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Effect of processing conditions on the physical, chemical and transport properties of polylactic acid films containing thymol incorporated by supercritical impregnation

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ABSTRACT

This study deals on the supercritical impregnation of thymol in polylactic acid (PLA) in order to obtain biodegradable antimicrobial films by means of a procedure, which is in agreement with the principles of green chemistry, reducing the environmental impact of products and of its preparation processes. The impregnation tests were carried out in a high-pressure cell using supercritical carbon dioxide as impregnation medium at different operational conditions. These assays were implemented at pressures of 9 and 12 MPa, a constant temperature equal to 40°C and different values of depressurization rates: 0.1, 1.0 and 10 MPa min⁻¹. Depending on the impregnation process conditions, thymol was incorporated into the films at concentrations from 13.5 to 20.5 %w/w. FTIR analyses confirmed the presence of thymol on the surface of the films. Furthermore, the supercritical impregnation process at the conditions used in this work produced a strong modification of the thermal and mechanical properties of the PLA films.

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