

THE ROLE OF COMPATIBILIZING AGENT IN THE PREPARATION OF AGRICULTURAL WASTE REINFORCED BIOCOMPOSITES

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Composites based on natural resources are becoming increasingly important due to their renewability and sustainability in relation to the environment. Agricultural waste is an effective source of natural resources for the preparation of biocomposite materials. Agricultural waste produces a large amount of biomass, which is classified as natural fibers. Natural fibers are classified by origin and are divided into plant, mineral and animal fibers. Natural fibers of plant origin have significant advantages over synthetic fibers.

The properties of biocomposites depend on the compatibility of the polymer matrix and the filler, in this case a natural fiber. In this regard, this work considers the problem of combining a non-polar polymer matrix and a polar filler of agricultural origin in thermoplastic composites. The degree of compatibility of components in polymer composites can be improved by adding compatibilizing agents.

As filler, it is proposed to use agricultural waste, namely hazelnut shells for the production of a biocomposite. It was obtained from the local market. Low-density polyethylene grade 15 803-020 (SOCAR Polymer LLC) was used as the polymer matrix. To solve the compatibility problem between the non-polar polymer matrix and the polar filler, maleic anhydride grafted high density polyethylene (PE-g-MA, Exxelor® PE 1040) was used as a compatibilizer.

It is known that compatibilizers consist of two parts: one is compatible with one of the two components of the composite, which must be compatibilized, and the other part is compatible with the second component. During the study, it was found that maleated polyethylene improves the compatibility of the polymer matrix and lignocellulosic material, since the anhydride group reacts with hydroxyl groups on the lignocellulosic material to form ester bonds (Fig. 1), while the hydrophobic polyolefin part of the compatibilizer diffuses with the molecules of the polymer matrix.

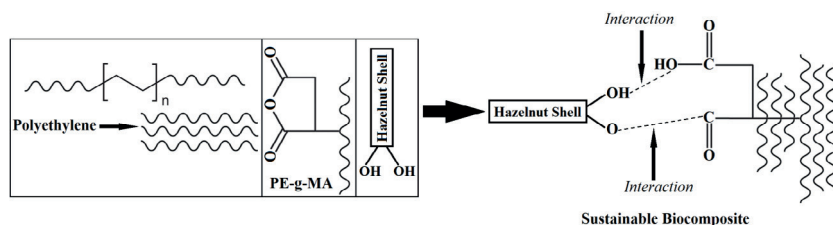


Fig. 1. Possible reaction mechanism between hazelnut shell and polyethylene matrix prepared in the presence of compatibilizing agent

This is confirmed by the fact that in the spectrum of compositions prepared in the presence of a compatibilizing agent there is no peak at 1789 cm^{-1} , which confirms the presence of maleic anhydride in the compatibilizing agent. This shows that the reaction takes place during the preparation process of the composite.

Thus, we can say that sustainable biocomposites are a new class of materials that promise an alternative to traditional plastics, and compatibilizing agents play an important role in their preparation.