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The effects of supercritical carbon dioxide on the degradation and antimicrobial properties of PLA biocomposite

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Abstract
Biopolymer products that is biodegradable presently attracting an attention from researchers and industry. The biodegradable packaging based on polylactic acid (PLA), durian skin fibre (DSF), epoxidized palm oil (EPO) and incorporated with cinnamon essential oil (CEO) as antimicrobial agent have been developed and showed to be a promising field of research. This paper reported the effects of supercritical carbon dioxide on the degradation and antimicrobial properties of PLA biocomposite films produced via solvent casting. The biocomposites underwent supercritical carbon dioxide (SCCO2) treatment at two different conditions under 40 °C temperature and at 100 bar and 200 bar pressure. Water absorption test showed that the untreated PLA biocomposite absorbed most water as compared to treated PLA biocomposite with SCCO2 at 5.1%. This is due to the hydrophilic nature of the fibre that absorbed water molecules. Soil burial test showed that the treated PLA biocomposite possessed the highest value of weight losses after 80 days with 97.8%. Biocomposite with the presence of CEO demonstrated antimicrobial activity against both gram-positive and gram-negative bacteria. This showed that SCCO2 significantly improved the properties of PLA biocomposite films. The supercritical fluid treatment of PLA biocomposite could be an alternative for active packaging industries to ensure that the packaging product meets the requirement by consumers as well as being an eco-friendly product.

Author Keywords
And antimicrobial activity; Degradation properties; Durian skin fibre; Polylactic acid; Supercritical carbon dioxide

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