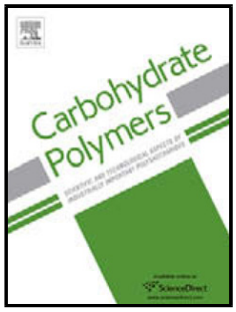

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Influence of the composition and high shear stresses on the structure and properties of hybrid materials based on starch and synthetic copolymer

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Highlight

- Shear stress is used for preparing the films from starch and synthetic copolymer.
- Activation promotes crystallization of starch and ordering of the amorphous phase.
- An increase in the starch content and activation result in rise in tensile strength.
- Starch content was shown to influence on sorption and diffusion in the opposite way.

Abstract

The method of mechanical activation in the rotor-stator device was used to combine the starch hydrogel and the latex of the synthetic copolymer. The compatibility of the components was found to improve consistently by the preliminary mechanoactivation of the starch gel and the joint activation of the mixturs.

The joint activation was shown to promote the crystallization of starch and the amorphous phase ordering of the composite.

An increase in the starch content and co-activation were found to result in rise in the Young's modulus and tensile strength, but joint activation ensures an increase in the elasticity of the samples.

The kinetic parameters of moisture transfer through composite films were estimated. A distinct compensative effect was found, consisted in a significant increase in the sorption coefficient and a decrease in the diffusion coefficient with increasing starch content.

Keywords: Starch, Styrene-acrylic copolymer, Rotor-stator device, Films, Microstructure.

1. Introduction

Recently, polymers from renewable sources are of great interest due to their biodegradability and the elimination of a number of environmental problems [Yu, Dean, & Li , 2006; Leja, & Lewandowicz, 2010]. Biodegradable polymers include three main groups of materials [Yu, & Chen, 2009]: 1. Natural polymers (starch, cellulose, etc.). 2. Synthetic polymers from bio-monomers. 3. Polymers obtained by microbial fermentation. Among the natural polymers for the production of biodegradable materials, starch is the most widely used, thanks to its easy availability