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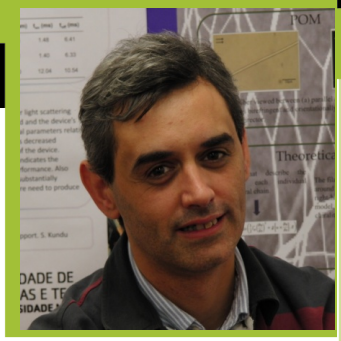
FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Department of Materials Science – CENIMAT/I3N

Oil-Fishing With Cellulose Meshes

Polymeric and Mesomorphic Materials Group
at DCM/FCT/UNL and CENIMAT / I3N



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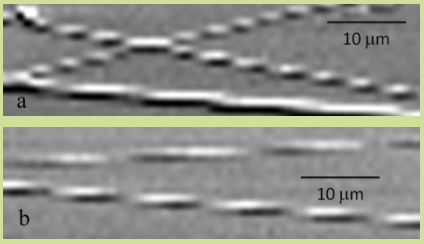
Current research interests:
Nano particules, Liquid Crystal Elastomers, Cellulosic Liquid Crystals

Objectives

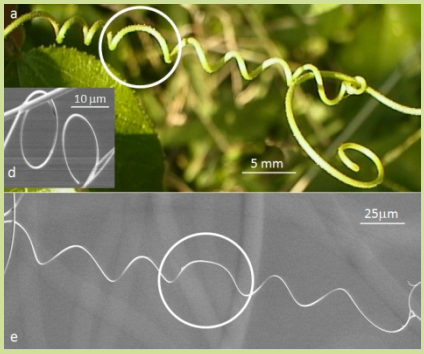
The main goal of this work is the manufacture and characterization of new renewable cellulosic-based meshes, which can effectively and selectively separate water from oil/mixtures. In this work the main objective includes the use of the natural recyclable fibre meshes, which can be thrown into the polluted sea, to capture the oil spill microdroplets. Thereafter the networks are easily collected, separated from the oil and reused. A major attempt will be made to establish and understand the phenomena of oil-adhesion to the cellulosic meshes, under different water environments.
The interpretation between the droplets and the meshes will be studied by contact and sliding angle measurements.



J. P. Canejo, J. P. Borges, M. H. Godinho, P. Brogueira, P. I. C.,Teixeira, E. M. Terentjev, Advanced Materials, **2008**, 20, 4821-4825.

Methodology

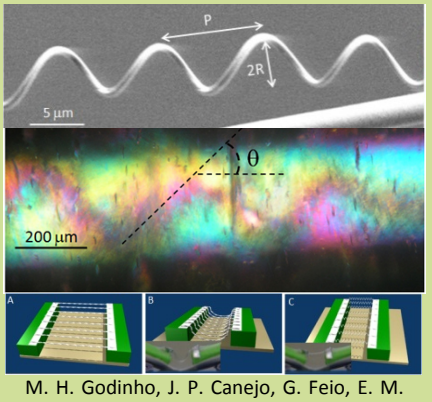
The first task is dedicated to the formulation of starting materials that are at the genesis of the fibres. The next step involves the fibre production. Different methodologies will be considered, which involve the use of electrospinning technique The characterisation of the fibres obtained includes the use of SEM, mechanical-optical characterisation, POM and AFM techniques. The next step focuses on the interactions between the oil droplets and the wet and dry fibres. Surface tension, contact angle and wettability measurements will be performed using a contact angle system. The fibre membranes will be tested under water to evaluate their ability to capture oil droplets. Oil static contact angles will be evaluated underwater, at ambient temperature, with different detecting oils. Underwater oil-adhesive forces will be measured by suspending an oil droplet with a metal ring, controlled to squeeze the surface at a constant speed, and then allowed to relax.



M. H. Godinho, J. P. Canejo, L. F. V. Pinto, J. P. Borges, P. I. C. Teixeira, Soft Matter, **2009**, 5, 2772.

Expected Results

A new material to remove oil droplets from water will be obtained. These new structured materials at the micro/nanoscale will be able to capture micro liquid “objects” opening new links between physics, material science, chemistry and environment. The study of underwater wettability at liquid/solid interface, accompanied by the study of the wettability at the air/solid interface, will open new horizons to these membranes applications, such as protein adsorption in solutions, in-liquid electrowetting, fabrication of underwater antifouling materials, and small-droplet manipulation in microfluidics. The results already obtained for cellulosic based fibres by the team show that these materials are clearly good candidates to be used as starting materials to capture oil droplets . In the frame work of this grant several electrospun geometries of threads formed by different sculped fibres, able to catch oil droplets from water, will be produced and ready to be scaled-up and used at an industrial level.



M. H. Godinho, J. P. Canejo, G. Feio, E. M. Terentjev, Soft Matter, **2010**, 6, 5965.

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