

# Experimental Set-up to Combine Shear with Strong Magnetic Fields

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## Introduction

### Abstract

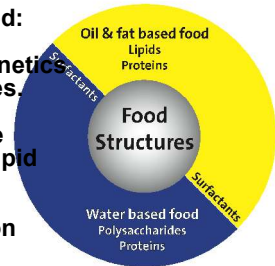
The set up combines the influences of a strong magnetic field and a structuring or destabilizing shear force. It comprises a superconducting magnet with a temperature controlled Searle rheometer geometry in the bore. Information on the material properties can be gathered over the scattering pattern of a laser beam through the gap and the rheological data. The set up is part of the work done within the EU FP6 project called "Magnetic Field Assisted Biomaterials Processing".

### Material - Process Relation

Two systems are being investigated:

- The influence on crystallization kinetics and polymorph type of triglycerides.
- Influence on permeability and size distribution of modified phospholipid vesicles.

Possible application: Encapsulation techniques, targeted drug delivery

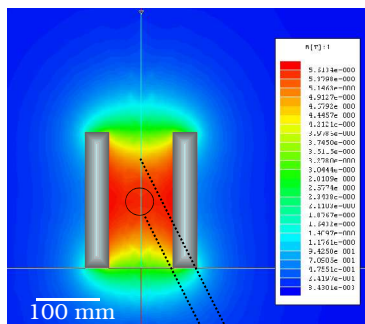


## Set-up Details

### Rheometer and Magnet

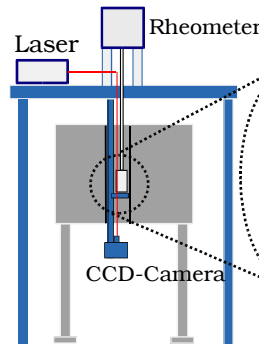


### Central Field Profile

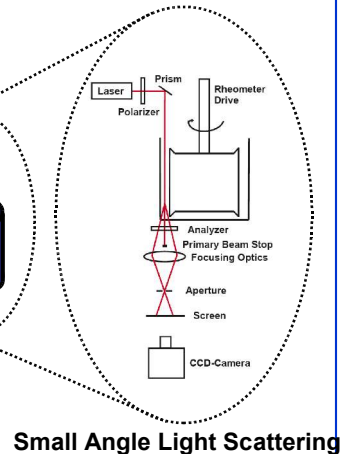


$(\Delta B \cdot B)_{\max} = 150 \text{ T}^2 \text{ m}^{-1}$   
Field homogeneity: 99%

### Schematics



### SALS



Small Angle Light Scattering

## System Specifications

### The Magnet

- Cryogen-free
- $B_{\max} = 5.6 \text{ Tesla}$  at  $I_{\max} = 100 \text{ A}$
- 78 mm diameter vertical RT bore
- Vertical, adjustable, rampable field
- Field homogeneity  $\pm 10\%$  at  $\pm 8 \text{ cm}$
- Coil temp:  $6^\circ\text{K}$ , coil material:  $\text{Nb}_3\text{Sn}$

### The Rheometer

- Controlled stress rheometer
- Torque range:  $1 \mu\text{Nm} - 50 \text{ mNm}$
- Cylinder dimensions:  $30 \cdot 44 \text{ mm}$
- Cylinder radius ratio ( $\delta$ ): 1.08
- Sample volume: 18 - 23 ml
- Adjustable temperature range:  $0-70^\circ\text{C}$

### The Laser-optics

- Laser light source: He-Ne, 632.8 nm
- Beam path: vertical through gap
- Scattering pattern recording: CCD camera
- Data analysis: SALSSOFTWARE, K.U. Leuven

NanoBioMag

