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Effect of pressure and time on scCO₂-assisted incorporation of thymol into LDPE-based nanocomposites for active food packaging

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In this work, the scCO₂-assisted incorporation of thymol in LDPE nanocomposites with different concentrations of an Organo-modified montmorillonite (OM-MMT) nanoclay is proposed as the preparation method of an antimicrobial food packaging system. Mass transfer characterization of thymol, for both incorporation and release processes, as a function of the nanoclay content of the material and the CO₂ pressure during the impregnation was carried out as well as the structural characterization of the nanocomposites, which was developed for a better understanding of the impregnation and release processes. From the incorporation, release experiments and their theoretical analysis, it was obtained that the intercalated structure of the nanocomposite materials did not involve an additional resistance to the thymol incorporation in the polymer structure during the scCO₂-assisted impregnation process. Nevertheless, the decrease of the diffusion coefficient of thymol in the nanocomposite, D_{eff} , during the release process from the material to a food simulant was observed. Thus, the D_{eff} associated to thymol uptake in the nanocomposite materials took values between 2.17×10^{-12} and $2.44 \times 10^{-11} \text{ m}^2 \text{ s}^{-1}$. Meanwhile, the D_{eff} of thymol associated to its release from the nanocomposite took values between 7.0 and $9.0 \times 10^{-14} \text{ m}^2 \text{ s}^{-1}$. Finally, the developed nanocomposite materials showed a thymol concentration that allows a strong antibacterial activity against *S. Aureus* and *E. coli*.

Biography

Adrián Rojas is a PhD student at the University of Santiago de Chile's Doctoral Program in Food Science and Technology. He is working on the development of active packaging by means of supercritical impregnation process using carbon dioxide. As result of this research line, he has published six papers in reputed journals.

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