International Award: Lidietta Giorno granted for Research

The International Awards “Guido Dorso”, sponsored by the Senate and the University of Naples “Federico II”, are awards given since 1970 to internationally renowned young scholars and personalities from the institutional, economic, scientific and cultural communities who “have contributed with their activities to support the needs of development and progress of the South of Italy”. The official ceremony took place in Rome, at the Palazzo Giustiniani of the Senate of the Italian Republic on October 13, 2011.

The XXXII edition’s awards were given to eminent exponents of the political, economic and cultural life. Among them, for the research sector, Lidietta Giorno was granted with the award for her contribution in the development of highly selective artificial biomimetic membrane systems (combining biomolecules with artificial membranes) able to distinguish at molecular level between substances having similar physical-chemical properties. She was acknowledged as a top level excellence in the field at international level. All the winners have been also given the title of “Ambassador of the South”, while the plaque of the President of the Republic, Giorgio Napolitano, intended for a scientific and cultural institution in the South, was assigned to the Osservatorio Banche-Imprese of Bari, chaired by Michele Matarrese.

Until now, the Dorso Award has been given to 37 young scholars and 184 Italian personalities, 28 of which operating abroad, and two Nobel laureates (Renato Dulbecco in medicine and Franco Modigliani in economy). Also 7 High Educational Institutions, 2 Universities in the United States, 1 in Japan and 1 in China have been recommended, while 6 Cultural Institutions of the South have been granted with the plaque of the President of the Italian Republic. A balance of great value!

Richard Maling Barrer Prize to Prof. Enrico Drioli

The International Congress on Membranes and Membrane Processes (ICOM 2011) was organized by the Membrane Technology Group of the University of Twente, The Netherlands and held at the RAI convention center in Amsterdam from July 23 - 29, 2011. Around 1100 researches coming from various regions of the World and active in membrane science and technology met in Amsterdam. The program of the congress covered the broad spectrum of topics today studied, analyzed and developed in the field of membrane science and technology, from water treatment and desalination to artificial organs, tissue engineering and regenerative medicine, from gas separation to agro-food and packaging, etc.

The program consisted of three plenary lectures, 78 keynote lectures, and of almost 400 oral and more than 600 posters presentations, from students as well as from senior scientists in the field. Among these, 12 oral presentations and 23 poster presentations were related to researches carried out and/or in progress at the Institute on Membrane Technology of the National Research Council of Italy (ITM-CNR) at the University of Calabria. During the congress, Prof. Enrico Drioli, Founding Director of ITM-CNR and Professor at the Department of Chemical Engineering and Materials of the University of Calabria, was awarded for “Richard Maling Barrer Prize” of the European Membrane Society, for his “outstanding contributions to membrane science and technology”.

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On 23rd September 2011 was held in Museo del Presente in Rende the event “Turn on light on science” in which ITM researchers were involved in demonstrating how science help the investigative medicine on crime scenes and lost people to survive in extreme conditions. The idea was to divulgate basic science knowledge catching the curiosity of young and adults. The theme of the current year was science and fiction.

Two researcher teams performed scientific demonstrations related to American series CSI and Lost.

The research team worked in CSI fiction in charged of reproducing the investigative medicine in CSI demonstrated how membrane filtration system can be useful for the separation and isolation of microorganisms that are found in the crime scene. Such methodology allows to separate and concentrate microorganisms present in tracer through filtration process by using membranes with suitable molecular weight cut-off. The isolated microorganisms are analysed and identified by means of targeted techniques. From the type of microorganism (e.g., microalgae, bacteria, yeasts) it is possible to establish the environment where the murder occurred helping the investigation.

The team involved in the Lost fiction demonstrated how lost people on a desert island can survive by using filtering media (e.g., tissue of their jacket or leafs of some kind of exotic plant) to obtain drinking water from seawater and sludge groundwater. In this case, there is the common phenomenon which may help them to survive at list for few days, the osmosis. If they put some seawater containing a high salt concentration, but hopefully no other polluting substances, in a kind of membrane and then submerge this membrane in a pound of sludge ground water, which is in turns polluted by organic matter but which has a low salt concentration, then for the phenomena of osmosis, pure water will pass spontaneously from the sludge side of the membrane to the seawater side, thereby diluting the high salt concentration.

After few dilution cycles, salinity can reach a lower value (half value for each doubling of the total volume) so that they can drink this water and survive a few days more, until they will be rescued. In this case, we can really say, the appropriate membrane saved their life!
Editorial Activities

SPECIAL ISSUE OF CHEMICAL ENGINEERING AND PROCESSING: PROCESS INTENSIFICATION


In 2009-2011 TU Delft hosted and coordinated a unique international project called “Delft Skyline Debates”. A multidisciplinary team of 75 prominent scientists, young researchers and science managers from 13 countries representing leading universities, research institutes, industries, R&D funding organisations and European Commission was assembled. The team chaired by Professor Andrzej Stankiewicz from TU Delft included both academics and industrialists known for their visionary thinking and ability to look beyond the horizons of current R&D trends.

The main deliverable of the project, “Research Agenda for Process Intensification: Towards a Sustainable World of 2050”, has just been published. The research agenda is primarily intended as a recommendation from an international team of leading scientists to political, economic and scientific organizations for the funding of key multidisciplinary R&D programs including not only Process Intensification and process technology but also interfacing disciplines, such as chemistry, biochemistry, applied physics, materials engineering and electronics. Scientific background of the research agenda have been published in a special issue of the Elsevier journal “Chemical Engineering and Processing: Process Intensification”. A significant contributio n of ITM researchers to the development of membrane engineering in different sectors for the next decades is present:

1. Efficient technologies for worldwide clean water supply, F. Macedonio, E. Drioli, A.A. Gusev, A. Bardow, R. Semiat, M. Kunhar

New Editorial Responsibility

membranes

Prof. Dr. Spas D. Kolev (Editor-in-Chief), Annarosa Gugliuzza (Editorial Board Member)

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Annarosa Gugliuzza has been nominated Editorial Board Member of the journal “Membranes” published by MDPI AG. Membranes is an international, peer-reviewed open access journal of separation science and technology published by MDPI online quarterly. It publishes reviews, research articles, communications and technical notes. The aim is to encourage scientists to publish their experimental and theoretical results in as much detail as possible. There are, in addition, unique features of this journal:

- manuscripts regarding research proposals and research ideas will be particularly welcomed
- electronic files or software regarding the full details of the calculation and experimental procedure - if unable to be published in a normal way - can be deposited as supplementary material.

Annarosa Gugliuzza is also Guest Editor of the Special Issue “Responsive Polymer Membranes”, which will be published in Membranes on 2012.

CNR Highlights

A second edition (2009-2010) of the CNR Highlights has been presented by the CNR President Luciano Maiani on 27/07/2011 at the CNR Headquarter in Rome. In this new edition, 220 articles have been selected on the basis of their impact factors among the 14,000 articles produced in the last two years, to present the best image of CNR research to the world. Two papers from ITM have been selected for the Highlights 2009/2010:


Five researchers from all Italy have been selected to illustrate the 4 main areas of CNR activity. Alberto Figoli has presented his paper for the Life and Environment Area.

Plenary, Keynote, Invited Lectures

Lidietta Giorno:


Loredana De Bartolo:


L. De Bartolo is also working group member of the Action Cost “From nano to macro biomaterials (design, processing, characterization, modeling) and applications to stem cells regenerative orthopedic and dental medicine (NAMABIO)”. 1st meeting in Ancona 5-8 Oct. 2011

Enrico Drioli:

LECTURE/COURSE: International collaboration in science and engineering for a sustainable industrial growth, University of Eindhoven, 28 Sept. 2011


KEYNOTE: Enrico Drioli, Francesca Macedonio, Recent progresses and perspectives in desalination with integrated membrane systems, Saudi International Water Technology Conference Riyadh, Nov. 21 - 22, 2011

KEYNOTE: Enrico Drioli, Progresses in pressure driven membrane operations and in membrane distillation for seawater desalination and water treatment, The 26th Arab Engineering Conference - Water Resources in the Arab Countries, Jeddah (KSA), 7-10 Jan., 2012
ITM researchers abroad

**Bilateral Agreement Citrus Research Institute (CRI-CAAS)/Institute on Membrane Technology (ITM-CNR)**

Dr. **Alberto Figoli** and Dr. **Alfredo Cassano**, permanent researchers at the Institute of Membrane Technology (ITM-CNR), visited the Citrus Research Institute (CRI) from September 18, 2001 to September 21, 2001 within the Agreement on Scientific Cooperation between the National Research Council of Italy and the Chinese Academy of Agricultural Sciences (CAAS). A Joint Project entitled “Upgrading fruits and vegetable juice quality and enhancing by-products utilization through integrated membrane process” was approved in 2011 within the above agreement. It is coordinated by Dr. Alfredo Cassano from the Italian side and by Prof. Jiao Bining from the Chinese side. The project aims to: evaluate the recovery of high added value compounds from products and by-products of citrus processing industry by using integrated membrane operations; improve the quality of fruit and vegetable juices by using membrane technology; investigate membrane operations based on the use of hollow-fiber membranes to remove pesticides from orange juice.

The Citrus Research Institute was founded by the Ministry of Agriculture in 1960 and now subordinates to both the CAAS and Southwest University. As a national scientific research center, the CRI has played an important role in the compilation and revision of national and regional plans, the implementation of major and key projects and services for industry development, and made its contribution to the sustainable development of the China citrus industry. The Research team of Prof. Jiao Bining is involved in activities related to the quality and safety control of citrus products and standard formulations. Basically four major research area are under investigation: establishing standards and developing whole-course-control techniques for citrus quality and safety; developing detection techniques; developing detection techniques for citrus traceability; developing high efficiency pre-sampling methods and kits for the rapid detection of low level microbial/chemical contamination.

**Italy-India bilateral project**

In the framework of the ongoing Italy-India bilateral project on “Membrane contactors for arsenic(III) to arsenic(V) conversion” (Italian Principal Investigator: Alessandra Criscuoli), different research visits have been made. On October 13-27 2011, Dr. Swachchha Majumdar (Indian Principal Investigator) from the Central Glass and Ceramic Research Institute-CGCRI of Kolkata (India) was at ITM-CNR for carrying out experiments on arsenic oxidation with an MnO2 coated ceramic membrane, previously prepared in India. After, from December 5 till December 19 2011, Dr. Ganesh C. Sahoo (from CGCRI) prepared in the ITM-CNR laboratories polymeric capsules (both in PEEK-WC and PES) and flat membranes to be coated with MnO2. From the Italian side, **Alessandra Criscuoli** and **Alberto Figoli** (ITM-CNR) visited the Central Glass and Ceramic Research Institute-CGCRI of Kolkata (India) during the period: December 10-17 2011. They carried out experiments on ceramic membranes for the oxidation of iron and had the opportunity to visit some plants for iron and arsenic oxidation, installed in north of Kolkata. They also presented the research activities in progress at ITM-CNR with seminars on “Membrane Contactors” (Alessandra Criscuoli) and on “Membrane preparation and applications in water treatment” (Alberto Figoli).

**Research studies at POLYMAT**

**Straddle of November and December 2011**, Dr. **Annarosa Gugliuzza** spent two weeks at the Excellence Centre of Polymer Materials - POLYMAT. This is a Research and Technology Organization of the University of the Basque Country (Spain) located in Donostia-San Sebastián, undeniably amazing and rich in tradition city! During her stay, she had the great opportunity to use new advanced and sensitive techniques for studying the behaviour of responsive membranes, previously prepared at ITM-CNR, and consolidate thus the collaboration between two research groups. A constant interaction with researchers from other Countries and with complementary expertise enabled the exchange of opinions and knowledge on specific topics of the research. She greatly appreciated the warmth and the hospitality from all people working at the Jose Mari Korta Lab. The familiar atmosphere and the fine cooking of this wonderful Country made this experience even more unforgettable!

**Bilateral Project Italy-Poland**

From 21 to 27 November 2011, within the framework of bilateral project granted by CNR from Italy and by PAN from Poland, entitled “Development of biocompatible membrane to be used in bioartificial skin”, **Sabrina Morelli** and **Simona Salerno** visited the Institute of Biocybernetic and Biomedical Engineering of the Polish Academy of Sciences, IBBE-PAS of Warsaw. During this period Sabrina and Simona met the team of Prof. Andrzej Cho...

The international Conference on Membrane Technology in Water Treatments: Research and Application (MTWT2011) was held on September 16-17, 2011 in Harbin, P. R. China. This conference was jointly hosted by the Harbin Institute of Technology, Department of Science and Technology (Shandong Province), the Weihai Municipal Government, the European Membrane Society and the National Engineering Research Center of Urban Water Resources. Prof. Drioli was appointed as Honorary Chairman.

The event focused on water treatment and the lectures were mainly devoted to the study of i) Drinking water purification, ii) Domestic wastewater reuse, iii) Industrial wastewater treatment, iv) Membrane materials and module, v) Membrane bioreactor, vi) Novel hybrid membrane processes, vii) Membrane fouling mechanisms and control, viii) Desalination. All delegation from Europe participated as “special guest”. ITM-CNR was represented by Enrico Drioli, Lidietta Giorno, Alberto Figoli, Alfredo Cassano. They reported recent developments in membrane Engineering for water treatment and desalination (Enrico Drioli), membrane technology employing integrated membrane systems for olive oil wastewater treatment (Lidietta Giorno and Alfredo Cassano) and membrane encapsulation system for polymeric hybrid beads production for arsenic removal (Alberto Figoli). Other European colleagues lectured on membrane preparation and characterisation (Kang Li, Imperial College, UK) and water recovery and wastewater treatment in the food industry (Frank Lipnizki, AlfaLaval, Denmark). Very interesting lectures on water treatment were also given by distinguished professor coming from China and Membrane Chinese Companies. A large number of students of Harbin Institute of Technology attended showing a great interest in membrane technology as showed by the high number of questions made and interactions with the European delegation even after the conference. The event was very well organised and the deep scientific discussions and interactions among the EU delegation and Chinese professors made it really successful.

Stock Exchange Post-Docs

Twenty post-doc fellowships have been financed by the Calabria Region for performing research activities at public research organizations. Six of them will be undertaken at ITM. Since Sept. 1st, 2011 Carmela Conidi started a two years Post-Graduate Exchange (Stock Exchange Pots-Doc) Fellowship in order to carry out a research project on the following topic “Membrane processes for the recovery of biological active compounds from agro-food products and by-products”. Research activities will be developed for one year at ITM and for the second year at the Instituto Universitario de Ingegneria di Alimenti per el Desarrollo - Universidad Politecnica de Valencia. Emma Piacentini’s research project is on: “Membrane emulsification technology for controlled manufacturing of bioactive functionalized emulsions: process optimisation and new developments”. The project activity started last November 1st, 2011 and it will end in November, 2013. The research activity will be carried out in collaboration with Loughborough University (United Kingdom) and Karlsruhe Institute of Technology (Germany) where Emma Piacentini will spend one year. Filomena Giorno will carry out a research on “Development of cell-recycle continuous membrane reactor with ultra-filtration system for production of oils from Microalgae”. Foreign Hosting Institution: Department of Molecular Plant Physiology, Radboud University Nijmegen (The Netherlands) Start - End date: 1 Sept. 2011 - Aug. 31, 2013.

The post-doc fellowship of Antonella Piscione started on Nov. 1, 2011 and will finish on Nov. 31, 2013. She will undertake post-doctoral work within the project: “A New Biotechnological Approach for the Study of Neuronal Regeneration”. The activity abroad will be performed at the Retinal Development and Regeneration group from the DFG-Center for Regenerative Therapies Dresden Cluster of Excellence / TU Dresden (Germany).

Simona Salerno will perform a research on “Realization of hepatocyte culture membrane system as a model for in vitro toxicological tests alternatively to animal experimentation” in cooperation with the “Biotechnological-Biomedical Center, BBZ of the Leipzig University (Germany) where she will be hosted for her year abroad. Start - End date: Nov. 1, 2011 - Nov. 31, 2013.

Luana De Lorenzo will spend the year abroad at the Leiden Institute of Chemistry, Leiden University (The Netherlands) with a research on “Multiscale modeling of nanostructured polymeric mixed matrix membranes for gas separation”. Start - End date: Nov. 1, 2011 - Nov. 31, 2013.

Visiting Scientists

I am Dr. Nikolay Belov from A.V. Topchiev Institute of Petrochemical Synthesis (TIPS, Russia). During this Autumn I took part in Workshop on Membrane Distillation and Related Phenomena and was surprised when my poster was awarded by first prize. I estimate it as the sign of attention to our Russian Membrane Society. After this Workshop I made a technical visit to ITM-CNR and University of Calabria. I use this opportunity to thank the girls and Sergio who accompanied me during the short travel from Ravello to Castiglione. And I shall never forget Italian beer and fluent Italian speech. My visit to Rende was a part of collaboration of ITM-CNR and University of Calabria with TIPS in the framework of DoubleNanoMem project. In spite of a short duration of my visit I succeeded to learn some peculiarities of permeability measurement, hollow fiber preparation and, oddly to say, ancient history of Calabria. In this regard I appreciate very much hospitality of Fabio, Gabriele, Paola and John. It was not my first and I hope it was not the last visit to ITM. We should meet together in the future. Grazie mille!

My internship at ITM was an excellent experience in many aspects. When I left Lisbon I didn’t know exactly how would it be, but when I arrived I had a very good surprise in all the fields! Regarding the professional side, I’ve been working with Dr. Giorno and Rosalinda about ways to recover components with high added value from olive mill wastewater. In my opinion, this is a group with a big experience in this field so I learnt many interesting thing that can also help me in my work in Lisbon, which consists in the recovery of phenolic compounds from the olive pomace, a residue of the production of olive oil. My experience at ITM allowed me to know the utility and ways to integrate the enzymes in this kind of process. Beyond all the professional things that I learnt, I found there a very kind group. It’s a group with a big team spirit and always ready to help each other. I met people from many countries and with completely different cultures, which helped me to open my horizons. The interaction with so different people was an experience really enriching for me. I would like to thank everyone, but specially Dr. Giorno and Rosalinda for the excellent opportunity, help and disponibility to teach me. I hope to see everyone soon! Maria do Carmo Fraga
... Visiting Scientists

My experience with a Marie-Curie Fellowship

Hi, my name is Haydar Alaa, and I come from the Chemical Eng. Dept. of the University of Technology of Baghdad (Iraq). I started my work at the Institute on 19/09/2011 and continued working until 13/12/2011. My work dealt with the preparation of hollow fiber membranes by using polyethersulfone (PES) as polymer and several types of additives. I investigated the effect of different parameters such as of polymer and additives concentration, and bore fluid concentration and injection rate on the produced hollow fiber properties. The produced membranes were characterized in terms of thickness, porosity, mechanical properties, pore size distribution and morphology. These experiments were done under the supervision of Dr. Alberto Figoli and the direct assistance of Dr. Silvia Simone. I wish to express my sincere thanks to the management of the Institute and all the staff for their help in conducting experiments and measurements.

Hi, my name is Abdul sattar Hashim, and I come from Baghdad (Iraq). During my stay at ITM-CNR, I have dealt with the preparation of membranes using a biodegradable polymer, polyactic acid (PLA). Asymmetric and symmetric membranes, porous and dense, were prepared by varying different parameters such as the coagulation bath temperature and the evaporation time. The morphology of the membrane was studied by scanning electron microscopy, while membrane were characterized in terms of thickness, contact angle, mechanical properties and swelling tests. Finally, the produced membranes were tested for separation of methanol/methyl tert butyl ether mixtures by pervaporation. I wish to thank Dr. Alberto Figoli, my supervisor, the Director of the Institute and all the ITM-CNR staff for their kindness cooperation in conducting this research work.

Ciao Tutti!!! Felice Anno Nuovo!!!!

It gives me an immense pleasure to connect you all through ITM news. I take this opportunity to thank (EU, FP7), for the Marie Curie International Incoming Fellowship awarded to me and coordinated by Dr. Alberto Figoli as a financial aid to experience the highly integrated membrane research atmosphere. I have been experiencing this for the past 18 months and 6 more to go. This fellowship is like a boon for a person like me to choose the ITM with a dream to pursue flourishing career in membrane science. In nutshell, I am working in the area of ionic liquid microencapsulation using membrane encapsulation in novel way and its subsequent application in the field of pollution control aspects’. This fellowship program copped me as a challenging person in membrane scientific community to work together in the area of multidisciplinary brain network. Preparation and application of Ionic Liquid Microsphere preliminary results were presented in ILSEPT 2011(Spain) and Marie Curie fellow’s symposium (Poland). It was a distinctive platform to acquaint current and advanced updates in membrane science and to exchange the ideas about frontier areas of science.

The program would be nothing without the enthusiasm and imagination from Director Dr. L. Giorno, who not only providing the required research atmosphere and made my stay more comfortable. Rain or shine, if I send an email for any information, there was always a rapid response from her. I inspired by the innovative ideological thinking of Prof. E. Drioli, and his meticulous suggestions about my research. Dr. A. Figoli, is the person to be more excited than me for my research outputs, irrespective of its nature. It is quiet surprising one to me and later I learned the value of self motivation behind his attitude. I am happy to be associated with this group of researchers. Associating with Dr. E. Piacentini for my experiments and measurements.

Hi, my name is Loredana De Bartolo, the Italian responsible of the project entitled “Development of biocompatible membrane to be used in bioartificial skin”, for the realization of biodegradable membranes by using natural polymers.

Together with my colleague Veronika Jarmarová it was the second visit of ITM during the bilateral project between CNR and the Czech Academy of Science and I was here several times before, so partially it was like visiting old friends. We spent here one week during October, full of hard work and fun. Every day we measured the characteristics of a series of new membranes on the permeation apparatus and we spent a lot of time evaluating and discussing the results. Together with the team from the lab of John Jansen (foto) we specified the permeability of two types of membranes for different gases and vapors. We studied two types of materials – a polymer composite material containing carbon nanotubes and new polymer material with covalently bonded ionic liquid. The results of these measurement we expect to publish in a new paper.

Like every year before I have to appreciate a very kind care and welcoming from everybody in the lab and John’s especially. We felt very comfortable, we learned a lot and we are looking forward to the next year to visit ITM again. Marie Kačírková
Projects and Related Activities

DoubleNanoMem 24 months Progress Meeting, Leuven (BE), August 1-4, 2011

The two-year progress meeting of the DoubleNanoMem project was hosted by Prof. Bart van der Bruggen of the Katholieke Universiteit Leuven from Aug. 1-4. Representatives of all ten teams involved in the project were present at the event, as well as the project officer of the European Commission, Dr. Martin Chamberlain. In this occasion Dr. Chamberlain thanked the coordinator and all partners for the fruitful work and informed about his decision to leave the project for other tasks within the EU, making place for the new Programme Officer Dr. Helge Wessel. With scientific presentations and lively discussions each team showed its results achieved in the previous six months and outlined the future plans to implement the project for the final research year. Decisions about the next progress meeting and the final workshop were taken. As a conclusion of the meeting, a visit was made to the laboratories involved in membrane research in the group of Bart van de Bruggen. Many researchers from different countries work under his supervision, mainly on pervaporation and nanofiltration. This visit opened further discussions about interesting opportunities to develop new collaborations and strategies to better exploit the fall-out of the project. During a more informal meeting on the 3rd day, additional time was devoted by a select group of project partners to the preparation and planning of common manuscripts, detailed discussions of some technical aspects of the work and to the exchange of samples between the different partners. ITM was represented by F. Bisignano, G. Clarizia and J. Jansen.

MEDITAS final project meeting, Freiburg (Germany) 29 - 30 August 2011

The 7th MEDITAS (Membrane Distillation in Remote Areas) meeting was the final project meeting and was held on the 29th and 30th of August 2011 at Fraunhofer ISE in Freiburg (Germany). The main objective of the meeting was the presentation of achievements of the past 6 months as well as a conclusion about the major achievements of the overall project. Both Alessandra Criscuoli and Enrico Dirolli attended the meeting, presenting and discussing the contribution of ITM-CNR.

NEMOPUR Project review meeting, London, (United Kingdom), September 27, 2011

The NEMOPUR review meeting took place on Sept. 27 at Imperial College London (UK). The meeting was officially opened by the coordinator of the project Prof. Andrew Livingston that outlined the purpose of the meeting which was to review the progress of the project at month 37 covering recruitments, research, training management and reporting. The ITM team was represented by Dr. Elena Tocci, Eun Woo and Samuel Garcia, both PhD Students whose research activities are directly related to NEMOPUR, and by Chi Hoon Park, one of the two Experienced Researcher (ER) appointed during the third year of the project. The other ER was appointed at the Technical University of Dortmund (DE).

Each scientist-in-charge was discussing his research, the dissemination achievements and the future work plans. Membranes showed interesting performance in terms of separation and selectivity properties. NEMOPUR training activities were discussed. Excellent progress has been made and two events were remaining. One was the Conference on Molecular Imprinting; it was held some days later at Imperial, on 26-30 September 2011. The second event scheduled has to be run at ITM in April 2012. ITM team presented the plans of the workshop on Progresses in Organic Solvent Nanofiltration, 23-25 April 2012, Cetraro, Italy. The discussion continued on management and administrative activities.

At the end of the day it was discussed on the future research focus of the final year taking into accounts the results obtained during the 3 years of the project and design and cost a selected number of Active Pharmaceutical Ingredients (API) processes. It was agreed that some business cases for innovative purification technologies would have been delivered and should include the process economics and technical requirements. The best case would be submitted with the final report to the EC. http://www3.imperial.ac.uk/molecularpurification

First annual BIONEXGEN meeting, Swansea (United Kingdom), October 5 - 6, 2011

The first annual BIONEXGEN meeting, FP7 EU project, took place at Swansea University on the 5th and 6th of October 2011 in Swansea, United Kingdom. The meeting has been organised by Prof. Nidal Hilal and his group and all the partners involved in the project gave presentations on their scientific research achievements. From ITM-CNR, Dr. Alberto Figoli and Dr. Giorgio De Luca presented their work on the new membranes prepared and theoretical transport aspects through the new membranes, respectively. The Postdoc Dr. Giulia Fiorani (ITM-CNR, Padova Unit) and Dr. Mauro Carraro from University of Padova reported also the new findings on the synthesis of novel antimicrobial agents to be loaded in the membrane, done under the supervision of Dr. Marcella Bonchio. The fruitful discussion among the partners and the wonderful surrounding environment made the meeting really successful. http://www.bionexgen.eu/

CapWa 12 Months Progress Meeting, Rende (ITALY), October 25-26, 2011

The 2nd progress meeting of the 3 years project CapWa (NMP3 – SL – 2010 - 246074) was held at the Institute on Membrane Technology (ITM-CNR) on October 25-26, 2011. The meeting was attended by the team leaders and by a number of researchers of each of the fourteen partners. Aim of the project is the capture of evaporated “waste” water from, e.g., power and paper/board plants. The produced water could be a source of liquid water. Prof. Enrico Dirolli is the scientific responsible for ITM-CNR in the process. The meeting was officially opened by the Coordinator of the project, Dr. Ludwin Daal (from KEMA – the Netherlands), and by the Director of ITM-CNR, Dr. Lidietta Giorno. The scientific discussions on the first day described the progress in the synthesis and characterization of coated membranes by water capture, in the preparation/characterization and testing of novel hydrophobic membranes, in the membrane module design, in the membrane module simulation and optimizations, in the energy modeling of the system for defining the real advantages in the suggested strategies. During the various breaks extensive exchanges of information took place. ITM-CNR main activities in this project are related to the preparation and development of a novel membrane condenser based on microporous hydrophobic membranes. The first day meeting was concluded with an interesting tour through the CNR-ITM laboratories and ended with an excellent dinner with traditional food in a restaurant in the heart of Vecchia Rende. The second day was mainly focused on system requirements, dissemination actions, project management and financial issues. Next project meeting will be held in Madrid in April 2012. CapWa site: http://www.watercapture.eu/
Focus on Research at ITM

Multiscale Modeling in Membrane Science

In the last two decades several molecular computational procedures, such as quantum, molecular mechanics and dynamics, became a reliable tool for molecular design and interpretations of experimental data. The rapid reliability of the aforementioned computational procedures, arise from a combination of several factors: improved theoretical methods, based on quantum or statistical mechanics, improvements in intermolecular force fields, rapid increases in computer speed and memory, and more efficient algorithms [1]. Also membrane science applications require modeling at multiple scales (electronic/atomic and even mesoscale or continuum modeling) [2].

One example of a multi-scale investigation has been carried out at the Institute on Membrane Technology (ITM-CNR), in the frame of the joint Einstein-RFBR (Italian-Russian) Project, in the area of "The theory of nonlinear integrable systems and applications". The aim of this work was to predict the effects of a direct fluorination of poly(ether ether ketone) with cardo group (PEEK-WC) on the perm-selective features of the fluorinated membranes. Prof. Kharitonov, the Russian partner of the project, is an expert in direct fluorination, a reliable method to fluorinate polymeric surfaces. Since three decades this process has been applied at the industrial scale for improving the barrier properties but there is limited fundamental knowledge of the process [3] at molecular scale. For this reason, accurate quantum mechanical calculations were used, in the framework of Density Functional Theory, to indicate which carbon atoms of PEEK-WC monomers are preferentially fluorinated, in order to define what are the most likely structures of fluorinated monomers.

According to Hammet principle, the most stable carbo-cations should provide the sequence of carbon atoms to be fluorinated, assuming that the carbo-cations formation is the rate determining of the electrophilic aromatic substitution. Thus, the stability of all aromatic carbo-cations, forming by the attack of the F₂ electrophile, has been calculated using an accurate quantum mechanics approach. Moreover, it is worth noting that the quantum mechanics calculations have been performed considering both the electrophilic aromatic substitution and also the electrophilic addition on the aromatic ring and carbonyl group. Finally, the analysis of the infrared bands has allowed us to validate the conclusions of quantum calculations. Therefore, the novel PEEK-WC fluorinated monomers were modelled. These have been used to build the fluorinated polymeric chains [4]. Both “quantum” models, with one fluorine atom (considering an aromatic electrophile substitution) and with more fluorine atoms (considering an addition) have been used for the following molecular dynamics simulations. Starting from the monomers, fluorinated polymer chains have been modelled, and under 3D periodic boundary conditions, polymer “boxes” have been simulated. Their morphology and free volume distribution have been analysed. The MD simulations show a general drastic drop of the free volume in case of fluorinated polymers in comparison to the unmodified PEEK-WC [4]. The short fluorinated materials show a widely homogeneous distribution of free volume and long fluorinated polymer has a smaller amount of free volume than the short one. Correspondingly, the variations in free volume influence strongly the transport properties.

Giorgio De Luca, Elena Tocci

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High Educational and Training Activities

Training Course in Water Treatment for Algerian PhD Students

A Training course on Basic on Membrane Technology in Water Treatment has been organised by ITM-CNR during the period 29th November 2011 -16th December 2011. The course was attended by PhD students coming from the School in Processes Engineering and Environment of the University Center of Bordj Bou Arreridj (Algeria) but also by some PhD researchers in Chemical Engineering of UNICAL.

The course was based on theoretical lectures and practical lab experiments given by ITM-CNR and UNICAL researchers. Prof Drioli started the course giving an overview of the membrane technology in water treatment and reuse. Lectures on membrane preparation and characterisation, on transport phenomena in membranes and on the classical pressure driven process and more advanced innovative membrane technologies have been deeply discussed by different researchers.

The attention and interest to the course from the attendants has been demonstrated by the large number of questions and continuous interaction with the teachers.

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… High Educational and Training Activities

Course on “Membrane Technology at Valparaiso

Alberto Figoli has been invited to give a course on “Membrane Technology: Encapsulation and Food Application”, on 24-28 October 2011 at the School of Food Engineering, the Ponteficia Universidad Catolica, Valparaiso, Chile.

This course was organised by Prof. Beatriz Cancino, Inpromem Group (Investigación en procesos con membranas,) and supported by the Escuela de Alimentos and the Programa de Acuicultura, both of the Ponteficia Universidad Catolica de Valparaiso. It was a great opportunity to visit the University, laboratories and discuss with several professors on the potentiality of membrane technology in the food field and possibility of further collaborations.

Besides the scientific aspects, it was very nice to interact directly with the students and a special thanks goes to Andres Ramirez and Rosa Navarro who showed the beautiful city of Valparaiso and surrounding and to the all the people met for the great hospitality.

Joint - Lab activities Korea

As a positive fall-out of the establishment on 16 June 2011 of the International Joint Lab on Membrane Technology between Hanyang University and ITM - CNR, a series of exchange visits between the two Institutions has been initiated. Mrs Suk Young Lee from the Hanyang University and an Iranian PhD student, Naser Tavajochi, are visiting ITM for one month (from 9 Jan – to 6 Feb) for performing the characterisation tests at ITM-CNR of the membrane previously prepared in Seoul.

Two other graduate students, Young Rae and Jung Hyun, will be spending 1 month starting from February at ITM as well for studying AFM and MD simulation of polymer membranes.

Two months Secondment at GVS SpA in Bologna

The EU-FP7-PIAP-“IMeTI - Implementation of Membrane Technology to Industry” is a Marie Curie project for the integration of academia and industry by researcher exchange. The secondment has been performed by Dr. Alberto Figoli at GVS, Italy, for the period of two months (September-October 2011). The time spent was very fruitful for carrying out preparation and characterisation of novel mixed matrix membranes and for discussing with the researchers at GVS on possible collaboration and alternative area of research in which membrane technology could be applied with success. Special thanks goes to Dr. Luca Querze (Director of R&D Unit), Dr. Nino Gaeta (IMETI Coordinator for GVS) for their constant support and discussion during the stay of Dr. Figoli in Bologna and all the research team who showed a great enthusiasm and support the research activities making his stay unforgettable.

New Actions

Upcoming Scientific Events

NEMOPUR Workshop on “Progresses in Organic Solvent Nanofiltration”, Cetraro (CS) - Italy, 23 - 25 April, 2012

The Workshop on “Progresses in Organic Solvent Nanofiltration” is organized as part of a European Commission funded FP7 ITN Project “NEMOPUR - New Molecular Purification Technologies for Pharmaceuticals Production”. NEMOPUR is a collaboration of nine European partner institutions, coordinated by Imperial College London (UK), and focuses on creating a new generation of molecular purification technologies for Active Pharmaceutical Ingredient (API) manufacture, with a particular focus on the removal of organic impurities from API production. In this framework, the main purpose of the Workshop is to explore all relevant aspects of OSN, and in particular the advances in membrane operations for purification of bioactive compounds in non-aqueous systems and their final formulation.

The event will take place at the Grand Hotel San Michele, Cetraro (CS) - Italy, a nice location overlooking the Tyrrhenian sea, on 23 - 25 April, 2012.

DoubleNanoMem Workshop, Cetraro (CS) – Italy, on May 15 – 17, 2012

The DoubleNanoMem Workshop on “Nanostructured and Nanocomposite Membranes for Gas and Vapour Separations” is organized in the frame of the homonymous project, financed under the EUs 7th programme. The main scope of the workshop is to bring together researchers and industries, working in the field of gas and vapour separations, to present the current state of the art in new materials development and to discuss on future needs and perspectives.

Demonstrating the scientific progress, we hope to stimulate a discussion on the potential industrial exploitation of new materials and technologies in view of Europe’s competitiveness in a global market. The industrial community will have the opportunity to present its products, its challenging problems or interesting case studies. The workshop should form a platform for future collaborations between academia and industry. Interested participants will have the opportunity to visit the laboratories of ITM-CNR in a guided tour. The Workshop will be held in Grand Hotel San Michele in Cetraro, Italy on May 15 – 17, 2012.
New Projects

FotoRiduCO2 - Photoconversion of CO2 to methanol fuel
The Italian Ministry of Education, University and Research has approved, under the PON "Research and competitiveness 2007-2013, the 3-years project "FotoRiduCO2 - Photoconversion of CO2 to methanol fuel". The project activity started last June 1st, 2011. The partnership consists of Italcementi Fabbriche Ruinite S.p.A. Bergamo (Coordinator), Dipartimento Energia e Trasporti di Consiglio Nazionale delle Ricerche, Advanced Technology Solutions S.R.L., Salentec S.R.L., Università degli Studi di Palermo and Università del Salento.
The CNR is involved as Dipartimento Energia e Trasporti. In particular, the Istituto di Tecnologia Avanzata per l’Energia "Nicola Giordano" (ITAE), the Istituto per la Tecnologia delle Membrane (ITM), the Istituto per i Processi Chimico-Fisici (IPCF) and the Istituto per la Sintesi Organica e la Fotoreattività (ISOF) are the institutes where the research activities are in progress. The ITM-CNR contributes to the FotoRiduco2 project investigating gaseous separation by membranes and membrane operations. Mixtures containing carbon dioxide, nitrogen, oxygen, water vapour, etc. will be operate with membranes and then feed to the photocatalytic reactor in order to produce fuels.

MATRECO (Advanced materials of eco-sustainable transports)
From July 1st, 2011 ITM-CNR is involved in a National Project within the Operative National Program “Ricerca e Competitività” 2007-2013 which supports projects within the field of scientific research, technological development, industrial competitiveness and innovation in the planning period 2007-2013. The Project entitled “MATRECO” (Advanced materials of eco-sustainable transports) aims to research new materials based on advanced technologies and to develop an appropriate manufacturing process in order to target the production of components/structures functionalised to increase final customer satisfaction (more value, same price) and characterised by an outstanding environmental sustainability (use of easy renewable resources and of near-zero carbon lifecycle processes, from raw material extraction to final recycle/reuse/disposal, without any negative compromise in quality and in technical content/ performance given to customer).
The consortium includes Research Centres and Universities (Catania, ENEA-materials, Calabria, ITM CNR, Napoli Federico II, Bari, CRF), large Companies from automotive (Centro Ricerche FIAT, Adler plastics, Tiberina) and railway sectors (Firema), SMEs from nautical sector (Seal Marine, Borrone), furnishing (Sirianni e Cosmob) and packaging (Filadel) able to exploit research results in new products to increase shares in their market sectors. Activities of ITM-CNR will be focalized on the development of an eco-sustainable process for the treatment and recycle of exhausted alkaline liquors used for the production of cellulose fibers by using membrane operations. Research activities for ITM will be coordinated by Dr. Alfredo Cassano.

OLITREVA (Capacity Building for Sustainable Treatment and Valorization of Olive Mill Waste in Palestine)
A new project: Capacity Building for Sustainable Treatment and Valorization of Olive Mill Waste in Palestine (OLITREVA) has been funded under the Seventh Framework Programme of the EC. OLITREVA project aims to strengthen RTD and cooperation capacities of Palestinian research centres and thus, to enhance their response to the environmental threats posed by olive oil production residues in the country. Its target would be to enhance S&T capacities of local research performers devoted to the field of Olive Mill Waste Treatment, by increasing networking and cooperation with European centres of top-level research and scientific excellence working in the same field. It will run from 2012 until 2014 and Alessandra Criscuoli is the scientific responsible for ITM-CNR.

OLIO PIU’ (Advanced technological systems and integrated methods in the olive growing and processing chain for the increase in value products and by-products, the development of new sectors and the creation of eco-friendly productive systems)
From October 1st, 2011, ITM-CNR is involved in a National Project, coordinated by Conasco - Reggio Calabria, within the Operative National Program “Ricerca e Competitività” 2007-2013, supported by Italian Ministry of Education, University and Research.
The project aims to answer to the expressed demand of olive mills, through the study and the introduction of advanced technologies and integrated biotechnological systems.
In particular the project will redesign the productive technological system of the olive growing and processing sector, through the achievement of a chain model suitable for the overall Mediterranean area, which is able to create both innovative processes and products in the field of excellence of environmental compatibility. Within the project, ITM-CNR will develop integrated and intensified membrane processes to recover and valorise high added value compounds from olive mill waste. Research activities will be coordinated by Dr. Lidietta Giorno.

The WATERBIOTECH, FP7 project has officially started on 1st September 2011. It is a European-funded project, targeting a sustainable water supply in Africa and other developing countries. The fundamental principle of the WATERBIOTECH project is to treat wastewater by means of biotechnology for reuse. The approach aims at compensating water scarcity and reducing the overexploitation of freshwater resources and will thus ensure a sustainable water supply for developing countries in Africa. In the course of the project, a consortium comprising 18 partners (8 European, 8 African, 1 from the Middle East and 1 international) is developing a practical approach using biotechnology as an affordable, cost-effective, efficient and environmentally friendly method for wastewater treatment in Africa. The target countries are Algeria, Burkina Faso, Egypt, Ethiopia, Morocco, Senegal, South Africa, Tunisia, Ghana and Saudi Arabia. ITM-CNR is involved as partner and key experts are Dr. Alberto Figoli (scientific coordinator), Dr. Alessandra Criscuoli and Prof. Enrico Drioli.

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