Rheological modelling Of PLA/PCL blends and their nanocomposites filled with NCC

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Abstract

In this paper, the rheological properties of poly(lactic acid) (PLA) / poly(ε-caprolactone) (PCL) blend and its nanocomposite containing nano calcium carbonate (NCC) (surface-pretreted with stearic acid) are studied. The 75 wt.% of PLA is used to prepare PLA/PCL blend sample and 2 phr of NCC is added to this blend composition to prepare nanocomposite. The variation of storage modulus (G') as a function of angular frequency is investigated via a rheo mechanical spectrpscopy (RMS) apparatus. Also, the Palierne model is used to deliberate the linear viscoelastic properties of the samples from the experimental obtained modulus. Since the 2 phr of NCC is lower than its percolation threshold, we able to succesfully apply the palierne model. Results show that PLA and PCL do not have good miscibility, due to presence of the second small plateau which is related to dispersed phase (PCL) shape relaxation. Also it is found that storage modulus of nanocomposite was 10 times higher than blend. It seems that the NCC particles prevents PCL droplets from coalescence, since the second plateau is still visible in small range. The palierne model predicts lower interaction between the PLA and PCL in their blend and nanocomposite. This result may be due to the fact that this model do not consider the contribution of the interface to the storage modulus of the blend. As it is seen in the figure 1, the Palierne model plot of nanocomposite shows that the interfacial tension was decreased with the presence of NCC, because of the presence of smaller PCL droplets in nanocomposite in comparison with blend.

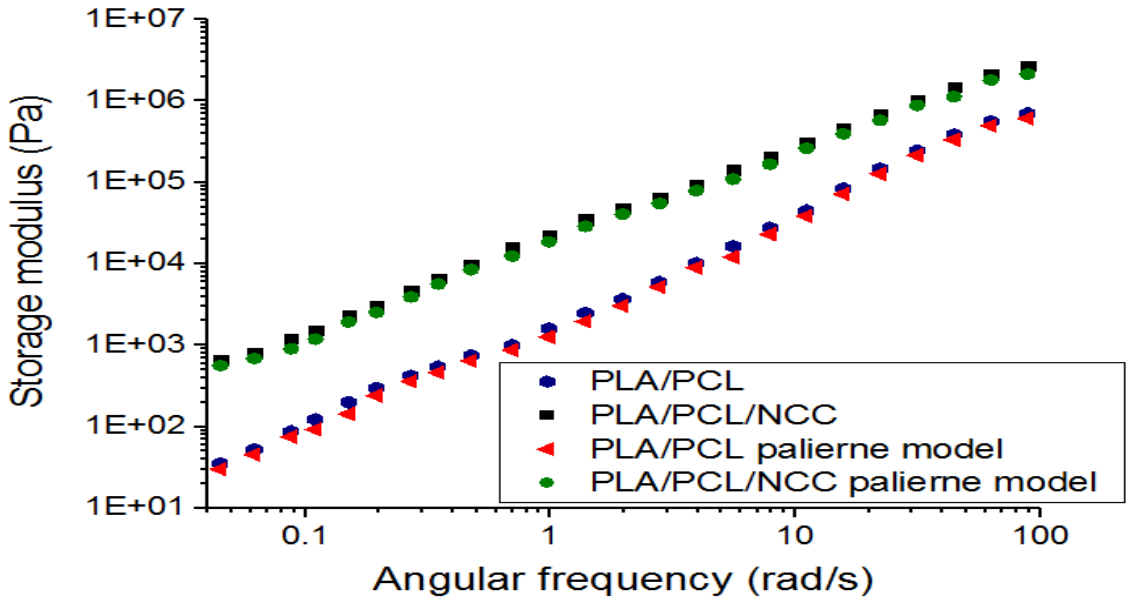
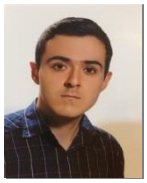


Figure 1

Keywords—*Poly(lactic acid), Poly(ε-caprolactone), Nano calcium carbonate, Rheological properties,Palierne model.*

Professional Biography (100-150 words)

Mohammad Mahdi Negaresh has completed his MSc at the age of 24 years from Amirkabir University of Iran. He has published 2 international conference papers.



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