SCIENCESPRINGDAY

FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Department of Materials Science - CENIMAT / I3N

Cellulose in Motion

Soft and Biofunctinal Materials Group (SBMG)
at DCM/FCT/UNL and Cenimat / I3N

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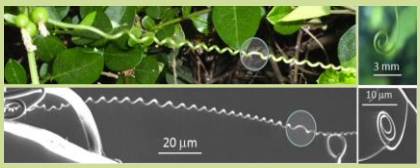
•B.Sc. in Macromolecular Chemistry (EHU, Spain 2004)
•M.Sc in Applied Chemistry and Polymeric materials (EHU and CSIC, Spain 2010)
•PhD in Polymer Chemistry (CSIC, 2011)
•Research Interests: Polymers and liquid crystal physics.

Objectives

Cellulose and its derivatives, such as hydroxypropylcellulose (HPC) have been studied for a long time but they are still not well understood especially in solution. These systems form networks similar to elastomers when produced from liquid crystalline (LC) solutions, that can be manipulated in order to produce helicoidal structures and spirals that respond to external stimuli producing bending, unbending and torsion motions similar to movements found in plants.
The main objective of this work is to take profit of these special characteristics and develop a new soft motor. For that purpose we pursue to understand the structure-properties relationship and the mechanism behind the motion by means of a deep study of the cholesteric liquid crystal HPC/water system using Rotational rheology and Rheo-NMR in order to determine the structural changes that can be induced by shear flow .



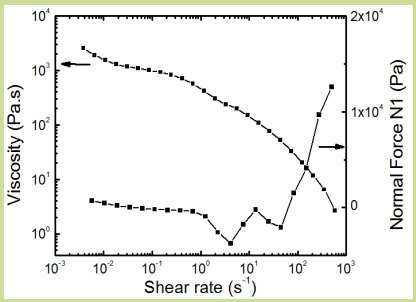
Methodology

•Preparation of new liquid crystalline cellulose systems and composite materials.

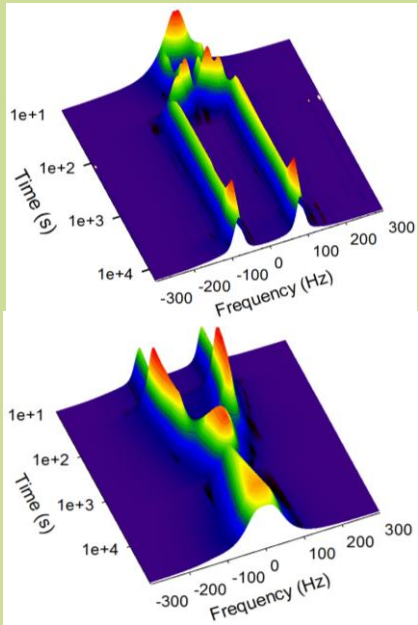
•Study structure –properties relationship (using Rheo-NMR and rheology) techniques in order to find the physical relationship between the structures produce from these systems and the movements that they can acquire when actuated by light, different types of solvents and temperature.

•Built up and optimise the characteristics of a new soft motor based on the cellulosic liquid crystal networks prepared.

Rotational Rheology



Rheo-NMR



Expected Results

Understand the motion that cellulose based networks can acquire when triggered by light, temperature and different solvents by controlling the processing conditions and the dimensions of the device.
A major attempt will be made to understand, from an experimental and fundamental point of view, the similarity found between these systems in a macro, micro and nano scale and the movements present in plants. The mechanism that is behind the motion observed will be deeply understood.

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