

Nanocomposites and nanomaterials

Synthesis of chitosan-based nanocomposites filled with *in situ* condensed silica

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In recent years the problem of environment pollution has aggravate dramatically forcing both polymer science and industry look for the renewable sources of raw materials. Among various natural polymers used for composite materials synthesis considerable attention has been given to chitosan because of its unique properties. Chitosan is the principal deacetylated derivative of chitin which is the second most important polysaccharide on earth next to cellulose and is available from waste products in the shellfish industry. Chitosan has good solubility at aqueous acidic medium and can be modified easily owing to both hydroxyl and amino groups. Thanks to its good biocompatibility, biodegradability, nontoxicity and availability chitosan has widespread applications in biomedical, food, chemical industries etc.

In this work chitosan-based nanocomposites filled with *in situ* condensed silica were synthesized and investigated. Chitosan was used as 2 wt.% solution in diluted acetic acid. Water solution of polysilicic acid was used as a precursor for the silica synthesis. 3-glycidoxypropyltrimethoxysilane (GPTMS) was used for the crosslinking of chitosan. In addition thanks to its organic-inorganic nature silane acts as a coupling agent for the composite constituents. The procedure of chitosan cross-linking one can found in [1]. Chitosan nanocomposites filled with silica *in situ* were obtained by the same way adding inorganic precursor into initial reactive solution. Organic to inorganic ratio in nanocomposites was varied from 1:0 to 1:1 (wt./wt.). Chemical interaction between amino groups of polysaccharide and glycidyl groups of GPTMS resulting in chitosan network formation was confirmed by IR-analysis. Structure of the nanocomposites obtained and their thermal properties were studied as well by means of electron microscopy, DSC and TGA analysis respectively.

1. Shirosaki Yu., Tsuru K., Hayakawa S., Osaka A., Lopes M.A., Santos J.D., Costa M.A., Fernandes M.H. Physical, chemical and *in vitro* biological profile of chitosan hybrid membrane as a function of organosiloxane concentration // *Acta Biomaterialia*.-2009.-5.-P. 346-355.