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Co-precipitation of curcumin with PLLA by a supercritical antisolvent process

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Curcumin microparticles and composites particles in which curcumin are coated by poly(L-lactide) spheres were successfully prepared by SAS micronization using chloroform/acetone mixture (1:1 v/v) as solvent and different solute concentration (0.5, 1.0 and 2.5% w/v). Micronization assays were developed using two common used drug/encapsulation material (D/EM) mass ratios values (1:1 and 1:2). Meanwhile, the evaluated values of temperature (40°C) and pressure (10 and 15 MPa) were chosen considering the mixture critical temperature and pressure, respectively. Flow rates were kept constant at 1 mL min-1 and 20 g min-1 for the feed solution and CO2, respectively. The global and co-precipitation yields decreases as the pressure increases. These results could be explained due to the increase of the solubility of curcumin in the CO2 phase as pressure increases (or the density) under isothermal conditions. Thus, the maximum global (78%) and co-precipitation (58%) yields were obtained using a pressure value of 10 MPa, a 1:1 D/EM mass ratio and a solute concentration in the feed solution of 2.5% w/v. Other characterization included FTIR, DSC, SEM XRD and the measurement of dissolution profiles. From the dissolution profiles, the sustained release of curcumin from the composites was observed.

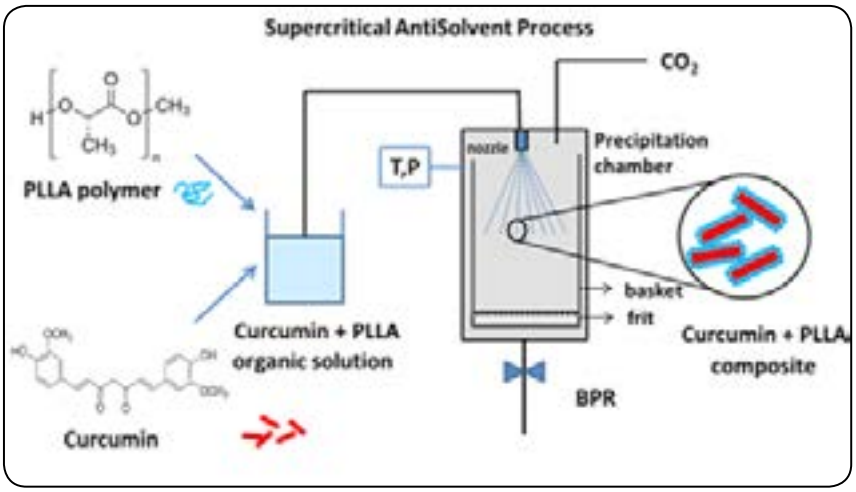

Figure 1. Molecular structures of curcumin and PLLA and schematic representation of the supercritical fluid antisolvent (SAS) micronization technique used to obtain curcumin-PLLA composites

Recent Publications:

1. A. Rojas, A. Torres, F. Martínez, L. Salazar, C. Villegas, M.J. Galotto, A. Guarda, J. Romero, Assessment of kinetic release of thymol from LDPE nanocomposites obtained by supercritical impregnation: Effect of depressurization rate and nanoclay content, European Polymer Journal 93 (2017) 294-306.
2. C. Villegas, A. Torres, M. Rios, A. Rojas, J. Romero, C.L. de Dicastillo, X. Valenzuela, M.J. Galotto, A. Guarda, Supercritical impregnation of cinnamaldehyde into polylactic acid as a route to develop antibacterial food packaging materials, *Food Research International* 99 (2017) 650-659.
3. A. Torres, E. Ilabaca, A. Rojas, F. Rodríguez, M.J. Galotto, A. Guarda, C. Villegas, J. Romero, Effect of processing conditions on the physical, chemical and transport properties of polylactic acid films containing thymol incorporated by supercritical impregnation, European Polymer Journal 89 (2017) 195-210.

4. N. Alvarado, J. Romero, A. Torres, C. López de Dicastillo, A. Rojas, M.J. Galotto, A. Guarda, Supercritical impregnation of thymol in poly(lactic acid) filled with electrospun poly(vinyl alcohol)-cellulose nanocrystals nanofibers: Development an active food packaging material, Journal of Food Engineering (2017).
5. A. Rojas, D. Cerro, A. Torres, M.J. Galotto, A. Guarda, J. Romero, Supercritical impregnation and kinetic release of 2-nonanone in LLDPE films used for active food packaging, The Journal of Supercritical Fluids 104 (2015) 76-84.

Biography

Adrián Rojas, student of University of Santiago's doctoral program in Food Science and Technology and member of the Food Packaging Laboratory (LABEN-Chile) and the Laboratory of Membrane Separation Processes (LabProSeM) is interested in the applications of the supercritical fluids for the development of active materials and how nanotechnology could improve the performance of these materials. Specifically, he has developed his doctoral thesis on the application of the supercritical impregnation process for the development of antimicrobial nanocomposite materials for food packaging applications, under the supervision of the professors María José Galotto and Julio Romero. As consequence of his doctoral research and other collaborations, he has published until the date seven papers in reputed journals.

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