DIMA
DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

Newsletter – March 2019

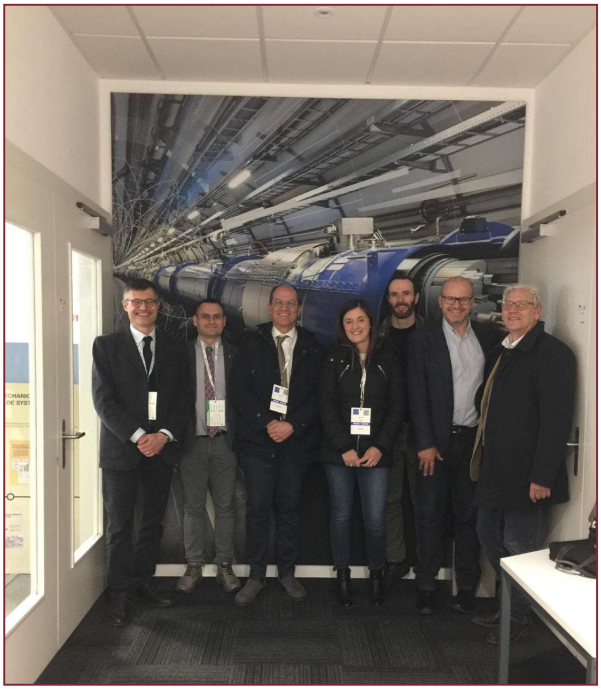
HIGHLIGHTS

Meeting with the President of the Lazio Region

Employment for young graduates, dignity and equal opportunities: on employment policies an important investment of 180 million Euro is recently created by the Lazio Region for the period 2019-2020. Financial resources are able to involve more than 70 thousand people with different measures for job, according to the path initiated in the past by Lazio region, responding to new needs arising from the labor market. The set of calls for proposals and actions was presented in Rome, at the Faculty of Civil and Industrial Engineering. The meeting took place in the Cloister Room. There was prof. Pascucci to represent the Rector, DIMA Director, prof. Gaudenzi, the President of the Lazio region, Nicola Zingaretti, and the Councilor for Employment, new rights and policies for reconstruction, Claudio Di Berardino.

Meeting of a Delegation of the DIMA at CERN

A meeting with a delegation from the DIMA was recently held at CERN in Geneva. In the picture, DIMA Director, prof. Gaudenzi with other colleagues Rino Del Prete, Alberto Boschetto, Luana Bottini e Carlo Casciola. There were also Michele Pasquali, fellow at CERN Engineering Department, Alessandro Bertarelli, mechanical engineer at CERN and prof. Fulvio Ricci, of Sapienza physics department, well known for his research on gravitational waves and his role in the Nobel Prize-winning experiment. Hereby a declaration of DIMA Director, prof. Gaudenzi: “Looking forward to create opportunities for our young researchers and students, who will have the opportunity of studying for their thesis at CERN, and to pave the way for an official cooperation agreement between CERN and DIMA. Carlo, Alberto and myself addressed CERN people in a seminar presenting the research activities of DIMA”.



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NEWS FROM DIMA

Innovative Applications of Nanoporous Materials for the Environment

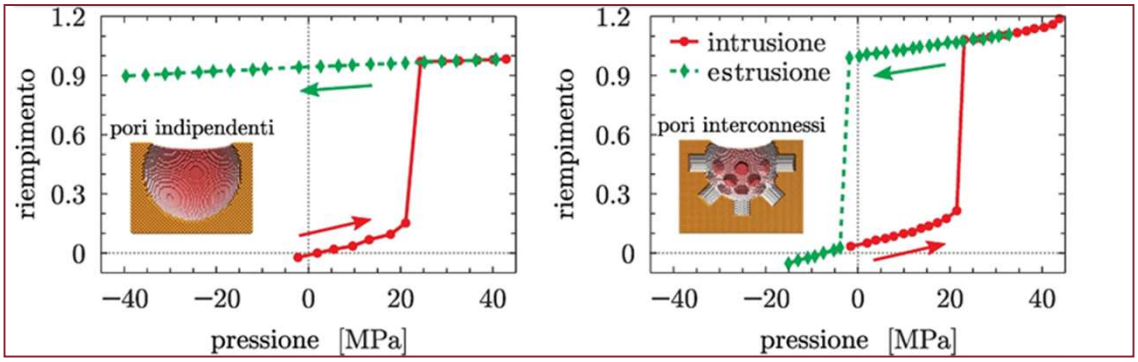
A Research group, coordinated by Carlo Massimo Casciola of the Sapienza Department of Mechanical and Aerospace Engineering, has employed advanced molecular simulation techniques to design nano-structured materials with controllable wetting or drying behaviour. The study, published on ACS Nano, represents a significant step forward in the engineering of porous materials for energetic and environmental applications.

Thanks to the presence of numerous miniscule pores (only a few nanometres in width), certain devices developed with nano-porous materials, the so-called HLS Systems (Heterogenous Lyophobic Systems) have an extraordinary capability of storing energy. These devices behave like a liquid battery. They are “charged” when the water pressure increases filling the pores and they “discharge” when, as the pressure diminishes, water is expelled, providing mechanical energy. However, to date, the “switch” allowing this mechanism to take place was not well understood and difficult to control.

Now, a new study conducted at the Sapienza Department of Mechanical and Aerospace Engineering has shed new light on this possibility by investigating the behaviour of various porous materials via high-pressure intrusion and extrusion experiments on water. The results of the study published on ACS Nano, point to an innovative strategy to control the movement of fluids in the materials under investigation. “The microscopic mechanism underlying the expulsion of water,” explains Alberto Giacomello, one of the researchers on the team, “is related to the presence of nanometer-sized bubbles in the interconnections between the pores that reduce the contact between the walls of the material and the water, thereby developing true superhydrophobic pores.” What seems to determine the capacity of nanoporous materials to spontaneously dewet appears to be the shape of the pores: the absence of an interconnection between the pores blocks the expulsion of absorbed water. However, if the pores are interconnected, the pores can “dry up” and expel the water, even at room temperature and at extremely high pressures, equivalent to those present hundreds of meters below sea level.

The researchers employed macroscopic models and atomic simulations to demonstrate that the phenomenon occurs when there are hydrophobic cavities equal to or less than one nanometre on the walls of the nanoporous material. Moreover, they also repeated the experiment, substituting the water with mercury and using other nanoporous materials, obtaining analogous results that confirmed the general validity of the mechanism.

“Our study provides theoretical and computational tools enabling scientists and engineers to design nano-structure materials capable of fully exploiting the characteristics of liquids in nanometer/sized confines,” points out Carlo Massimo Casciola, who coordinated the research project, “such as the ability to reversibly wet or dry a surface or increase their surface mobility. Numerous new applications are possible in this field, including mechanical energy accumulators for renewable sources and energy harvesting applications, vibration and shock absorbers, water purification techniques and surfaces capable of regenerating their superhydrophobicity.”



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OPPORTUNITIES FOR RESEARCH, NETWORKING AND INTERNATIONALIZATION

Erasmus Plus is the EU programme in the fields of Education, Training, Youth and Sport for the period 2014-2020 that promotes the international mobility of students and future graduates towards other countries participating in the programme to improve transversal and professional competences with particular attention to the job market and their contribution to the creation of a cohesive society.

Erasmus+ for Traineeship grants are assigned for the following activities at foreign host institutions:

- Professional education and orientation traineeships
- Curricular traineeships

350 mobility grants are available for students interested in a traineeship experience in public and private organizations throughout the participating EU countries. Application deadline: May 10, 2019 (2:00 pm). The "Letter of acceptance" is a requisite for admission to the selection process. To correctly complete the application, students must upload a valid ID photocopy, which must be signed, scanned and uploaded to the on-line application form.

Failure to do so will compromise your right to a mobility grant. Please note that the Call provides the application both for mobility "Erasmus+ Traineeship" and for "Digital Opportunity Traineeships". Digital Skills Traineeships address the following activities:

- Digital Marketing (i.e., social media management, web analysis, etc.);
- Digital graphics and mechanical or architectural design;
- Development of apps, software, scripts and websites;
- Installation, maintenance and management of IT systems and networks;
- IT security;
- Data analytics, mining, visualisation;
- Robot coding and training, artificial intelligence.

Students enrolled in Professional Master Courses, Specialization Schools, Single Courses, and PhD Programmes are NOT eligible.

Further information are available at this link: https://www.uniroma1.it/en/pagina/erasmus-traineeships-abroad