Polycinnamoyls Composites with Poly(butylene succinate) as Greener Bioplastics

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Fabrication of environmental friendly polymers are in great demand these days because they are derived from naturally occurring molecules which degrade easily into the environment with no harm and can be useful for solving environmental problems. One such environmentally benign, high performance polymer was synthesized using phenolic monomer i.e. poly(4HCA-co-DHCA) which has high thermal and mechanical strength than usual aliphatic polyesters such as poly(lactic acid) which makes the resulting polymer highly rigid in nature. Also, these polymers have liquid crystalline behavior which sometimes dramatically increases the mechanical strength. Because of the high rigidity, these polymers cannot be used in applications which require flexible polymers. Poly(4HCA-co-DHCA) is brownish in color and look alike wood but it is very rigid in nature. This polymer can be a good candidate to be explored further to obtain flexible polymer. Moreover, these aromatic polymers are proven to be safer to use and biodegradable[1,2]

Biodegradable rigid poly(4HCA-co-DHCA) can be made flexible by introducing aliphatic chain into the polymer. The poly(butylene succinate) (PBS) was hybridized as flexibility inducer into rigid poly(4HCA-*co*-DHCA) as shown in Figure 1. Since PBS is biodegradable in nature. It degrades into water and carbon dioxide much faster than poly(butylene adipate terephthalate) (PBAT) and poly(lactic acid) (PLAs).[3] In this report, we will present the formation protocol for composites of rigid poly(4HCA-*co*-DHCA) with different weight percent (PBS 0%, PBS 10%, PBS 20%, PBS 30%, PBS 40%, PBS 50%, and pure PBS) of flexible PBS and in depth analysis of the composite structure was done using various characterization techniques to study the toughness (PBS 0% 2 MJ/m^3, PBS 10% 2 MJ/m^3, PBS 20% 7 MJ/m^3, PBS 25% 18 MJ/m^3, PBS 30% 69 MJ/m^3, PBS 40% 76 MJ/m^3) and flexibility of the synthesized biocomposite material.

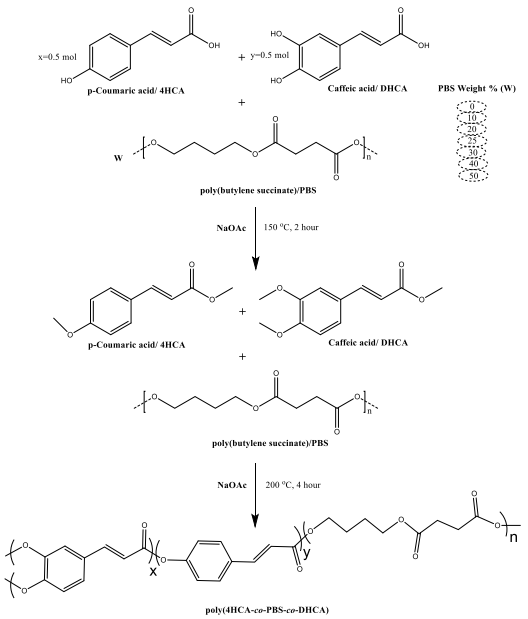

Figure 1: Scheme for the synthesis of bio composites.

References

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3) M.R. Nobile, A. Crocitti, M. Malinconico, G. Santagata, P. Cerruti *AIP Conf. Proc*. **2018**, 020180.

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