

Title : Synthesis of Dual Stimuli-Responsive Semi-Interpenetrating Polymer Network (Semi-IPN) Hydrogel from CMC/PNIPAM for Biomedical Applications.

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ABSTRACT

This research focuses on the synthesis of a smart hydrogel, a polymer exhibiting responsiveness to environmental stimuli particularly pH and temperature variations. The hydrogel was developed as a semi-interpenetrating polymer network (Semi-IPN) composed of carboxymethyl cellulose/crosslinked-poly (N-isopropyl acrylamide) (CMC/PNIPAM). Potassium persulfate (KPS) was employed as the initiator, tris[2-(dimethylamino) ethyl] amine (Me_6TREN) as the catalyst, and poly (ethylene glycol) diacrylate (PEGDA) as the crosslinker of PNIPAM moieties, with the molar ratio of crosslinker set as 0.125 % mol. The PEGDA molecular weight was kept constant at 575 Da. The synthesis process was monitored by characterizing the chemical structure using Attenuated Total Reflectance-Fourier Transform Infrared Spectroscopy (ATR-FTIR). Additionally, thermo-responsive behavior of solutions with 9% and 10% (w/w) semi-IPN polymer concentrations was analyzed using rheometer to monitor the change of viscoelastic properties of the materials as a function of temperature. The sol-gel phase transition of the polymer solutions was observed at 32 °C by test tube inversion method and the polymer concentration of 10% (w/w) exhibited the highest storage modulus of 121.23 Pascal. The on-going study includes increase the molecular weight of the crosslinker to 700 Da and later the viscoelastic properties of the synthesized Semi-IPN will be analyzed.

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