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Abstract
Xanthan (XG) and Guar gum (GG) are widely used polysaccharides in food industry. Mixing of XG and galactomannan with low galactose content (for example, LBG) leads to an enhancement in rheological properties and the formation of gels due to the interaction between XG and the galactose free segment. On the other hand, when mixing XG and high-galactose-content galactomannan, such as GG, gelation occurs in the presence of salts, but its mechanism is still unknown. The aim of this study is thus to examine the XG/GG solution in different salt concentrations by measuring the rheological properties.
The results indicate that the XG and XG/GG solutions exhibit thixotropic and anti-thixotropic behavior, respectively, while GG solutions show no thixotropic behavior. The thixotropic behavior can be described by a structure-breakdown kinetics model, which assumes the structure in the solution is gradually ruptured in a shear field, resulting in a decrease in viscosity with time. The transient viscosity data were thus analyzed according to the structure-breakdown kinetics model using a curve-fitting method. Two parameters, the rate constant and the initial to equilibrium viscosity ratio, were then obtained.
The analysis shows that there are two modes in the structure breakdown of XG solutions under shear. The rate constant of the slow mode is found to obey the Arrhenius relationship and its dependence on shear rate can be described by a simple rate law. On the contrary, the rate constant associated with the fast mode does not follow the Arrhenius relationship. The structure associated with these two modes can not be recovered after setting for a period time after shear, indicating that the structure is generated during the preparation of the solutions. Furthermore, it is also found that the addition of salts (KCl) or sucrose can significantly reduce their thixotropic properties.
For XG/GG solutions, anti-thixotropic behavior was observed; however, distinct thixotropic behavior was otherwise observed in the presence of salts.
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