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Polyelectrolyte complexes of polysaccharides with gelatin

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Polysaccharides are among the polymers that make up the fundamental components of life and constitute a major proportion of the Earth's biomass. Polyelectrolyte complexes (PEC) of polysaccharides (which are responsible for the steric factor of stabilization and increase in viscosity of a continuous phase) with gelatin (which provides the high rate of adsorption) are currently considered as the most perspective stabilizers of the dispersed systems in particular in food industry. A cationic polysaccharide chitosan is widely used as a "matrix" for the formation of (bio)polyelectrolyte complexes due to the attractiveness of its properties such as biocompatibility, biodegradability, low toxicity and relatively low manufacturing cost, due to the existence of rich natural sources of polysaccharide. Macromolecules of chitosan have a high density of positive charge in the acidic environment due to ionization of the free amino groups. Therefore, self-assembly of (bio)PEC occurs in acidic solutions of chitosan in the presence of the negatively charged polyelectrolyte. Gelatin is the product of collagen destructiony and has been widely used as a fundamental material for microspheres, sealants, tissue adhesives and carriers for controlled delivery systems. Gelatin has also been widely used in combination with other polymers for encapsulation.

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SWCNT glass composite- A novel material for electronic, optical and mechanical applications

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A new generation composite has been synthesized by impregnating SWCNT in oxide glass matrix using melt-quench technique. Current-Voltage relationship was studied with different temperatures and the electrical conductivity was found to increase significantly with the increase in temperatures. The activation energy of the composite was determined by Arrhenius analysis and found to be significantly low. Microstructural analysis of the composite by SEM, FESEM and TEM clearly shows the random orientations of the bundles of nanotubes throughout the glassy host. TEM micrographs show wonderful alignment of nanotube inside the bundles. The charge transport phenomena of the composite was analyzed by using variable range hopping (VRH) and fluctuation induced tunneling (FIT) model. It was found that the charge conduction through the composite was well explainable by the FIT model. Moreover an interesting optical property of this composite has been observed where one can see strong near infrared fluorescence from Single walled carbon nanotube-borosilicate glass composite around 0.84-2.03 μm with 325 nm laser excitation. Band gap fluorescence of SWCNT bundles along with defect related fluorescence from SiO2 structure were the source of the NIR emissions of the composite. Finally researchers are looking for new class of materials having high mechanical resistance, low density and microwave attenuating properties for different structural applications. All these properties are well established in this composite thereby making it one of the versatile materials for conductor-insulator interface device coupled with broadband fiber optic telecommunications , fabrication of NIR tunable lasers and high end structural application.

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