



Thesis Project Form

Title (tentative): Experimental study of the formation of a silicone oil emulsion in an in-vitro model of the eye

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Description

Motivation and application domain

Vitrectomy is a surgical intervention by which the vitreous humour is removed from the eye and replaced by a tamponade fluid, which has the role of maintaining the retina in contact with the outer layers of the eye. Silicone oils are often used as long term tamponades. They have several beneficial properties, however, the main complication is that they tend to form an emulsion with the aqueous solution naturally present in the eye.

Aim of this work is studying the mechanics underlying the formation of emulsions.

General objectives and main activities

The objective of the thesis is to use a model of the human eye to reproduce the possible formation of a silicone oil emulsion. The model is 3D printed with a transparent material and is filled with silicone oil and a water solution containing blood serum proteins. This is because such proteins have been shown in previous works to act as surfactants.

The eye model will be mounted on the shaft of a computer controlled motor and is set into motion, thus reproducing saccadic eye rotations.

At the end of each test the fluids will be taken out of the model and inspected under a microscope to verify the existence of an emulsion. If an emulsion will indeed be present it will be characterised in terms of frequency of occurrence of drops diameter.

Training Objectives (technical/analytical tools, experimental methodologies)

The student will have the opportunity to work in a lab and interact with researchers expert in the field of emulsions and surface tension. The student will also have to post process the experimental data.

Place(s) where the thesis work will be carried out: The thesis will be carried out at the ICMATE institute of CNR.

Additional information

Pre-requisite abilities/skills: Basic notions of fluid mechanics

Maximum number of students: 1