

Nanocomposites and nanomaterials

Polymeric composites for medical applications

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This investigation is devoted to study of materials based on two or three component polymeric systems include gelatin, chitosan and 2-hydroxyethylmethacrylate (HEMA): unfilled or filled with multiwalled carbon nanotubes (MWCNTs). The films were obtained from solution of water soluble polymer with adding monomer HEMA. These materials were synthesized in order to obtain composites for medical applications, namely coatings for internal implants or matrices for bactericides or scaffolds. The main task of presented work was developed a composite with smooth surface and ordered structure. As well as, elaboration of hydrogel with crosslinked flexible internal structure as carriers for bioactive component.

Composite films based on chitosan were obtained from solution of polymer dissolved in acetic acid and filled with nanotubes using sonication. Polymeric films based on HEMA - from solution of the monomer in ethanol in the presence of AIBN as an initiator of radical polymerization. The filling degree was 0.1 wt%. For producing of three component materials the solution of chitosan, solution of gelatin and HEMA were mixed together in demanded rations. The hydrogel were composed on hydrophobic plate at temperature for 80 C during 3 h.

Composites for coatings or scaffolds were testing using DSC analysis, thermomechanical study, microscopy and spectral study. For the hydrogel - a water absorption, absorption of bioactive agents and release kinetics were investigated. For all materials and biological tests was carried out. According to obtained results the most perspective materials as scaffolds or biocompatible coatings are films based on chitosan or HEMA filled with carbon nanotubes; better characteristics as hydrogel carrier were obtained for chitosan-gelatin-HEMA compositions.

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