MOLECULAR MOBILITY AND TRANSPORT PROPERTIES OF MULTILAYERED EVA/EVOH FILMS

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ABSTRACT

The partial hydrolysis of poly (ethylene-*co*-vinyl acetate) (EVA) allows obtaining a material with tunable properties due to the vinyl alcohol (VOH) hydrophilicity and the hydrophobicity of ethylene and vinyl acetate (VA) groups, i.e. poly(ethylene-*co*-vinyl alcohol) (EVOH). EVA and EVOH films can be used in different fields such as food packaging, purification process and drug release.

A three-layered (EVOH/EVA/EVOH) film was obtained during EVA hydrolysis (Fig. 1a). Its microstructure was characterized by DSC, DMA and WAXS methods and the transport properties were evaluated by water permeability measurements. An evolution of the glass transition temperature and the crystallinity degree as well as the amorphous phase was noted with the hydrolysis time increase, i.e. with the increase of the EVOH layer (Fig. 1b). Also, it was observed that the diffusion and permeability coefficients decrease with hydrolysis time increase.

In order to study in details the amorphous phase properties, temperature modulated DSC (TMDSC) analysis was carried out for the cooperative rearranging region (CRR) characterization. The modelisation of the obtained results was performed according to the Donth's model. In the case of the completely amorphous EVA, the dynamic glass transition temperature (Tα) was detected at -14 °C and the CRR volume was 9.2 nm^3. This result indicates the weak cooperative movements in the amorphous phase.

In addition, performed broadband dielectric spectroscopy (BDS) measurements revealed the relaxation processes associated with the molecular mobility related to intermolecular and intramolecular interactions.

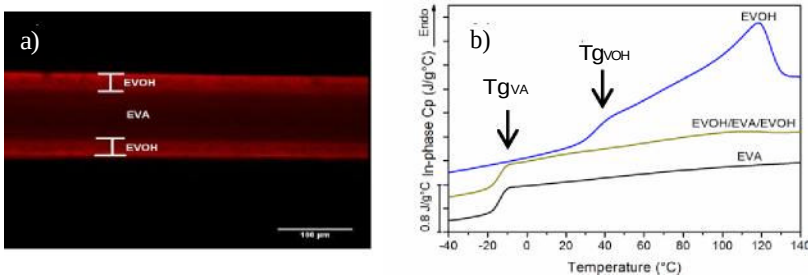

Fig. 1: a) Optical image of three-layered film. b) In-phase Cp curves of EVA, EVOH and three-layered films.

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