SCIENCE SPRING DAY

FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Chemistry Department

Dielectric and Calorimetric Research Group

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Luís Branco(DQ), Isabel Fonseca (DQ),
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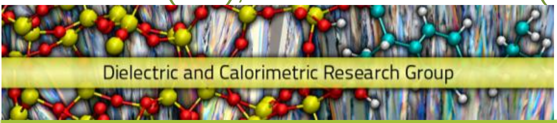


BAM Federal Institute for Materials Research and Testing

UMET Unité Matériaux Et Transformations

3B's

Université Lille Nord de France

Madalena Dionísio

PhD on Physical Chemistry; Assistant professor of the Chemistry Department.
Research Interests: Investigation of physical phenomena of condensed matter: glass transition; physical ageing; influence of nanoconfinement. Molecular mobility and phase transformations. Transport properties.

Objectives

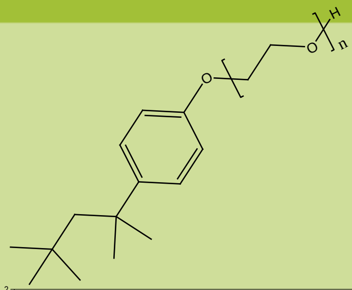
To evaluate the molecular mobility of glass formers, either low molecular weight materials or polymers, below and above glass transition. Evaluation of the influence of i) constraining as crystallization or ii)confinement to nano-structured geometries, to bring a deeper insight to the glass transition phenomenon, that is still a challenge of the condensed matter physics.
To stabilize otherwise unstable forms of materials as pharmaceutical drugs and access the state of the thus produced form, a problem with special relevance in pharmaceutical science.

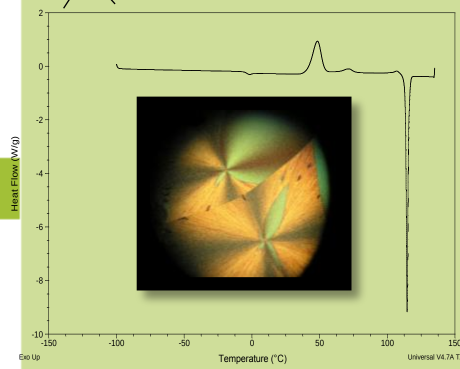
Methodology

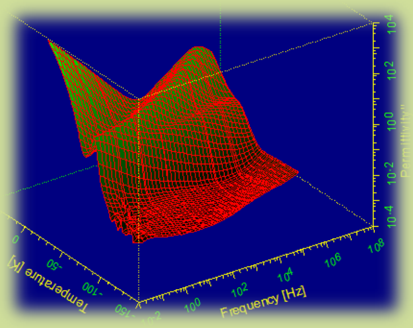
Dielectric Relaxation Spectroscopy (DRS) is the main technique to probe molecular mobility of the different materials. Differential Scanning calorimetry (DSC), and X-ray difraction are used as complementary tools. In crystallizable materials, Polarized Optical microscopy is applied to follow crystallization. In nanoconfinement studies, DRS is used to access in situ dynamical behavior of the confined guest; two different strategies are being brought together i) nanoconfinement in inorganic silica based matrices (pore sizes from 4 to 7 nm) and ii)combination of the target API with Ionic Liquids – these two approaches are being used together in order to obtain a synergetic effect.
Target Materials: pharmaceutical drugs, ionic liquids, ionic liquids intrinsically combined with APIs, liquid crystals, surfactants, amorphous and semi-crystalline polymers.

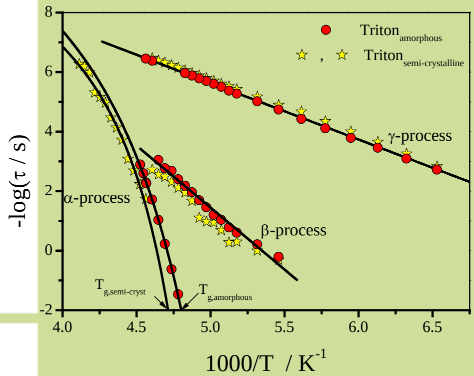
Expected Results

As main outputs it are expected results of fundamental nature: evaluation of length scale that drive cooperativity and thus the dynamical glass transition, and of applied nature- conditions leading to crystallization suppression and mobility enhancement.
For each tested material, it is aimed to draw a relaxation map for each condition acting as the dynamical fingerprint of the material.
It is expected also to establish the long term stability of the amorphous guest form. To establish a correlation between dynamics and pore size. To extract transport properties of ILs: mobility, number of charge and diffusion coefficients .









Funding:

requimte rede de química e tecnologia

FCT Fundação para a Ciência e a Tecnologia

COMPETE