GELATION OF WHEAT SOLUTIONS

Problem

The gel point in materials represents the point where behavior changes from more viscous (liquid-like) to more elastic (solid-like). The conditions under which this occurs are critical to many food constituents, such as wheat/soya solutions used as setting agents within reconstituted meat products.

Solution

Oscillatory controlled stress experiments, in which a small sinusoidal stress is applied to the material, provide a convenient method for evaluating elastic and viscous properties without destroying the delicate structure of soft semi-solids.

Figure 1 shows the oscillatory elastic modulus (G') results for several soya solutions containing ionic strength modifiers at a variety of processing temperatures. Although none of the solutions show significant temperature effects up to 85°C, both solutions with added salts (B,C) exhibit higher G' (elastic/solid-like behavior) than the solution made up in pure water. The solution (C) containing a small amount of potassium chloride (KCl) in fact gelled prior to this temperature sweep. This test, therefore, represents a way to evaluate the effect of ionic strength on gelation.

Figure 2 illustrates the ability to detect the temperature of gelation for two aqueous wheat solutions with different gelation enhancing enzymes. The temperature of gelation is the point where the G' and G" curves cross. (G" being the loss modulus, and the cross over point being the point at which there is a balance between solid and liquid-like structure). Even though the different enzymes yield the same gel temperature, the final gel strength (G') is much higher for enzyme A. This information can be used to gain an
appreciation of the food product's behavior in production and when consumed. For example, at the gel point the character of food changes significantly. It may therefore be crucial to pump products into packaging before this point is reached. The gel strength, on the other hand, has a great bearing on a food's texture, and hence its appeal when consumed. In the case of reconstituted meat products the gel strength also dictates whether or not they hold together.

Figure 2. GELATION OF WHEAT SOLUTIONS

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