

Development of Reinforced Bio-filament Composites Composed of Agricultural By-product for 3D Printing Technologies

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Abstract

In this study, biocomposite filaments with agricultural by-products can be used in extrusion-based 3D (Three-dimensional) printing. Extrusion-based 3D printing stands as a promising technique owing to its versatility. We hypothesized that bio-filament composite consisted of something derived from agricultural by-products could be used as 3D printing materials that could overcome the drawbacks of PCL (poly-caprolactone). Bio-filament mixed with PCL and agricultural by-products was defined as r-PCL in this study. In order to find it out the optimal mixing ratio of filaments, we had investigated PCL, r-PCL 10%, r-PCL 20%, r-PCL 50% separately. The morphological and chemical characteristics of the filaments were analyzed by FE-SEM (Field emission scanning electron microscope) and EDX (Energy-dispersive X-Ray spectroscopy), and the mechanical properties were evaluated by stress-strain curve, water contact angle, and cytotoxicity analysis. Results of this study have been shown as a promising way to produce eco-friendly bio-filaments composite for FDM (Fused deposition modeling) method based 3D printing technology. Thus, we could establish biomimetic scaffolds based on bio-printer filaments mixed with agricultural by-product.

Key words

Bio-filament, Extrusion process, Agricultural by-product, 3D printing technologies

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