Academic Journal of Polymer Science
ISSN: 2641-8282

Juniper Publishers
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Opinion
Volume 1 Issue 2 - July 2018
DOI: 10.19080/AJOP.2018.01.555559

Academ J Polym Sci

Compatibilization Potential of Ionic Liquid-Based Surfactants for Polymer Blends

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Submission: July 6, 2018; **Published:** July 10, 2018

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Keywords: Surfactant; Ionic liquid; Compatibilizer; Polymer blend; Hydrophobic; Biopolymer

Abbrevations: ILs: Ionic Liquids; ILBS: Ionic Liquid-Based Surfactants

Opinion

The development of the polymer composites industry has been very encouraging in the past years. The polymer blends have also been received considerable attention, this is due to the blends are easy to prepare, their production cost is low, and so on. At the present time, bioplastics such as polylactic acid, polyhydroxybutyrate and polybutylene succinate are gaining consideration due to their excellent biodegradability, biocompatibility and non-toxicity. Blend between bioplastics and biopolymers (for example; cellulose, zein and starch) to produce bioplastic/biopolymer blends have attracted the researchers' interest. Besides, the produced bioplastic/biopolymer blends may also be able to be used in fabrication of biocompatible and biodegradable products. Moreover, the utilization of expensive synthetic bioplastics can be reduced through consumption of biopolymers this can further lower the cost of products [1,2].

Nevertheless, the blend approach suffers from low physicochemical properties due to incompatibility in the blends system. The compatibility between the bioplastic and biopolymer is very low, thus results in reductions of their performance, particularly in the mechanical, thermal and rheological properties. The incompatibility is due to the bioplastic which wholly non-polar (hydrophobic) [3], while the biopolymer is naturally polar (hydrophilic) [4], and therefore the importance of compatibilization on the blends could not be ignored.

In response to this, the compatibilization methods by using compatibilizers were frequently carried out to compatibilize between two different polymers particularly for a better adhesion at their interface [5]. Previous reports have indicated that the organic salts such as surface-active agents (surfactants) could also be used as compatibilizers in polymeric blend and composite systems specifically for non-polar and polar polymers [6-8]. This is due to the fact that the surfactants have amphiphilic character which contained of non-polar and polar parts (hydrophobic and hydrophilic groups) [9,10] that capable to compatibilize between non-polar and polar polymers [11]. Thus, they could provide compatibility between the component phases of bioplastic and biopolymer in the blends system.

On the other hand, ionic liquids (ILs) are known as organic salts that have low melting temperature (<100°C). ILs are non-volatile, highly polar and stable, miscible and soluble with many organic and/or inorganic compounds, chemically inert as well. ILs are also non-toxic, recyclable, non-flammable and eco-friendly [12]. The use of ionic liquid-based surfactants (ILBS) for compatibilization seems to be remarkable because they have fascinating feature i.e. low melting temperature compared to ordinary surfactants, this could increase the compatibilization efficiency.

Additionally, among several types of ILBS, 1-dodecyl-3-methylimidazolium-based ILs can be employed for experimentation since they have some valuable characters for instance; consisted of single long alkyl chain (effective for the hydrophobic-hydrophobic interaction), environmentally friendly, low melting temperature, low toxicity and most importantly they are also thermally stable.

It is expected that the ILBS will improve the physicochemical properties (mechanical, thermal, rheological, etc.) of the polymer blends since they have amphiphilic character which can act as interaction link between non-polar (hydrophobic) and polar (hydrophilic) polymers, and they can assist them to interact with each other as well. It is also anticipated to benefit the industries

that are interested to utilize both bioplastics and biopolymers in their products because this approach does not require any modifications of the polymers.

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DOI: 10.19080/AJOP.2018.01.555559

How to cite this article: Ahmad Adlie Shamsuri. Compatibilization Potential of Ionic Liquid-Based Surfactants for Polymer Blends. Academ J Polym Sci. 2018; 1(2): 555559. DOI: 10.19080/AJOP.2018.01.555559