PROPERTIES OF COLLAGEN-BASED WASTE/POLYETHYLENE THERMOPLASTIC BLENDS

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The current system of using and disposing of plastics has important drawbacks: plastic packaging material with a value of $80 billion-$120 billion is lost each year. Aside from the financial cost, by 2050, oceans are expected to contain more plastics than fish (by weight), according to a new report The New Plastics Economy: Rethinking the Future of Plastics [1].

Plastic packaging is present through our everyday life as water drink bottles, microwave dishes, cosmetic containers, rubbish bags, films etc. Polyolefins, such as high-density polyethylene (HDPE), low-density polyethylene (LDPE) and polypropylene (PP), constitute the majority of thermoplastics currently used. Considering the fact that consumption and production of those is continuously increasing post-consuming has become an important issue. Polyolefins, as most synthetic polymers, do not decompose naturally. One of the ways of obtaining polyolefine biofragmentable polymers and modify the properties – is incorporating through the blending with polysaccharides, proteins of vegetal and animal origin [2,3]. Such combination allows adjusting the properties of the films, including moisture content, viscosity, strength, organoleptic properties and biodegradation ability. For this purposes chrome free leather wastes can be used.

Leather chrome shavings represent one of the most important by-product of the tannery industry. Chrome containing wastes can be used in the production of non-food items (mulching films, isolation, construction materials, items for the bottom of shoes, leather boards etc.). Conventional leather waste processing is energy and time consuming, therefore utilization by the methods of thermoplastic processing industry remains as one of the solutions.

The research was focused on the preparation of thermoplastic blends based on linear low-density polyethylene (LLDPE) and pre-hydrolyzed collagen (PHC) with ability to biodegradation due to biofragmentation. Blends of LLDPE and PHC, with content up to of 20-50% of PHC, were studied in order to develop a formulation with optimal physical-chemical and mechanical properties.

Proposed technology allows us to adjust conventional equipment of thermoplastic industry processing for collagen-based LLDPE compositions. The technology consists of the following steps: mixing of PHC with LLDPE on z-shaped rotor mixer for 30 min. then drying for 24 hrs. t=90 ^{o}C, homogenizing of dried mixture and injection molding.

References

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