SYNTHESIS, DIELECTRIC AND SWELLING CHARACTERIZATION OF NOVEL CHITOSAN-POLY((N,N-DIMETHYLAMINO)ETHYL METHACRYLATE) SEMI-IPN GEL FILMS

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Chitosan (CS) is a cationic pH-sensitive polymer obtained by deacetylation of chitin which is the second most common amino polysaccharide in nature. It is a biocompatible, biodegradable, and a nontoxic polymer. Due to these properties, it has numerous applications in various industries such as: drug, cosmetics, and medicine and agricultural devices.[1, 2] PDMAEMA is a cationic polyelectrolyte which is both temperature- and pH-sensitive[3].

Polymers which respond to the minute changes of environmental stimuli as volume change or swelling/shrinking are called as stimuli-responsive polymers. The external stimuli types for these polymers are temperature, pH, electic field, magnetic field, light, and some specific chemicals such as glucose. In pH-sensitive gels, pH-dependent swelling/shrinking behavior is observed depending on the ionization degree of ionizable groups of network structure. [4]

In this work, novel semi IPN gel films (CS-DME) from chitosan (CS) and (N,N-dimethylamino)ethyl methacrylate (DME) were prepared in the solution of chitosan (1 wt %) in aqueous acetic acid (2 vol %) at various initial monomer concentrations (0.06 – 0.21M) at room temperature using N,N-methylene bisacrylamide (NMBA) as cross linker, ammonium persulfate (APS) as initiator and N,N,N,N-tetramethyl ethylenediamine (TEMED) as accelerator.

Both CS and CS-DME semi IPN gel films were characterized by XRD, FTIR, and equilibrium swelling values in both distilled water and in buffer solutions with pH = 2-10 at constant ionic strength (I=0.08M). Complex dielectric constants were measured at room temperature by a LCR meter (GW Instek LCR819) in the frequency range from 12 Hz - 100 kHz using a dielectric cell consisting of two parallel plate electrodes (2cm x 3cm) coated with copper.

While equilibrium swelling values (ESVs) of CS-DME semi IPN gel films in distilled water increased with initial DME concentration in monomer feed, ESVs of these films in buffer solutions decreased with the increase of pH of swelling medium from 2.2 to higher values.

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