# Optimizing the cost of a low-fat emulsion

## Application

Food

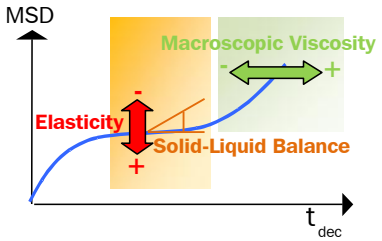
## Objective

Decrease the fat content in a product by replacing some of the fat content by polymer.

## Device

Rheolaser® LAB6

**Reminder about Mean Square Displacement**




MSD curves are the signature of the product's microrheology. It reflects the viscoelastic behaviour of a sample.

By acquiring MSD curves at different ageing times for a same sample, it is therefore possible to identify the evolution of both viscosity, elasticity, and microstructural properties of a given product.

## Introduction

The food industry faces a great challenge nowadays because people are more and more concerned about fat and sugar content of what they eat. Health is the centre of attentions, and the industry has to react by creating healthier products based on their old recipes. As explained in the previous Application Note (see: *Optimizing the texture of a low-fat emulsion*), one of the solutions is to replace part of the oil phase by water, while using thickeners and gelling agent to match the texture and rheological properties of the original product.

One of the key interests of microrheology and Rheolaser LAB6 here is that the user can prepare various formulas (up to 6) and compare them simultaneously by running a unique experience. Meanwhile, the optical technique allows characterizing these fragile products at rest, with no shear and/or denaturation.

In this example, the purpose is to decrease the oil content in an emulsion (from 75% v/v to 40% v/v), by using various thickeners at optimal concentrations, in order to match the textural properties of the original emulsion, and then compare the cost of the different emulsions.

## Raw data: Particles Mean Square Displacement (MSD)

In microrheology, particles probe the viscoelastic behaviour of the sample. Thus, particle Mean Square Displacement curve is the signature of the product rheology.
In this example, the goal is to match the rheological properties of a given product. The easiest way to do so is graphical: by adjusting the formulation to obtain the same MSD curve, the user can visually define the correct composition of his product.

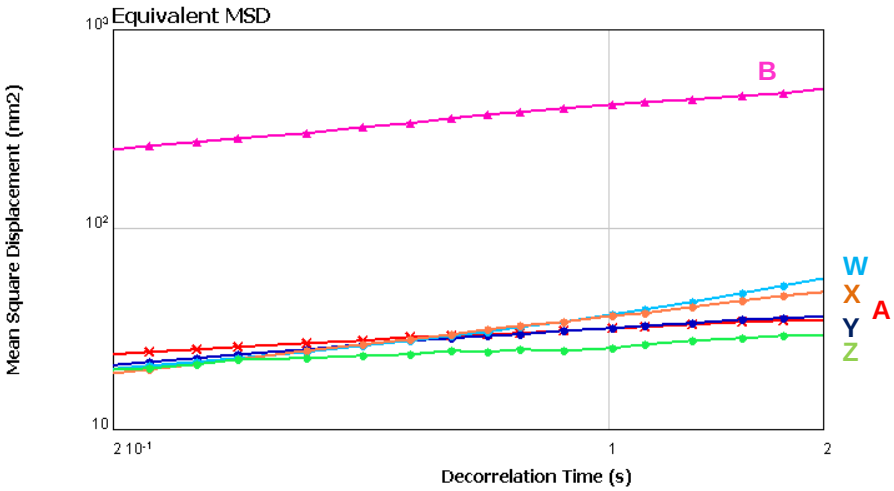



*Figure 1. MSD of the original emulsion (A, red), the diluted emulsion (B, pink), B + 0.2% of xanthan (W, light blue), B +0.4% of guar gum (X, orange), B + 0.8% of alginate (Y, dark blue), B + 0.2% of carrageenan (Z, green)*

By adjusting the various polymers concentration (see Application Note "Optimizing the texture of a low-fat emulsion"), it is possible to obtain very similar MSD curves, comparing diluted emulsion + polymer (W, X, Y, Z) and the original emulsion (A).
It is then interesting to compute parameters such as Elasticity Index (EI) and Solid-Liquid Balance (SLB) to quantify the strength of the structure and the behaviour of the product (liquid or solid), and rank easily the formula.