

Newsletter Intermediate Meeting Heraklion 2018



DoDyNet

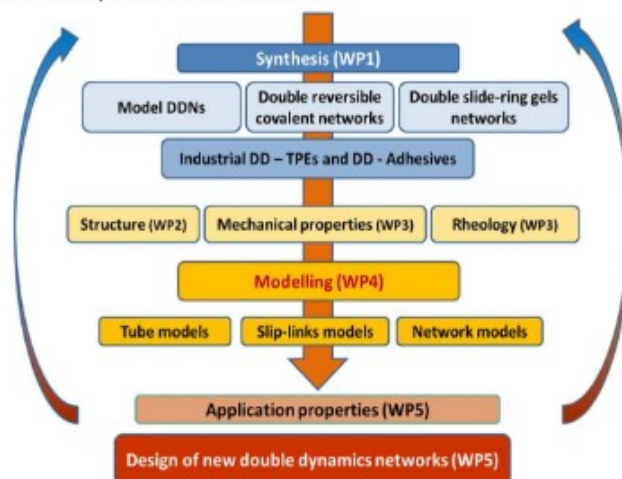
DoDyNet INITIAL TRAINING NETWORK

01.



**Innovative Training Network (ITN)
Marie-Curie Actions**

This September, the DoDyNet group had their first intermediate meeting. This meeting took place over the course of a week in Heraklion, Greece. First the project served as a way of introducing members to the entire network. Industrial partners Allnex (Belgium), DSM (The Netherlands) and tesa (Germany) were represented by Patrice Roose, Michelle Seitz and Stephan Zoellner respectively. This was followed by a series of lectures from participating professors as well as visiting experts Giuseppe Marucci (UNaples) on generalities of networks, Daniel Reed (ULeeds) on polymer physics and Emanuela del Gado (Georgetown University) on the microscopic dynamics and rheology of soft gels. As the Early Stage Researchers (ESR) come from varying scientific backgrounds, the objective of these lectures was to ensure that everyone starts with a basic understanding of each part of the network.



This is how Dodynet works: Samples synthesised in one work package (WP1) are characterised for structure, rheological and mechanical properties in another (WP2 and WP3) and then modelled (WP4) at the same time with continual feedback between each group to advance the research.



FORTH OVERVIEW



The Foundation for Research and Technology - Hellas (FORTH)

It was established in 1983, is one of the largest research centers in Greece. They are active in fields as varied as electronics, molecular biology and cultural studies and promote scientific progress through collaboration with international partners and high quality research.



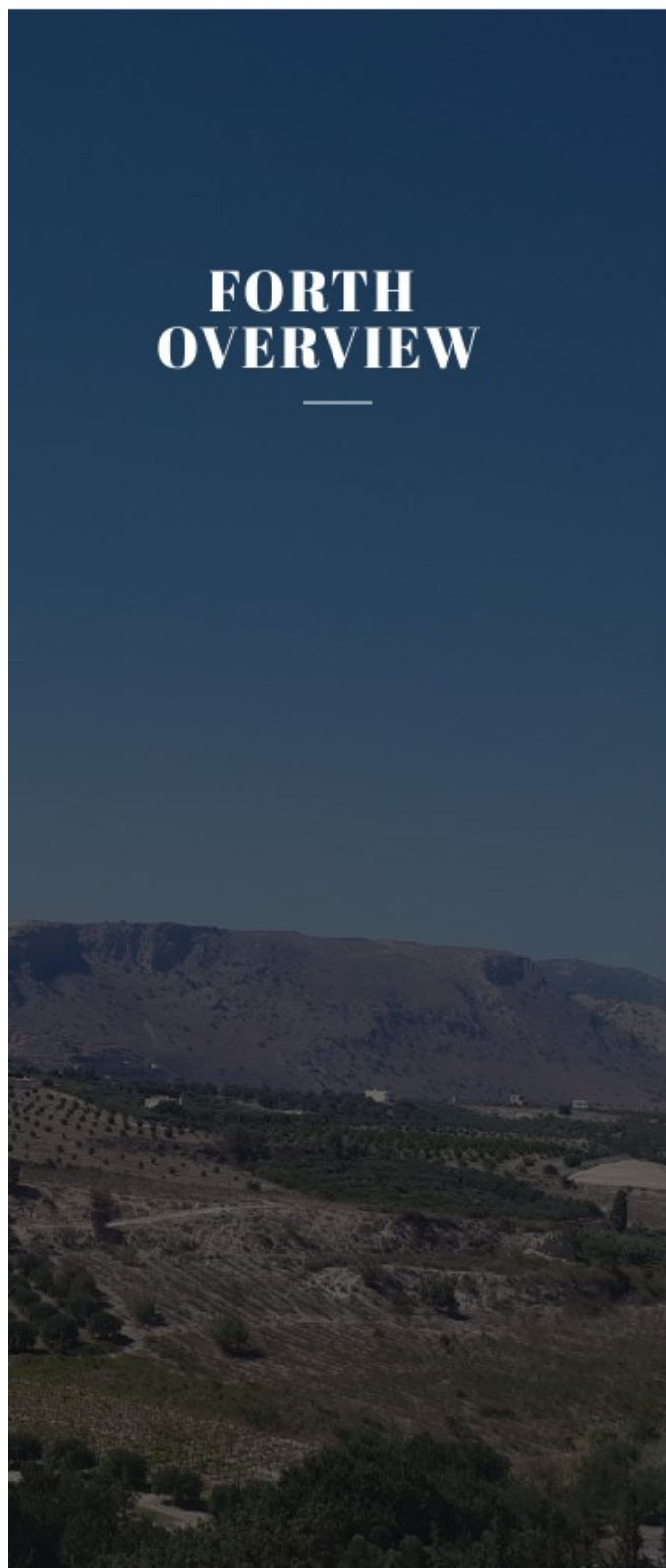
The Institute of Electronic Structure and Laser (IESL) was one of the three initial institutes founded in 1983. It has since established its international presence in the areas of Laser Science, Micro/nano-electronics, Polymer Science, Materials Science and Astrophysics.



The Polymer and Colloid Science group focuses on the rheology and dynamics of model polymer and colloidal systems with expertise in scattering techniques (dynamic, neutron, X-ray).



This is the lab where ESR Consiglia Carillo and Christina Pyromali work with Prof. Dimitris Vlassopoulos.



TEAM PRESENTATION

**Clément
Coutouly**

Clément Coutouly
ESR 1, works on the synthesis and dynamics of model supramolecular polymer networks at Université catholique de Louvain in Belgium under the supervision of Prof. Charles-André Fustin and Prof. Evelyne Van Ruymbeke.

**Rowanne
Lyons**

Rowanne Lyons
ESR 2, works on the synthesis and rheological analysis of double dynamic networks based on slide ring gels at the Université catholique de Louvain in Belgium under the supervision of Prof. Charles-André Fustin and Prof. Evelyne Van Ruymbeke.

**Larissa
Hammer**

ESR 3, works on the design and synthesis of double dynamic networks based on reversible covalent bonds at ESPCI Paris, France under the supervision of Renaud Nicolaÿ.

**Stefania
Traettino**

ESR 4, works on "supramolecular double-networks based on microgels with reversible covalent interactions" at Laboratoire Matière Molle et Chimie, ESPCI Paris, under the supervision of professor Michel Cloitre.

**Christina
Pyromali**

ESR 5, studies the linear and non-linear viscoelastic response of double dynamics networks under large shear deformation at FORTH, Greece, under the supervision of Dimitris Vlassopoulos.

Wendi Wang

ESR 6, studies viscoelastic response of double dynamics networks under transient elongation at Danmarks Tekniske Universitet (DTU) in Denmark under the supervision of Qian Huang, Ole Hassager and Anne Ladegaard Skov.

**Carole-Ann
Charles**

ESR 7, studies the elastocapillary effects on double dynamics networks at Laboratoires Charles Coulomb in Montpellier, France, under the supervision of Christian Ligoure and Laurence Ramos.

04.

TEAM PRESENTATION

**Consiglia
Carillo**

ESR 8, studies the deformability and fracture mechanisms in reversible covalent DDNs at FORTH in Heraklion under the supervision of Dimitris Vlassopoulos.

**Simone
Sbrescia**

ESR 9, studies the influence of temperature and composition on mechanical properties of DD-Thermoplastic Elastomers at DSM in The Netherlands under the supervision of Michelle Seitz and Tom Engels, officially enrolled at UCL in Louvain-la-Neuve with Evelyne van Ruymbeke as supervisor.

**Paola
Nicoletta**

ESR 10, studies the structure and diffusion in DDNs at the nano- to micro- scale at Johannes Gutenberg-University Mainz in Germany (Department of Physical Chemistry) under the supervision of Prof. Dr. Sebastian Seiffert.

Hongwei Liu

ESR 11, studies the nonlinear rheology of reversible double dynamics networks at Università degli Studi di Napoli Federico II in Napoli, Italy, under the supervision of Giovanni Ianniruberto

Yanzhao Li

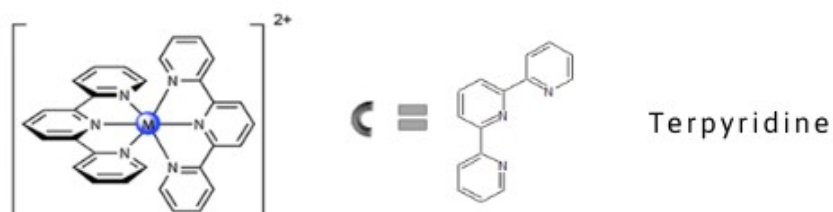
ESR12, modelling the linear dynamics of double dynamics polymer networks at Université catholique de Louvain in Louvain-la-Neuve, Belgium under the supervision of Evelyne Van Ruymbeke.

Jianzhu Ju

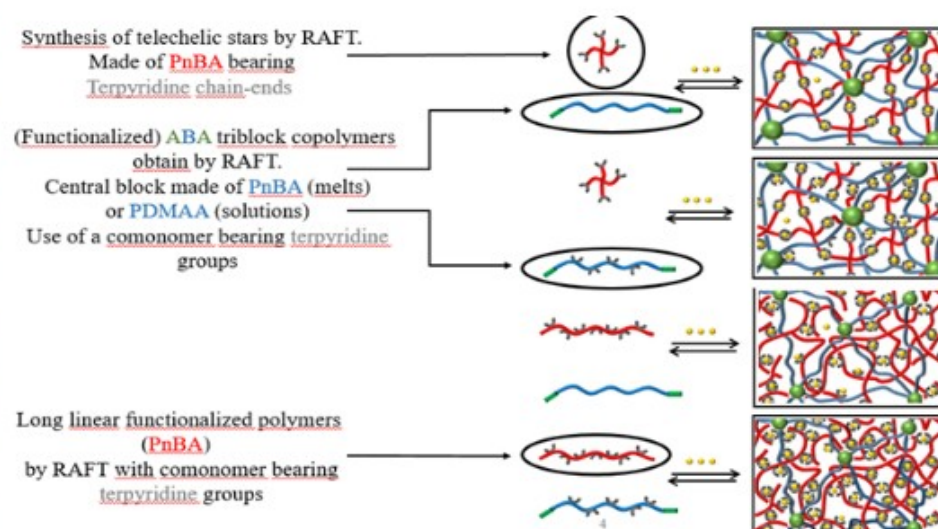
ESR 13, studies the application property of double dynamics networks at Laboratory of Soft Matter Science and Engineering in ESPCI, Paris, France, supervised by Costantino Creton and Tetsuharu Narita.

At this stage, many ESRs are at the beginning of their research. Nevertheless, the earliest researchers recruited, Carole Ann and Clément have already made great progress:

Clément Coutouly, ESR 1, UCLouvain, has been working on the synthesis of model double dynamic networks based on metal-ligand interactions. Terpyridine ligands and divalent metal ions form stable complexes:



The goal is to develop durable double network gels with strong mechanical properties, which can be achieved in three ways:



The synthesis of long chain ABA triblock copolymers has been achieved with poly n-butylacrylate (PnBA) and polystyrene (PS) in the melt state. The amount of PS was varied from 2-5%, with a turbid aspect observed at 5% PS.



PS 3%



PS 5%



EXPERIMENTS

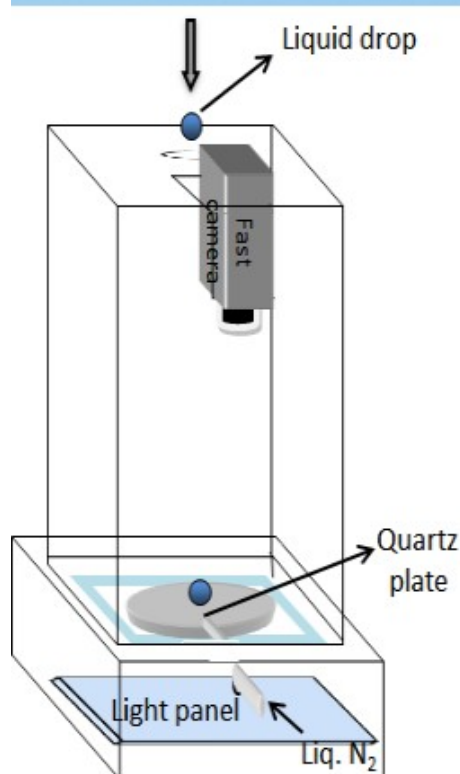
These copolymers were also successfully functionalized with 0.5% of terpyridine.



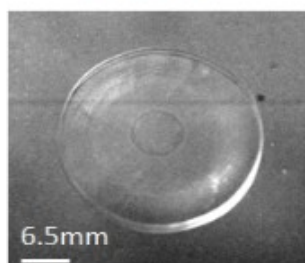
The next steps include increasing the percentage of terpyridine ligands to 2% and investigating the possible phase separation that may be occurring at higher PS levels. A total of 11 samples were immediately available for Dodynet members. Bravo Clément!

Carole-Ann Charles, ESR 7, Laboratoire Charles Coulomb, has been working on improving and characterizing a setup allowing the study of drop impact dynamic with minimized shear dissipation. This setup uses the inverse of Leidenfrost effect by performing the impact on a thin layer of liquid nitrogen that evaporates when the drop at ambient temperature comes into contact with it, forming a vapor cushion on which the drop can expand radially freed from shear dissipation.

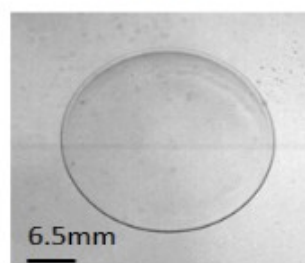
By changing the surface of impact from a silicon wafer to a quartz plate, a semi-automatic analysis of the data is now possible and a study of the sheet thickness field is conceivable thanks to the better contrast.



Before

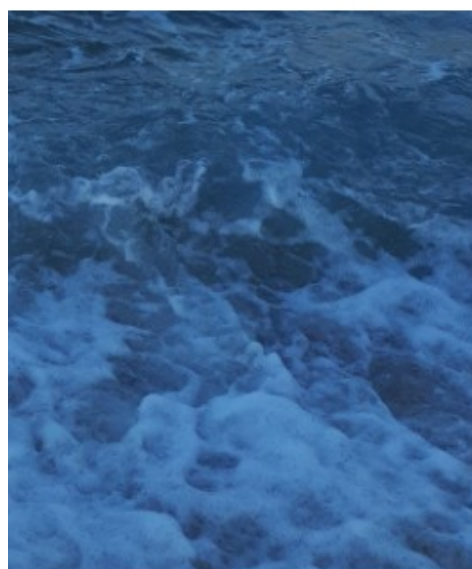


After



S. Arora et al., 2017

Subsequently this setup will be used to study the impact of double dynamic networks and will allow to rationalize the different roles of inertia, elasticity, capillarity and dissipation.

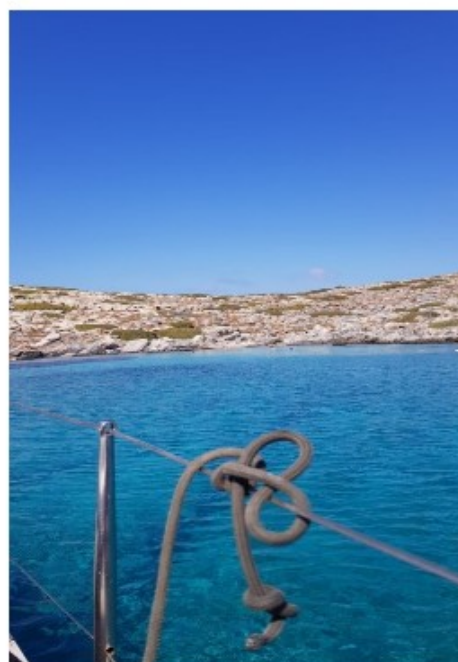




Of course in such a beautiful setting, we did not spend all our time in the laboratory! On Sunday 23rd, we sailed up to Dia, an island 7 miles north of Crete with a rich history.



According to mythology, after the people of Crete angered Zeus, he created a giant sea monster to destroy them but was persuaded to change his mind and he petrified it instead. This might explain why it's still uninhabited...



Both professors and students enjoyed a peaceful day of sunbathing and swimming on this beautiful island without an incident to declare during the outing!

08.



Next Meeting : DSM 2019

As a European Union funded initiative, one of the goals is to maximise collaboration between partner universities and industrial partners. This will be achieved through periodic internships for each ESR as well as regular meetings with all members.

The next meeting will be organized by DSM in the Netherlands from the 29th January – 2nd February 2019.

See you then!

The DoDyNet Summer School
22 - 27 July 2019
Capri

The school is addressed to students and researchers both from industry and academic institutions.

Confirmed invited speakers :

Ralph Colby (Penn State University)
Emanuela Del Gado (Georgetown University, USA)
Jian Ping Gong (Hokkaido University, Japan)
Giuseppe Marrucci (Naples University, Italy)
Daniel Read (University of Leeds, United Kingdom)
Michael Rubinstein (University of North Carolina, USA)
Ilja Voets (Eindhoven University of Technology, The Netherlands)
Zuowei Wang (University of Reading, United Kingdom)
Hiroshi Watanabe (Kyoto University)

The DoDyNet Team



www.dodynet.eu