

Application of Differential Scanning Calorimetry to Evaluate Thermal Properties and Study of Microstructure of Biodegradable Films

M. A. Aguilar-Méndez · E. San Martín-Martínez ·
L. Ortega-Arroyo · A. Cruz-Orea

Received: 15 October 2008 / Accepted: 1 April 2010 / Published online: 18 April 2010
© Springer Science+Business Media, LLC 2010

Abstract The glass transition temperature (T_g) and melting temperature (T_m) of gelatin–starch films were determined using differential scanning calorimetry. Also, the microstructure was observed using scanning electron microscopy (SEM) and the crystalline structure by means of X-ray diffraction (XRD). The effect of starch and glycerol concentrations in films on the thermal properties was evaluated through response surface methodology (RSM). The highest values of T_m were obtained at starch concentration intervals of (0.26 to 0.54) %w/w and glycerol concentrations lower than 0.5 (%w/w). On the other hand, the T_g values diminished as the glycerol concentration increased. Mathematical models for both transitions were fitted to the experimental data. The micrographs obtained by SEM show the influence of glycerol in the microstructure of the films, being more “gummy” as the content of the plasticizer increased. The XRD patterns of the films demonstrate the existence of some pseudo-crystalline regions in the biodegradable materials.

Keywords Biodegradable films · DSC · SEM · XRD