

Keratin based bioplastic film from chicken feathers and its characterization

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ABSTRACT

Plastics have been one of the highly valued materials and it plays an significant role in human's life such as in food packaging and biomedical applications. Bioplastic materials can gradually work as a substitute for various materials based on fossil oil. The issue like sustainability and environmental challenges which occur due to manufacturing and disposal of synthetic plastics can be conquering by bio-based plastics. Feathers are among the most inexpensive abundant, and renewable protein sources. Feathers disposal to the landfills leads to environmental pollutions and it results into wastage of 90% of protein raw material. Keratin is non-burning hydrophilic, and biodegradable due to which it can be applicable in various ways via chemical processing. Main objective of this research is to synthesis bioplastic using keratin from chicken feathers. Extracted keratin solution mixed with different concentration of glycerol (2 to 10%) to produce plastic films. The mixture was stirred under constant magnetic stirring at 60 °C for 5 h. The mixtures are then poured into aluminum weighing boat and dried in an oven at 60 °C for 24 h. The mechanical properties of the samples were tested and the physic-chemical properties of the bioplastic were studied. According to the results, Scanning Electron Microscopy test showed good compatible morphologies without holes, cavity and edge. The difference in chemical composition was analyzed using Fourier transform infrared spectroscopy (FTIR). The samples were also characterized by thermo gravimetric analysis (TGA), differential scanning calorimetry (DSC), X-Ray diffraction (XRD) to check the thermal and crystallinity properties. Other than that, bioplastic made up from keratin with 2% of glycerol has the best mechanical and thermal properties. According to biodegradability test, all bioplastic produced are proven biodegradable. Therefore, the results showed possible application of the film as an alternative to fossil oil based materials which are harmful to the environment.

KEYWORDS:

Bioplastic; Biodegradable; Chicken feather; Keratin; Glycerol; Protein