Biopolymers: suitability for low-fat products

Introduction

Food industry faces a great challenge nowadays due to people's demand of low-fat and low-sugar content products. Healthy products are moved to the center of attentions, and the industry continuously adapts the recipes. One of the solutions is to replace part of the fat content by water, which is texturized with biopolymers. The biopolymer has of course to be chosen carefully, in order to match textural and sensorial properties of the original product.
Rheolaser MASTER provides several advantages to handle this issue. Its six measurement positions allow studying up to six different recipes at a time and comparing them simultaneously by running a unique experience. Moreover, the optical technique allows characterizing these fragile products at rest, with no shear and/or denaturation.
In this example of a model mayonnaise (75% (v/v)) and low-fat mayonnaise (fat content decreased to 40% (v/v)) stabilized with different biopolymers, it is shown how Rheolaser can find the perfect thickener, which matches best the textural properties of the original emulsion.

Guar gum addition

In microrheology, particles probe the viscoelastic behaviour of the sample. Thus, particles Mean Square Displacement curve is the signature of the product rheology. The original concentrated emulsion (75% v/v) has a MSD curve with low values as it is a viscoelastic product with an elevated elasticity (A). When only diluting the emulsion, the elasticity decreases significantly, indicated by an increase of MSD (B). When 0.2% guar is added (C), the MSD curve lowers, which means that the elasticity increases. However, it has not yet reached the original level. This is only achieved, when another 0.2% of guar is added.

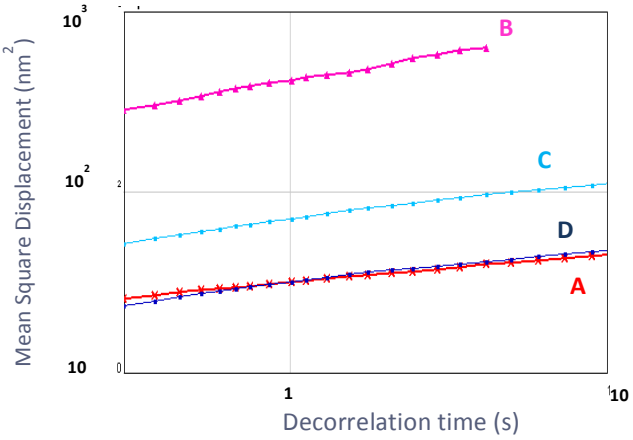

Figure 1. MSD of the original emulsion (A), the diluted emulsion (B), the diluted emulsion + 0.2% guar gum (C) and the diluted emulsion + 0.4% guar gum (D)

It can be observed that the slope of the MSD curves is different. The MSD curves of emulsions A (concentrated) and D (0.4% polymer) have a lower slope value, which corresponds to a more solid-like behaviour, whereas the diluted emulsion B and emulsion C (0.2% polymer) have a more liquid-like behaviour. In the table below, the Elasticity Index (EI) and the Solid-Liquid-Balance (SLB) are listed. The higher the EI, the higher is the sample's elasticity. The SLB gives an indication about the solid-like or liquid-like behaviour. Below 0.5 it is more solid-like, while above 0.5, the sample is more liquid-like.

Emulsion	EI (x 10^{-3} nm^{-2})	SLB
A : 75% v/v	42.4	0.16
B : 40% v/v	3.7	0.30
C : 40% v/v + 0.2% guar	21.0	0.22
D : 40% v/v + 0.4% guar	47.6	0.19