

Report from POLYCHAR 27, Naples, October 14-17, 2019



Fig.1. Group photo of POLYCHAR27 attendants

This year the Annual Polychar World Forum on Advanced Materials was held at the Congress Centre of the University of Naples “Federico II” in Naples on October 14-17, 2019.

The conference is the twenty-seventh from the series which originally was limited to polymer characterization (hence POLYCHAR), however now covers materials of all classes. The previous meetings had been held in Denton, Texas, USA (where the Forum was founded in 1992), Portugal (2004), Singapore (2005), Japan (2006), Brazil (2007), India (2008), France (2009), Germany (2010), Nepal (2011), Croatia (2012), South Korea (2013), South Africa (2014), USA (2015), Poland (2016), Malaysia (2017), and Georgia (2018).

This year’s edition was organized by the Institute for Polymers Composites and Biomaterials of the Italian National Research Council (IPCB-CNR) and the Department of Chemical, Materials, and Production Engineering of the University of Naples “Federico II”, Italy (DICMAPI-UNINA).

POLYCHAR is unique in many ways, however the most important feature is that it offers opportunity to young students and researchers to present their scientific results to a wide public and exchange knowledge with prominent scientists from all over the world. There is a number of prizes for young scientists and students to encourage their participation (please see below). POLYCHAR Forum pays also great attention to uniqueness and technology innovations, hence worldwide contribution is crucial.

A traditional preface to the conference is a one day Course on Polymer Characterization which is a nod to younger participants and explains fundamental issues related to polymer characterization. This year the following lectures were given:

- **Witold Brostow** - Viscoelastic behaviour of polymers
- **Victor Castaño** - Polymers, biopolymers and advanced nanocomposites for additive manufacturing
- **Pellegrino Musto** - Recent advances in vibrational spectroscopy and their applications to polymer science
- **Dusan Berek** - Liquid chromatography of synthetic polymers
- **Dirk Schubert** - Polymer blends and interfaces
- **Mario Malinconico** - Bioplastics: opportunities and challenges
- **Tomasz Sterzyński** - Macromolecular orientation in polymers

About 150 registered participants from academia from 21 countries and 3 continents attended POLYCHAR 27 that offered 81 oral presentations in two parallel sessions and 56 posters covering the following topics:

- Modeling, Predictive and Advanced Characterization Methods
- Smart and Functional Materials
- Synthesis and Chemical Modification
- Materials for Environment
- Materials for Medicine and Health
- Sustainability and Recycling
- Materials for Energy and Electronics
- Engineering and manufacturing.

The Conference was opened on Tuesday, October 15, 2019 by Cosimo Carfagna, Professor at University of Naples and past Director of IPCB-CNR, Luigi Ambrosio, Director of IPCB-CNR, and Maurizio Avella, Senior Researcher at IPCB-CNR.

During the conference four plenary speeches were given. The first, opening lecture was given on Tuesday, October 15, 2019 by **Krzysztof Matyjaszewski** from Carnegie Mellon University titled 'Synthesis and Characterization of tailored-made polymers via ATRP'. The second day was opened with a lecture given by **Chi Wu** from Chinese University of Hong Kong on 'Universal scaling of phase diagram of polymer solutions'. The third day was inaugurated by **José M. Kenny** from University of Perugia with a speech titled 'Processing and functionalization of bio-based nanoparticles for polymer bionanocomposites' and **Luigi Nicolais**, President of Materials S.r.l., who presented the lecture on 'Strategies to create a bridge between the university research and enterprise'.

Many interesting oral presentations with a wide range of topics were delivered during the Forum. Here is a list of keynote and invited speakers' presentations (see also below the prize winners):

A. Abate - Novel materials for stable perovskite solar cells

L. Ambrosio - Functional biomaterials and bio-interfaces

D. Berek - Separation and characterization of parent homopolymers in block copolymers with help of liquid chromatography

W. Brostow - Brittleness, flexibility and dynamic friction of polymers

S. Coppola - Encasing temporary water silhouettes by quick liquid packaging: a new bottom up approach

S.C. Carroccio - Hybrid polymeric systems based on organic and inorganic semiconductors for application in water remediation

V. Castaño - Challenges for advanced materials for 3D printing technologies

P. Dardano - Photodefinible microneedles for transdermal drugs delivery

E. Dargent - Molecular mobility in amorphous biobased poly(ethylene furanoate): the effect of positional isomerism

F. Donsì - Mechanical cell disruption technologies for the total use of agro-food residues in edible coatings and in oil structuring

E. Espuche - Nanocomposites: going from ex situ to in situ or mixed synthesis routes to tune gas barrier properties

P. Ferraro - Skillful manipulation of polymers based on pyroelectric EHD for engineering new micro-and nano-structures

G. Gorrasi - Mechanical milling: an alternative green method to produce structural and functional bio-nano-composites

M. Laus - Self limiting reactions for silicon doping

E.F. Lucas - simple characterization techniques to evaluate polymer performance as additive for petroleum production

A. Maffezzoli - Morphological and mechanical characterization of recycled short carbon fiber composites

D. Martella - Photonic polymers for microrobotics

A. Mija - Bio-based thermosets and their sustainable composites

O. Mukbaniani - Fluorine containing solid polymer electrolyte membranes

L. Myasnikova - The solid phase transitions in polymers, as revealed by different techniques

M.G. Raucci - Eumelanin functionalized polylactic acid fibrous substrate for neurodegenerative diseases treatment

G. Ricci - An overview of the latest developments in the stereospecific polymerization of 1,3-dienes

M.C. Righetti - Time and temperature evolution of the constrained amorphous interphase in semi-crystalline polymers

M. Salzano De Luna - Design of chitosan/graphene oxide aerogels for water purification

A. Sambandam - Sustainable nanohybrid materials for energy storage applications

F. Samperi - Syntheses and MALDI-TOF MS characterization of tailored poly(4-vinyl pyridine) based copolymers

J. Saunier - Effect of locking solutions on polyurethane PICCs: an in vitro evaluation

D. Schubert - Revealing novel power laws and quantization in electrospinning considering jet splitting – towards predicting fiber diameter and its distribution

M. Silverstein - Accessing innovative porous polymers through emulsion templating

M. Sirignano - Insights of gas phase to particle transition of carbonaceous combustion formed nanoparticles

T. Sterzyński - Investigation of deformation mechanism in mechanically coupled plastic-metal hybrid structures

L. Torre - Advanced composites and nanocomposites for high temperature aerospace applications

H.D. Wagner - Extreme scale-dependent tensile properties of an epoxy resin

S. Wongkasemjit - Reusable T. Reesei immobilized on SBA-15 for monomeric sugar production

H. Xia - Simultaneous realization of conductive segregation network microstructure and minimal surface porous macrostructures by SLS 3D printing

At the end of each POLYCHAR conference, several awards were distributed among the participants.

This year the *Svante Arrhenius International Materials Research Prize* went to **Michael Silverstein** from Technion Israel Institute of Technology for his work on 'Innovative porous polymers through emulsion templating'.

The *Paul J. Flory Research Prize* was awarded ex aequo to **Eric Dargent** from University Rouen Normandy in France and **Dirk Schubert** from Friedrich-Alexander University Erlangen-Nürnberg in Germany for their scientific achievements.

The *Jürgen Springer Prize for Young Scientists* was granted to **Shaghayegh Hamzehlou** from University of Basque Country in Spain for her speech titled 'Modeling and characterization of the morphology development of structured composite polymer particles'.

The *Bruce Hartmann Prize for Young Scientists* was assigned to **Sarra Zid** from University of Lyon, France for 'Numerical Study of Nanofiller size polydispersity and intercalation effects on nanocomposite barrier properties'.

Finally, the *Carl Klason Student Awards* were given to **Katarina Filatova** from Tomas Bata University, Czech Republic, **Hanna Fałtynowicz** from Wroclaw University of Science and Technology, Poland and **Sanja Seslija** from University of Belgrade, Serbia.

Scientific Committee (SciCom) of the Forum had its usual meeting. First, the SciCom had expanded its range by appointing nine new members as given below:

- **Veronica Ambrogi**, University of Naples "Federico II", Italy
- **Monika Dobrzyńska-Mizera**, Poznan University of Technology, Poland
- **Mirosława El Fray**, West Pomeranian University of Technology, Poland
- **Shaghayegh Hamzehlou**, University of the Basque Country UPV/EHU, Spain
- **Elena Kramarenko**, Lomonosov Moscow State University, Russia
- **Ana Laura Martínez-Hernández**, Technological Institute of Querétaro, Mexico
- **Alice Mija**, University of Nice-Sophia Antipolis, France
- **Ventura Rodriguez Lugo**, Autonomous University of Hidalgo State, Mexico
- **Vladimir Sedlarik**, Tomas Bata University in Zlin, Czech Republic

Further, the Board was updated with the new President: Victor M. Castaño from National University of Mexico. The SciCom representatives, in the name of all conference participants, expressed their appreciation to Prof. Brostow for all the years of his amazing leadership and support he gave to the POLYCHAR Society. From now on he is the Honorary President. Other SciCom roles remained unchanged. The POLYCHAR SciCom also announced an opportunity to submit papers presented at the Forum for publication in the *Journal of Materials Science Research*, a respected worldwide journal, after a standard refereeing process.



Fig.2. Prof. Witold Brostow and prof. Victor Castaño, former and current President of the POLYCHAR SciCom

The participants denominated this year's Forum as magnificent due to several reasons. First of all, thanks to enormous hospitality of the Italians in general and of the Local Organizing Committee, composed by Cosimo Carfagna, Luigi Ambrosio, Maurizio Avella, Veronica Ambrogi, Roberto Avolio, Irene Bonadies, Rachele Castaldo, Pierfrancesco Cerruti, Mariacristina Cocca, Francesca De Falco, Maria Laura Di Lorenzo, Emilia Di Pace, Maria Emanuela Errico, Gennaro Gentile, Marino Lavorgna, and Valentina Marturano. Second, the marvelous city of Naples with its historical city center being the largest in Europe and a UNESCO World Heritage Site, with a wide range of culturally and historically significant sites nearby, including the Roman ruins of Pompeii, which was visited by the participants during a guided tour organized on Friday, October 18, 2019. The day before, the conference attendants had taken part in a tour to Tunnel Borbonico, which represented a description of the last 500 years of Naples' history. Naples is also the cradle of the greatest food selection of which was available during the gala dinner on October 16, 2019. Third, because the POLYCHAR summarized the latest important developments in worldwide Material Sciences and Engineering. And last but not least, many international collaborations were initiated.

As usual, at the closing ceremony, chaired by Luigi Ambrosio, Director of IPCB-CNR, and Maurizio Peruzzini, Director of the Department of Chemical Science and Materials Technology of the Italian National Research Council, an invitation presented by Sujitra Wongkasemjit from Mae Fah Lung University to all for the next year was issued. Polychar 28 will take place in Chiang Rai, Thailand December 7-10, 2020. More details to be found on the website: <http://polychar28.mfu.ac.th>.