How protein and fat content influence dairy gel formation

Application
Food

Device
Rheolaser® Rheolaser

Introduction

Dairy products are a growing food segment worldwide, especially for children and health conscious consumers. It is therefore critical to ensure the quality of the textural properties for consumer acceptance. Yogurt and cheese are the result of a change in milk pH, which induces flocculation of the protein micelles. The flocculated micelles form the gel network. The pH reduction can be induced by addition of bacterial cultures, glucono-δ-lactone (GDL) or lemon juice to milk.
Rheological measurements of dairy products are complex as the gel network is weak and can easily be disturbed by intrusive methods such as mechanical rheology. Rheolaser performs zero shear measurements, since no external stress is applied. In this work we followed the yogurt formation with GDL as a function of time and pH. Elastic properties of yogurts with different protein and milk fat content will be compared.

Gelling time of yogurt

Rheolaser Master measures the particle Mean Square Displacement (MSD), which gives an indication of the viscoelastic properties during gelation. Figure 1.I shows the MSD curves of milk gelated with 1 wt% GDL at 40℃. The MSD curves in the top left are linear, which indicates a liquid behaviour before gelation. At longer times, micelles flocculate and a network is formed, leading to the typical viscoelastic curves (plateau formation).
The gel point is determined with the new Time-Cure-Superposition (TCS) method. TCS consists in rescaling the MSD curves with factors **a** and **b**, which gives a characteristic v-shaped curve indicating the gel point as shown in Figure 1.II (see application note “Gel point determination by TCS” for more details).
This yogurt sample with UHT milk and 1 wt% of GDL gelled at 42’25”. The pH was measured in parallel and the gelation took place at a pH of about 5.11, as expected.

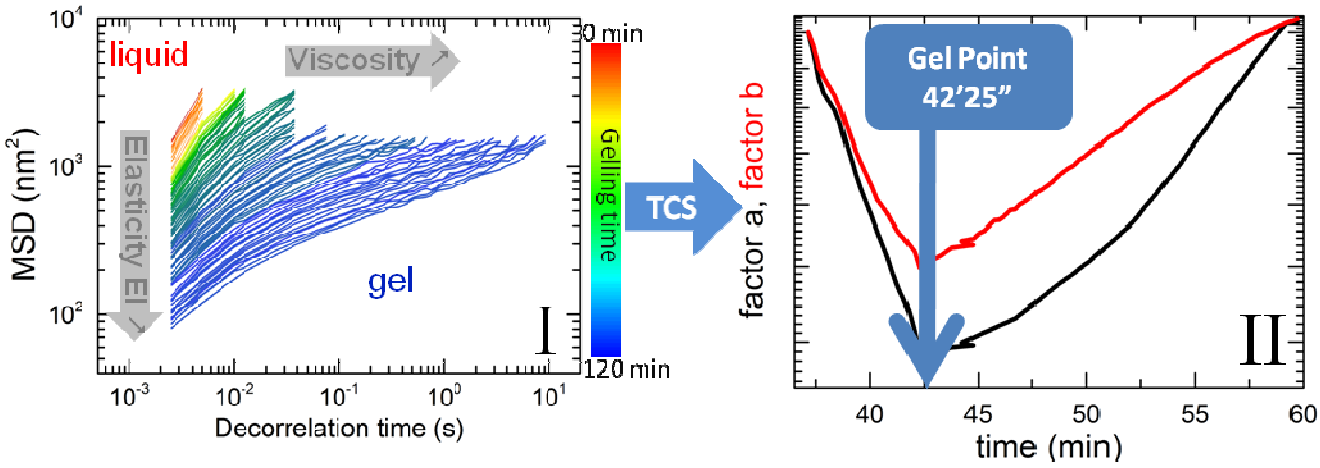

Figure 1: (I) MSD curve evolution as a function of time during yogurt formation. (II) Scaling factors a and b as a function of time.