# Thermosensitive Poly (N-isopropylacrylamide) Hydrogel for Wound Healing Dressing

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Thermosensitive poly (N-isopropylacrylamide) (PNIPAM) hydrogels were synthesized via a polymerization process initiated by a hydrogen peroxide-ascorbic acid redox system. This redox pair triggers polymerization under mild conditions, ensuring that the hydrogel maintains its bioactivity. In our study, PNIPAM was blended with various additives, including sodium alginate, chitosan particles, and theophylline, to assess how these components influence the material's viscoelastic properties. The mixtures were evaluated using dynamic mechanical analysis (DMA) in shear mode, which allowed us to characterize the temperature-dependent behavior of both the solution and the resulting hydrogel. One particular sample, designated 100N5A-GT, was formulated with a weight ratio of PNIPAM, sodium alginate, theophylline, and phosphate-buffered solution of 7.6:0.4:0.43:92, respectively. At a lower temperature of 20°C, the complex viscosity of the formulation was measured at approximately 1.77 Pa·s. This relatively low viscosity suggests that the material exists in a liquid state, making it suitable for injection. However, as the temperature increased to 35°C, the complex viscosity rose sharply to 264 Pa·s. This marked increase indicates a transition from a liquid to a gel state, which is ideal for in situ formation of a wound-healing dressing upon application to the skin. This thermally induced phase transition was further confirmed using cloud point measurements and the inversion tube test, both of which corroborated the temperature sensitivity. Additionally, spectrophotometric analysis was employed to monitor the release profile of theophylline from the hydrogel. The results revealed that the incorporation of chitosan particles significantly slowed the release rate of theophylline, suggesting that chitosan plays a crucial role in modulating drug delivery from the hydrogel matrix.

**Keywords:** N-isopropylacrylamide ； sodium alginate, theophylline, injectable wound dressing, thermosensitive hydrogel

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