OP 11 - Stability of Chitosan in Solution and in Solid State

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Thermal depolymerization of chitosan salt in solution and in solid state has been examined. Depolymerization was followed by measuring the apparent viscosity and intrinsic viscosity. The initial rate constants were determined from the intrinsic viscosity data, and the activation energies of chitosan salt samples in solution and in solid state were determined to 75 ±10 kJ/mol and 110 ± 5 kJ/mol, respectively. The presence of oxygen affected the rate of depolymerization of chitosan in solution, but not chitosan in solid state. These results indicate that oxidative-reductive depolymerization (ORD) mechanism is involved in the thermal depolymerization of chitosan in solution. In addition, the time course of the thermal degradation of chitosan solution showed one initial rate constant followed by a slower rate constant. The slower rate constant was increased by increasing the ionic strength, suggesting an influence of another mechanism than ORD. The initial rate constant of thermal depolymerization of chitosan in solid state has been shown to increase markedly with FA, and increase with the H+ concentration in the pH range 4-6, when pH is defined as the pH of 1% (w/w) chitosan salt solution. These data demonstrate the importance of acid hydrolysis mechanism in thermal depolymerization. The initial rate constants of chitosan in solution were not affected by FA. Probably, the acid hydrolysis is also involved in thermal depolymerization of chitosan in solution - but is initially neglectable compared with ORD. Chitosan glutamate and chitosan chloride have shown the same rate of depolymerization, showing that the type of counterion has no influence on the depolymerization. The results reported show that the stability of chitosan salt samples will be influenced by acid hydrolysis as the primary mechanism in the solid state and ORD as the primary mechanism in solution.