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## Effect of Salt on the Decomposition of Saccharides in Subcritical Water

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### Summary

Water that maintains its liquid state in the temperature range of 100°C to 374°C is called subcritical water. The water has two features: one is a low relative dielectric constant and another is a high ion product. The latter indicates the possibility that the water acts as an acid or base catalyst due to high concentrations of hydrogen and hydroxyl ions. It has been known that monosaccharides are degraded in the subcritical water and that the subcritical water catalyzes the hydrolysis of di- or oligosaccharides. However, the effect of salt on the degradation or hydrolysis has not been elucidated. The purpose of this study is to examine the effects of NaCl on the degradation of aldo- and ketohexoses and on the hydrolysis of sucrose.

Glucose, mannose or galactose were dissolved in distilled water at 0.5% (w/v), and its degradation was observed at 220°C using a tubular reactor. The degradation was also measured for the aldohexoses dissolved in water containing NaCl at various concentrations. The degradation processes were analyzed based on the Weibull equation, and the rate constant  $k$  and the shape constant  $n$  were evaluated for each degradation process. The presence of NaCl accelerated the degradation for all the aldohexoses. For the degradation of galactose, the  $k$  value increased with increasing NaCl concentration. Degradation of ketohexoses, fructose and sorbose, were also accelerated by the presence of NaCl. However, the formation of 5-hydroxymethyl-2-furaldehyde from both aldo- and ketohexoses was not affected by the presence of NaCl.

The hydrolysis of sucrose by the subcritical water was also examined at 170°C in the absence or presence of NaCl. The hydrolytic process was not significantly affected by the presence of NaCl, and it could be described by the rate expression of autocatalytic type. Because no significant degradation of glucose and fructose, which were produced through the hydrolysis, occurred at the temperature, the monosaccharides were formed in the concentration corresponding to the decrease in the sucrose concentration.