

NOVEL CHITOSAN-BASED WATER-SOLUBLE GRAFT-COPOLYMERS OBTAINED BY SOLID-STATE SYNTHESIS

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Reactive polymer blending is a promising path to new polymeric materials. A technique for polysaccharides grafting by concurrent extrusion of components in presence of low-weight-molecular reagents is reported in this work. The main feature of this method is that the entire modification does not require any solvents.

It was shown that the mixtures of chitin and poly(vinyl acetate) with sodium hydroxide subjected to simultaneous action of pressure and shear strain at elevated temperature undergo highest degree (up to 95-98%) of deacetylation. It was also revealed that the polymer-analogous transformations are accompanied by intensive trans-chemical reactions, resulting in enhanced compatibility of components and higher extent of intermixing.

The graft-copolymers of chitosan and poly(vinyl alcohol) (PVA) received by solid state co-extrusion show enhanced solubility in water at neutral pH. The structure of these materials was characterized by FTIR spectroscopy and wide angle X-ray diffraction (WAXD). By application of sequential fractionalization in combination with FTIR method it was shown that the soluble at ambient temperature fraction contains 50 mol% of chitosan.

The obtained chitosan-PVA graft-copolymers were processed into visually transparent homogeneous films, microfibers and microcapsules that were characterized for crystallinity and microstructure by using FTIR, WAXD, SEM, and DSC. The mechanical properties of the films were evaluated as well. It was, in particular, shown that the films based on 15 wt.% chitosan and 85 wt.% PVA demonstrate a substantially higher mechanical strength as compared with commercial PVA films.

It was demonstrated that the chitosan-based copolymers are good potential candidates for carriers of bioactive compounds and wound-dressing materials due to solubility at physiological pH and biocompatibility. They seem also to be very promising as compatibilizing additives to polysaccharide-based blends for composite fibers and films.

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