EFFECT OF ORGANIC WASTE PARTICLE ADDITIVES ON THE PROPERTIES OF THERMOPLASTIC CELLULOSE ACETATE

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With the continuous rise in synthetic polymer production, waste management is becoming an increasingly pressing global challenge. As a result, huge amounts of plastic end up in landfills and eventually migrate into natural ecosystems, where they disrupt the habitats of living organisms. Additionally, incinerating plastic waste contributes to higher greenhouse gas emissions. Biodegradable cellulose acetate (CA) offers a promising alternative to conventional synthetic plastics, as it can achieve comparable mechanical properties. However, a major limitation of CA is that its melting temperature is very close to its decomposition temperature, making melt processing difficult unless plasticizers are added. When appropriate plasticizers are incorporated, CA can be converted into thermally processable mixtures suitable for thermoplastic manufacturing. Additionally, agriculture and food production waste can be utilised as fillers to adjust product mechanical, thermal and/or hydrophobicity properties and reduce manufacturing cost.

In this study, compositions of thermoplastic cellulose acetate were obtained using ecofriendly plasticizer triacetin, and fruit waste particles. By varying the amounts of CA, plasticizer and filler particles, a set of thermoplastic mixtures was prepared and thermally processed using twin-screw extrusion, by estimation the extrusion parameters. By the means of injection molding and 3D printing the samples of novel bioplastics were obtained. The influence of the triacetin content on the mechanical properties of the extrudates is greater than that of the filler content. With an increase in the plasticizer content in the compositions, the tensile strength and elastic modulus values decrease both in the compositions with fruit waste filler and without filler, and the elongation, on the contrary, increases

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