BLENDS OF PVA WITH NATURAL FILLERS

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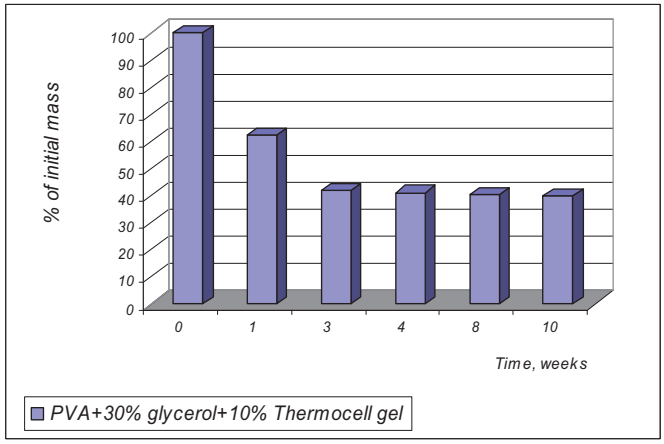
The aim of our research was development of biocomposites based on plasticized biodegradable synthetic polymer poly (vinyl alcohol) (PVA) blends with natural fillers and estimation of some characteristics of obtained polymeric materials. Constant content of glycerol (30 w% from PVA) was used as plasticizer. Local origin potato starch (Aloja), modified starch, and microcrystalline cellulose - thermocell (in forms of powder material and thermocell gel) were chosen as fillers for plasticized PVA biocomposites. Thermocell is homogeneous powder with a particle size of 10-30 nm, of various colors depending on type of the initial raw material. Powder thermocell differ from thermocell gel with average degree of polymerization, degree of crystallization and with particle sizes [1]. Modified PVA films were prepared by solvent casting technique from aqueous blends of all components. After drying PVA composites were thermally pressed or irradiated using ^{60}Co as the γ-radiation source (dose 25 kGy).

In this paper we report on the results regarding mechanical characteristics, water and water vapour absorption and biodegradation of obtained PVA biocomposites. It was found that all characteristics tested were significantly affected by content and chemical nature of natural fillers. As it was expected incorporation of hydrophilic starch facilitates water vapour absorption of biocomposites. Results of γ-radiation use show different influence of irradiation on the changes of mechanical properties of modified and clean PVA films. Tensile strength and elongation at break of irradiated modified PVA films decreased but for clean PVA films mentioned tensile strength increased ~ 2 times.

The high energy of radiation causes transformation of the –H and –OH groups of PVA. Both processes - scission and crosslinking of the main chains of PVA are possible simultaneously.



Biodegradation of PVA plasticized biocomposite

Biodegradation of PVA biocomposites was influenced by composition of the blend and takes place faster using natural fillers. Incorporation of thermocell gel facilitates biodegradation rate of PVA biocomposites ~ 6 times.

Analysis of present results testify that such way of PVA modification with natural fillers could be promising for development of selective kind of ecologically-sound biocomposites providing decrease of environmental pollution.

[1] M.Laka, S.Chernyavskaya. Obtaining and Properties of Microcrystalline Cellulose from Hardwood Pulp. .Baltic Polymer Symposium 2006, Birini Castle, Latvia, September 20-22. Programme and Proceedings, Riga, RTU, 2006, 39.