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STUDY OF THE RHEOLOGICAL BEHAVIOR OF THE CHITOSAN HYDROGELS VIA ENZYMATIC SYNTHESIS FOR TISSUE ENGINEERING APPLICATIONS.

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Enzyme-catalyzed production of ammonium hydroxide is used to neutralize chitosan acid aqueous solutions. This method allows the production of uniform chitosan hydrogels with a potential use in tissue engineering applications. The reaction of urea for produce ammonium hydroxide by urease following the next scheme:

The pH increase of the solution causes of deprotonation of free amino groups present in the chitosan molecule thus reducing the charge density of chitosan such than polymer chain mobility increases. As a result, the balance of hydrophobic interactions and hydrogen bonds favors the formation of a three-dimensional network. Gel formation was characterized rheologically and monitoring the pH at different initial urea concentrations (40, 60, 80 and 100 mM). Preliminary results show a progressive gelling evidenced by an increase in time evolution of G' and G'' in their rheological behavior. Be also seen crossing the viscoelastic modulus ($G' = G''$) in the first 5 minutes of reaction, after which G' remains above G'' until both reach a plateau. Above a critical urea concentration which could be between 40 and 50 mM, the final gels obtained have similar viscoelastic properties, regardless of the urea concentration. For these gels G' has values of approximately 1000 Pa over the entire range of frequencies and G'' have values of 60 Pa at low frequencies and 20 Pa at high frequencies. An inflection point in the pH time evolution for all urea concentrations (except to 40 mM) suggests that the gel point occurs in this pH range between 6.6–6.7.