

ITN Marie Curie project
DoDyNet:
*Double dynamics for design of new
responsive polymer networks and gels*



**UNIVERSITY
OF CRETE**

Speaker: Consiglia Carillo
Supervisor: Dimitris Vlassopoulos
ESR8 Position

My Background

- Age: 25
- Home town: Naples, Italy
- Bachelor Degree in Chemical Engineering (September 2012-December 2015)
- Master Degree in Chemical Engineering (December 2015- July 2018)

Scuola Politecnica e
delle Scienze di Base



Università degli Studi di Napoli Federico II

Dipartimento di Ingegneria Chimica, dei Materiali e della
Produzione Industriale



Thesis Work

Crystallization Phenomena of Waxy Crude Oil

Where?

- Laboratory of Reo-optical,
Naples
- Research Center Elastomers of
Versalis, Ravenna, Italy



The phenomena was studied using three different techniques:

How?

Time Lapse Microscopy

Rheology

Differential Scanning Calorimetry



My work at FORTH-Overview

Project: **DoDyNet** - Double dynamics for design of new responsive polymer networks and gels.

Main Tasks: Study the viscoelastic character of the material and their deformability and fracture mechanisms.

Samples:

- System with covalent bonding
- Slide – ring system

Start data: 1 September 2018

Networks

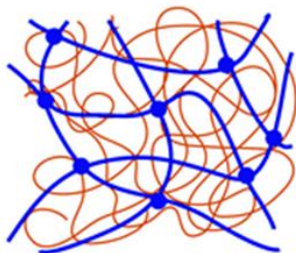
Double Dynamic Networks based on reversible covalent bonding



Combination of intrinsic reversibility with the robustness of covalent bonds.



Self-healing properties
Resisting to creep and to flow
Malleability
Recyclable and healable



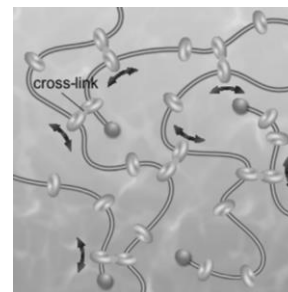
Double Dynamics slide-ring gels



Permanent system



Not excellent healing properties
Resistance to large deformations



Objectives

- Linear Viscoelastic measurements;
- Nonlinear shear behavior;
- Study the fracture mechanisms and self-healing:
- Understand the macroscopic cohesion of networks.



Rheological and mechanical properties are linked to molecular characteristics.

Main Tests

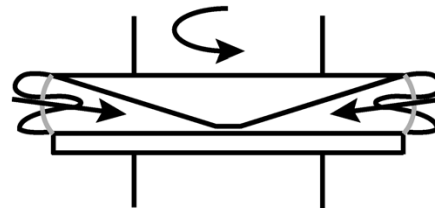
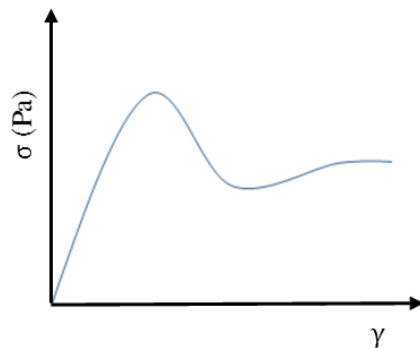
Dynamic strain sweep test

Dynamic frequency sweep test

Time - Temperature Superposition

Linear and Non linear creep tests

Step Rate test

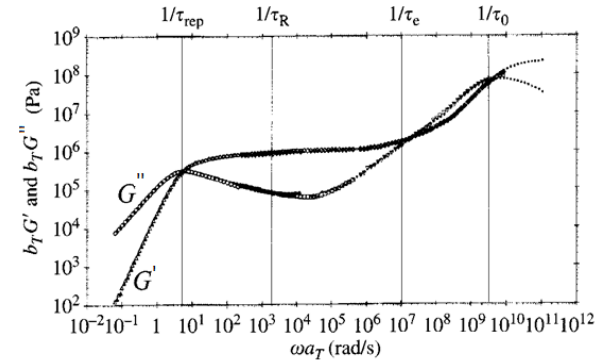


Yielding

Shear banding

Wall slip

Edge fracture



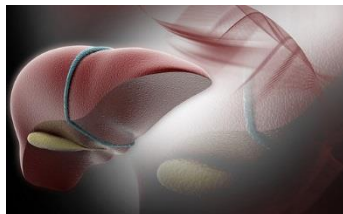
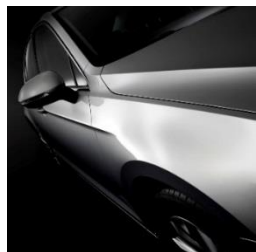
My work at Forth- Expected Results

- **LEARNING**

About polymeric rheology and the correlation with its microstructure.

- **PROPOSAL**

For the improvement of properties of networks studied, in order to have materials useful in different applications.



THANKS FOR THE ATTENTION

Have a nice stay in Heraklion !

