL]

Supporting Information 07





SI 06: Zoom of XRD with demonstration of peak shifting.

Blend PEO-51/PLLA-46