Research Team name: **Research Unit “Interfaces and Surfactant Adsorption”**
CNR-IENI (Istituto per l’Energetica e le Interfasi)
Genova, Italy

Presenter name: **Libero Liggieri**

Team Presentation – Annual Workshop, COST Action MP1106
Dublin, September, 2012

Research Team Name: **Research Unit "Interfaces and Surfactant Adsorption"**
CNR-IENI (Istituto per l'Energetica e le Interfasi)
Genova, Italy

Number of team members: 8

Team Leader: Libero Liggieri

5 staff researchers
1 post-Doc
1 PhD student
1 technician

2 physicists
3 chemists
1 environmental science
1 material science

Research interests related to MP1106:

- Surface-active species adsorption at liquid interfaces
- Surface rheology and kinetic effects in adsorption layers.
- (nano)Particles at liquid interfaces
- Applications to Emulsions and Foams
- Applications to Solid Foams (ceramics & carbonaceous)
- Nanoparticle interaction with lipid layers & Effects on Pulmonary Surfactant
- Superhydrophobic surfaces & Surfactants at Solid-Liquid interfaces

Basic facilities, equipment, devices etc.

- Dynamic Tensiometry and Surface Rheology
  - Drop Shape Tensiometer
  - Capillary Pressure Tensiometer
  - Maximum Bubble Pressure Tensiometer
  - LIFT (Liquid Film Tensiometer)

- Surface layers

  Langmuir trough w. fully programmable area patterns:
  - Wilhelmin plate tensiometer
  - Brewster Angle Microscopy
  - Ellipsometry
  - Langmuir-Blodget films deposition

  Atomic Force Microscopy w. solid-liquid cell

Basic facilities, equipment, devices etc. (cont.)

- Wetting and Contact Angle
  - Dynamic Contact Angle set-up

- Emulsions & Foams
  - Ultraturrax and other emulsion/foam generation devices
  - microscope set-up for emulsions

- Particles & Dispersions, Material Science
  - SEM/EDX Electron microscopy.
  - XRD
  - BET
  - AFM
  - Dynamic Light Scattering & zeta-Potential
  - Thermal Treatment devices

#1 project: Liquid Interfaces, Emulsions and Foams projects with Microgravity Experiments

Title(s): **FASES** (Fundamental and Applied Studies in Emulsion Stability)
PASTA (Particle-Stabilized Emulsions and Foams), **LIFT** (Liquid Film Tensiometer)

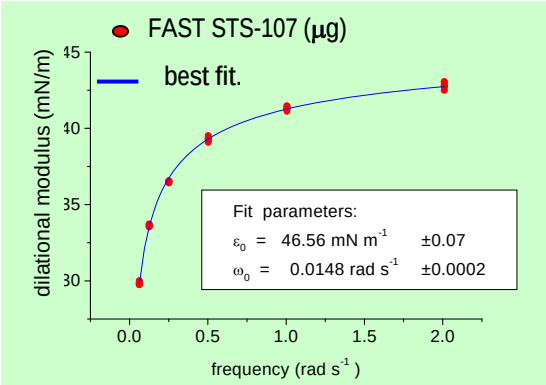
Duration: 2000 -

Funding organization: European Space Agency, Italian Space Agency (LIFT)

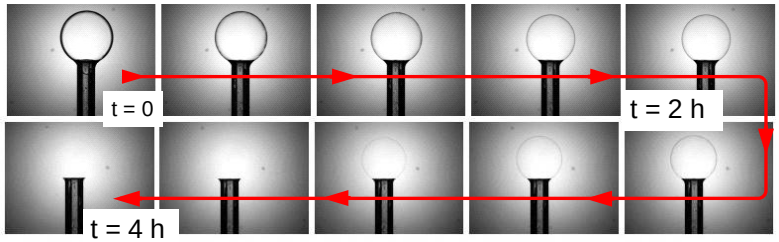
Participants: International Projects involving a network of EU and US laboratories.
some among COST Action MP1106 participants: CNR-IENI, Univ. Thessaloniki, MPI-KGF Golm, Univ. Aix-Marseille, Univ. Twente, Lafayette College .....

Facilities/equipment: FASTER (Facility for Adsorption and Surface Tension)
FASES-EC (Fundamental and Applied Studies in Emulsion Stability FSL Exp.Cont.)
FOAM-C (Foam Experiment Container); LIFT (Capillary Pressure Liquid Film Tensiometer)

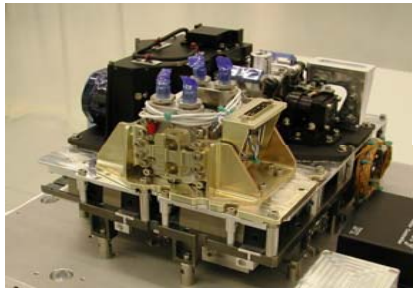
Most interesting results:



Surface dilational eleasticity vs. frequency of C12DMPO acqeous solution measured onboard the Space Shuttle STS-107).



Thinning of a of the spherical emulsion film (aqueous SDS in decane) in the LIFT prototype.



FASES-EC Experiment Container for FSL

#2 project:

Title: **NIPS (Nanoparticle Impact on Pulmonary Surfactant interfacial properties)**

Duration: 2011 - 2013

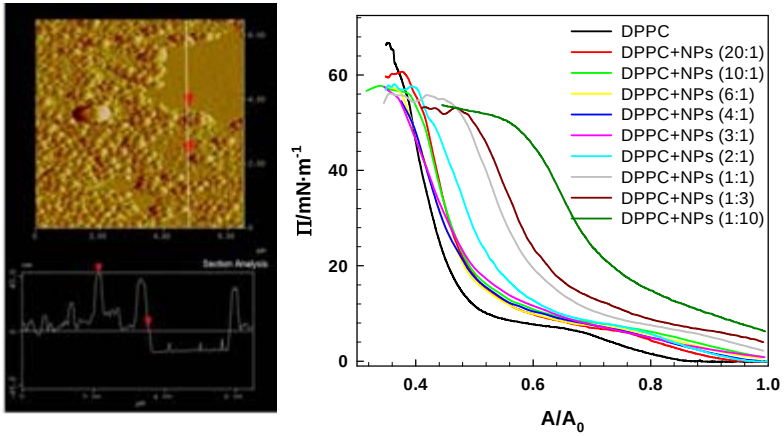
Funding organization: Istituto Italiano di Tecnologia (IIT)

Participants: various researchers from CNR-IENI, CNR-IRC (Istituto di Ricerca sulla Combustione)

Facilities/equipment: Tensiometry, Surface Rheology, Surface layer devices as above.

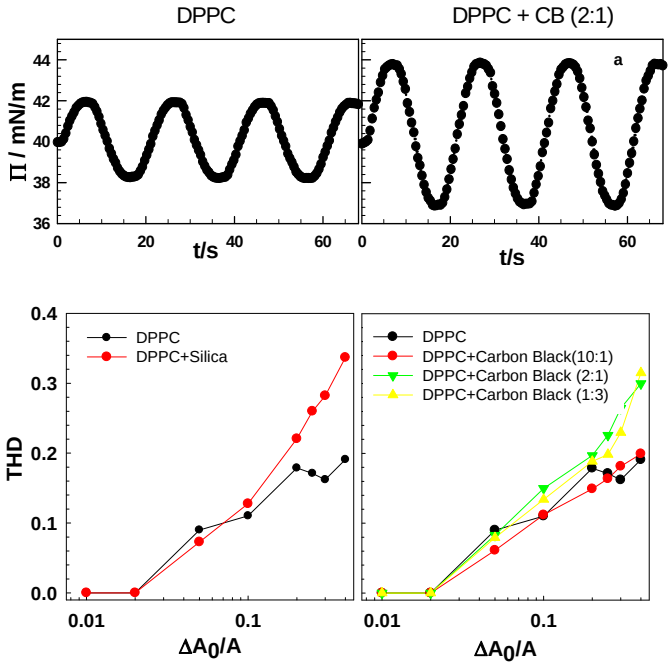
Most interesting results:

Structure and properties of mixed particle-lipid interfacial layers



Π-A compression isotherms of DPPC-SiO2 NPs at the acqueous interface and AFM imaging of the corresponding LB layers.

Influence of NPs on the surface rheology of PS layers during simulated respiratory cycles.



Total Harmonic Distorsion (THD) is used to quantify the non-linearity of the Surface Pressure response of the lipid layer incorporating the NPs.

#3 project:

Title: **Carbonaceous Solid Foams for CO2 capture**
(WP of Joint CNR-Italian Ministry of Economical Development “Clean Carbon” programme).

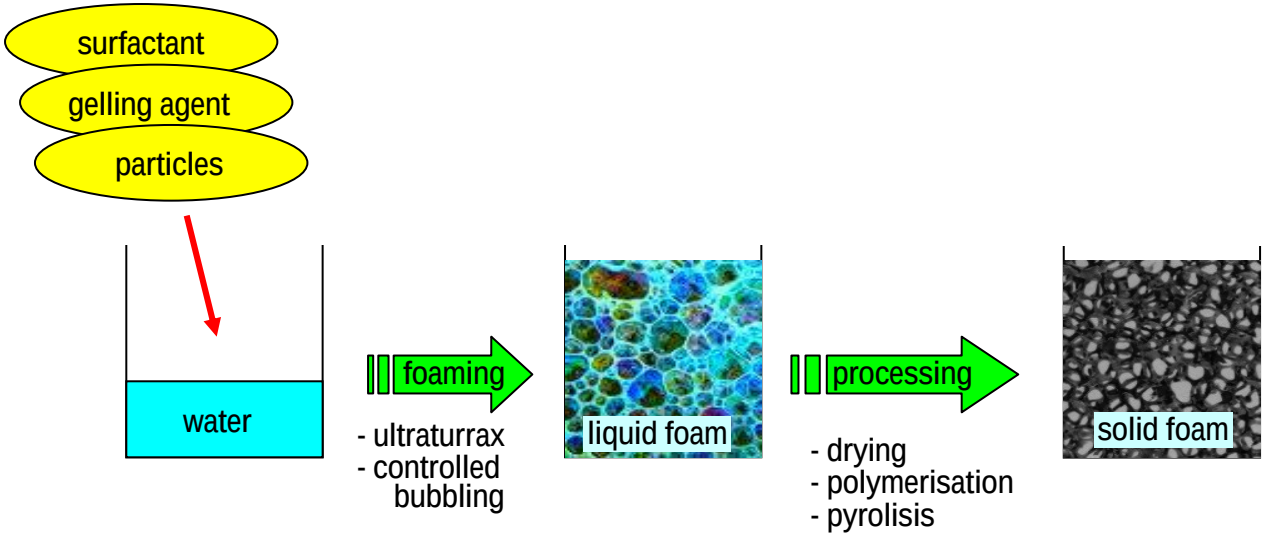
Duration: 2011 - 2013

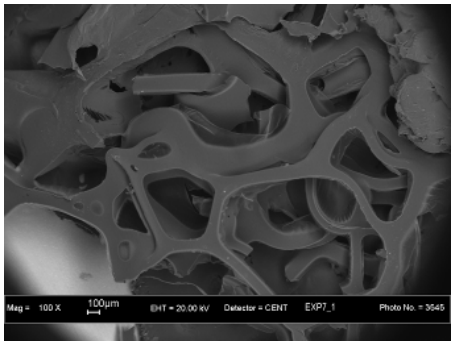
Funding organization: Italian Ministry for Economical Develoment (MSE)

Participants: various researchers from CNR-IENI, CNR-IRC (Istituto di Ricerca sulla Combustione)

Facilities/equipment: Tensiometry, Surface Rheology, Surface layer, Emulsions&Foams, Particle devices as above. Various microscopy devices, BET, Controlled atmosphere fournaces

Most interesting results: **Protocols for Carbonaceous Solid Foams**





Solid Foam from Carbon Soot particulate.

#1 Topic

Title: **Particles at Liquid Interfaces: Industrial, Biological and Environmental issues.**

- Basic aspects
- NP interactions with surfactant/proteins/polymer adsorption layers
- NP interactions with biological membranes/interfaces
- NP interactions with environmental aqueous interfaces (sea, internal waters, atmosphere, ….)
- Applications coherent with the Horizon 2020 mission: new materials and processes, smart emulsions & foams, targeted drug vehiculation, nanomedicine, medical diagnostics and imaging, toxicology, environmental protection.

Expertise required: Nanotechnologies, Material Science, Physical-Chemistry, Surface Science, Biophysics, Pharmaceutical Science, Toxicology, Environmental Science

Thank you for your attention