



Analysis of diffusion of water vapour into polymer coposites containing polysaccharides

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Abstract

The composites of polyethylene or poly(lactic acid) with biodegradable polysaccharides such as chitosan and modified starch were studied from point of their hydrophylicity. Results of a study of kinetics of water sorption from vapour phase were presented. Effective diffusion coefficients of water were calculated using Fick's equation. Experimental sorption isotherms were fitted to the equation of GAB model.

The authors proposed the formula which considers the dependence of moisture content on weight fraction of the hydrophylic component of composites taking into account the observed lack of moisture additivity, by introducing deviation parameter ϵ .

Modelling of water sorption isotherms of the polymer systems using the parameter ϵ leads to good correlations with experimental results.

Key words: Chitosan, Starch, Polyethylene, Poly(lactic acid) composites, Diffusion, Water sorption isotherm, Modelling

1. Introduction

Due to its nature, water interacts with hydrophylic polymer as a result of the interactions of the type of hydrogen bonds. Therefore, the physico-chemical properties of those polymers depend on the presence of water in their structure (Pu *et al.*, 2000). Moisture content present in polymers plays a key role in such properties as the electrochemical and biological activity of polymer membranes and their resistance to hydrolysis and biodegradation.

Polymer composites containing one hydrophilic

component are materials with potentially better biodegradability due to possibility of water diffusion together with enzyme into material structure (Mucha and Pawlak, 2002).

Polymer blending is a one of most effective preparation method of materials of new properties, for instance, new biomedical and technical applications (Messai *et al.*, 2005).

A purpose of our work was composites preparation in the form of films obtained by mixing of polysaccharides (chitosan in the form of powder and modified starch in the form of premixture with glicerol) with polyethylene and poly(lactic acid) in their molten state and investigation of