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Preliminary Study on Reactive Compatibilisation of Poly-Lactic Acid with Maleic Anhydride and Dicumyl Peroxide for Fabrication of 3D Printed Filaments

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Abstract

Biodegradable poly-lactic acid (PLA) has been extensively used in various fields including biomedical applications and tissue engineering. However, its inherent brittleness, less flexibility and miscibility limit its uses when blended with other polymers. Grafting of maleic anhydride (MAH) onto PLA using dicumyl peroxide (DCP) as radical initiator had been advocated in an attempt to produce functional groups which would improve the interfacial adhesion of PLA polymer blends, therefore enhance the mechanical properties of the products. In this preliminary work, the physical properties of grafted PLA and the effects of MAH on the grafting percentage of the PLA were investigated. A series of maleic anhydride grafted poly-lactic acid (PLA-g-MAH) was prepared by mixing PLA and MAH with constant DCP (0.2 phr) at 180 degrees C in an internal mixer. Effects of DCP and MAH concentration on the grafting percentage were deduced by Fourier Transform Infrared (FTIR) spectroscopy, thermal and titration analyses. The molecular weight changes were analysed using gel permeation chromatography (GPC). Grafting was confirmed and the degree of grafting was found to be dependent on the MAH concentration. The thermal properties of PLA-g-MAH were affected due to formation of new

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functional groups after grafting and there were changes in the molecular weight of the grafted samples. This study concluded that addition of predetermined concentration of MAH in the presence of minimal DCP was effective for reactive compatibilisation of PLA.

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Keywords Plus: POLY(LACTIC ACID); MECHANICAL-PROPERTIES; SCAFFOLDS ; CELL; PLA; COMPATIBILIZATION; POLYMERIZATION; POLYETHYLENE; MALEATION

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