Mid-Term Check , May 2019

ITN Marie Curie project
DoDyNet:
Double dynamics for designing new responsive polymer networks and gels

Fellow information

Consiglia Carillo (ESR8)

Institution: Foundation for Research and Technology Hellas (FORTH), Heraklion, Crete

Department: Institute of Electronic Structure and Laser

Supervisor: Dimitris Vlassopoulos

Start date: 1 September 2018

UNIVERSITY OF CRETE

FORTH
FOUNDATION FOR RESEARCH AND TECHNOLOGY - HELLAS

Background

- Age: 25
- Home town: Naples, Italy
- Bachelor's Degree in Chemical Engineering (September 2012-December 2015)
- Master's Degree in Chemical Engineering (December 2015- July 2018)
  - Thesis work: Crystallization Phenomena of Waxy Crude Oil

Scuola Politecnica e delle Scienze di Base
Università degli Studi di Napoli Federico II
Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale

Research project - Goals

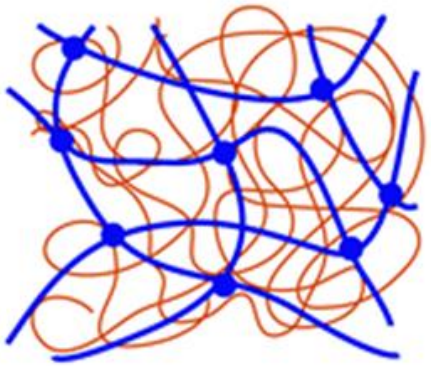
Study the dynamics and nonlinear shear response of double dynamics networks (models and industrial) as a function of their composition.

Investigate the origin of fracture mechanisms and self-healing properties and attempt at connecting to their linear and nonlinear viscoelastic properties.

Relate the nonlinear shear behavior to the elongational properties.

Link the rheological properties to the microstructure of the system (based on structural information from scattering and molecular characteristics)

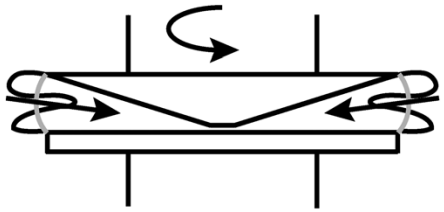
Tailor the rheological properties by altering molecular features.



Methodology

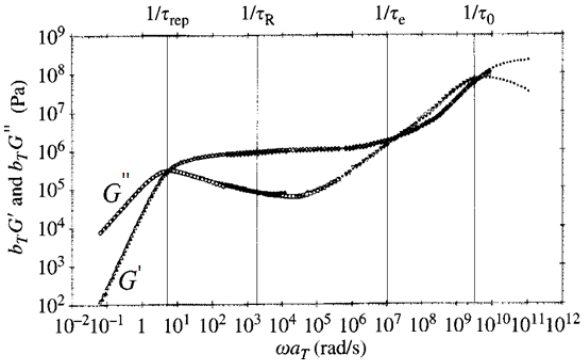
Linear and nonlinear measurements are performed in order to investigate:

- Conditions for time stability
- Relaxation spectrum linked to the molecular characteristics of the sample
- Analysis of relaxation processes
- Shear thinning (or shear thickening) behavior
- Yielding and flow instabilities



Conventional rheometry, nonlinear shear, creep measurements and piezo-rheometry

Dynamic light Scattering and slow dynamics



Training

Measurements techniques

- Rheology (linear, nonlinear)
- Dynamic light scattering
- Seminars

Training by DoDyNet

- Maastricht, January 2019
  DSM, Industrial Workshop

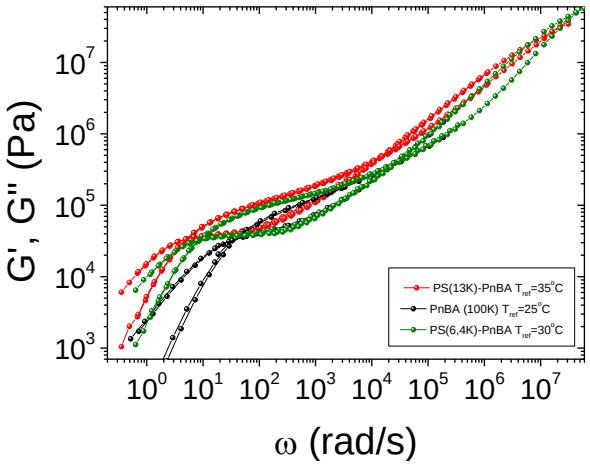
- Heraklion, September 2018
  FORTH, Elementary modulus

Planned secondment: ESPCI

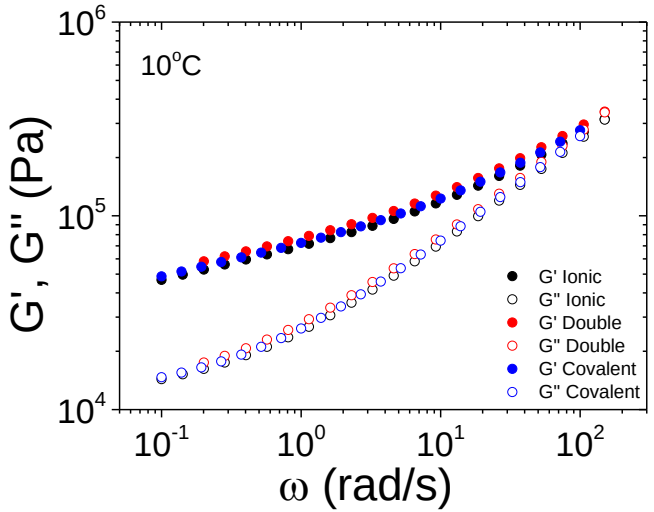
Industrial secondment: Tesa

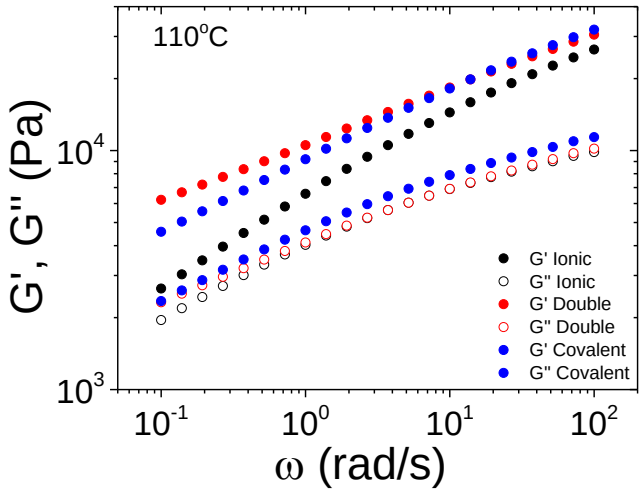
Results

Model: Triblock copolymer



Industrial (TESA): Dual crosslinked system





Outlook

- Acquiring stronger background on theoretical, experimental and application aspects of networks and double dynamics
- Exposure to industrial environment
- Improve soft skills
- Acquiring knowledge in different expertise

THANKS FOR THE ATTENTION!