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Extending polylactide applications by overcoming its drawbacks

Despite the profound features of polylactide (PLA) such as being originated from biomass and its biodegradability, PLA has several drawbacks that limit its use in different applications. A series of these drawbacks could be according to its glass transition temperature (Tg = around 60°C) and its very slow crystallization kinetics. In applications where the service temperature require to be below 60°C, PLA behaves as a very brittle polymer, whereas in those cases where the service temperature should be much wider beyond 60°C, PLA can easily be deflected by heat because the degree of crystallinity is not high enough to provide the required rigidity. Moreover, a series of drawbacks originate from the PLA's melt conditions. Due to the low melt strength of PLA followed by its slow crystallization rate, forming the final products with required shape is not easy. Similar scenario exists in processing of PLA/gas mixture to form high-quality foamed structures. In this work, it is shown that the enhancement of PLA's crystallization kinetics could significantly enhance its processability, formability and foamability, and could widen its service temperature beyond its Tg, and further can improve the mechanical properties of its final products. Furthermore, blending PLA with other biopolymers with high melt strength, high toughness and ductility could improve the melt strength and processability of PLA, compensate its brittleness and enhance its mechanical properties. These approaches provide new routes to extend the PLA's usage in much wider commodity applications.

Biography

M Reza Nofar has completed his PhD from University of Toronto and Postdoctoral studies from McGill University and Polytechnique Montreal. He is currently an Assistant Professor at Istanbul Technical University, Turkey. His research interests could be listed as Polymer Processing, Manufacturing of Innovative Biopolymeric Systems, Multiphase Polymer Blends and Composites, Multifunctional Nanocomposites, Micro/Nanocellular and Micro/Nanofibrillated Systems. So far, he has been the recipient of several Canadia National/Provincial and Institutional Scholarships and awards. He has contributed his research output as 1 authored book, 2 book chapters, 1 patent, 28 refereed journal articles, and over 50 refereed conference papers.

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