

## **POLYCHAR 21 World Forum on Advanced Materials** Report

The 2013 POLYCHAR World Forum on Advanced Polymeric Materials was held in Gwangju, Republic of Korea. POLYCHAR is an annual Conference, founded in 1992 at the University of North Texas, Denton, and it was held there until the year 2004 when the first POLYCHAR Forum was held outside the US, in Portugal. After being hosted in Singapore (2005), Japan (2006), Brazil (2007), India (2008), France (2009), Germany (2010), Nepal (2011), and Croatia (2012), now it was Korea's turn in 2013.

Under the chairmanship of Byung-Wook Jo, Department of Polymer Science and Engineering, Chosun University, Gwangju, 245 participants from 30 countries around the world have gathered from March 11 to March 15 in the Kim Dae-Jung Convention Centre, supported by the International Union of Pure & Applied Chemistry (IUPAC), the City of Gwangju, the Chosun University, the Korean Polymer Society, and a number of sponsors from industry.

The name POLYCHAR is derived from **polymer characterization** but goes beyond the initial goal and now addresses the whole field of Materials Science and Engineering (MSE). **The Short Course on Polymer Characterization**, held usually on the first conference day, was established at the very beginning by the Polychar founders: Witold Brostow, Michael Hess and Kevin P. Menard. The Course serves a tutorial for newcomers in the field of Polymer Science as well as up-date about recent developments in analysis and characterization of polymer systems provided by specialists in the field.

The Forum provides an opportunity to present new concepts, new materials, new discoveries – enhancing research collaborations, networking and dissemination of recent advances in MSE. In 2013, POLYCHAR is accompanied by a satellite conference, namely Rouen Symposium on Advanced Materials (ROSAM 2013, <http://rosam2013.com>, convener Jean-Marc Saiter, University of Rouen), which has established a POLYCHAR FORUM <http://polycharforum.org/> for improvement of communication within the 'POLYCHAR family' that has evolved over the years.

POLYCHAR 21 Forum had Sessions on:

- Predictive Methods and Simulations (3)
- Nano - and Smart Materials (8)
- Polymers in Electronics and Optoelectronics (7)
- Polymer Synthesis (6)
- Surfaces, Interfaces, Adhesion, and Tribology (8)
- Rheology and Processing & Mechanical Properties and Performance (9)
- Materials for Energy and Recycling (2)
- Green Polymer Engineering and Materials (13)
- Biomaterials & Natural and Biodegradable Polymers (19)
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Before that, topics of the tutorial Course were:

- Thermal Characterization of Polymers, Michael Hess (Chosun University)
- Polymer Relaxation Dynamics analyzed through Cooperativity and Glass transitions, Jean-Marc Saiter (University of Rouen)

- Introduction into Tribology, Witold Brostow (University of North Texas)
- Polymer Spectroscopy, IR and NMR, Michael Hess (Chosun University)
- Modern Electron Microscopy in Polymer Characterization, Swen Henning (Fraunhofer Institute for Mechanics of Materials, Halle)
- Advanced Microscopy and Spectroscopic Techniques for Surface Characterization, Holger Schoenherr (University of Siegen)
- Basics of Scattering Techniques: X-ray, Neutron Scattering, Light Scattering, Jean-Michel Guenet (Institute Charles Sadron, Strasbourg)
- HPLC Characterization of Polymers, Taihyun Chang (Pohang University of Science and Technology)

As each year, it is nearly impossible to make a selection from many outstanding presentations. Here is an attempt to list a small subset of the papers presented, as a *pars pro toto* (but see also the prize winners below):

Changhyun Choi (Samsung Total Petrochemicals, Chungnam): 'Polymer Industry in Korea – Past, Present and Future'

Hiroyuki Ono (Tokyo University of Agriculture): 'Ionic Liquids: Potential Partner for Biorefinery'

Chris Ober (Cornell University, Ithaca, New York): 'Lithography: A Tool in Accessing the Performance of Polymers and other Materials Systems'

Jiasong He (Chinese Academy of Sciences, Beijing): 'PMMA Nanocomposites: From Transparent to Microfoamed by Ionic Liquid and Supercritical Carbon Dioxide'

N.L. Bhandari, G.H. Michler, J.-M. Saiter, S. Thomas, C.K. Das & R. Adhikari (Tribhuvan University, Kathmandu; Martin Luther University, Halle-Wittenberg; University of Rouen; Mahatma Gandhi University, Kottayam, Kerala; Indian Institute of Technology, Kharagpur): 'Comparative Study of Mechanical, Morphological and Thermal Behavior of Neat and Treated Bamboo Flour Reinforced Polypropylene Composites'

Won-Ho Jo (Seoul University): 'Dispersion of Carbon Nanomaterials and its Application To Nanocomposites and Transparent Electrodes'

Yves-Henry Geerts (Free University of Brussels): 'A Chemist's Approach to Order in Molecular Semiconductors'

Chain-Shu Hsu (National Chiao Tung University, Hsinchu): 'Highly Efficient Polymer Solar Cells – Towards Next Generation Renewable Energy'

Anton Manakhov, Maryline Moreno-Counranju, Nicolas Boscher, Patrick Choquet & Jean-Jacques Pireaux (CPR Gabriel Lippman, Belvaux; Namur University): 'Thermally Reversible Adhesion between Metallic and Polymeric Plasma Polymerization and Gas Phase Reactions'

Dong-Hoon Choi (Korea University, Seoul): 'Intrinsic Charge Transport Property in Crystalline Nanostructured Objects Made from Organic Semiconductors'

Stanislav R. Stoyanov, Olga Lyuvimova, Javier R. Cuervo, Sergey Gusarov, Alex E. Kobryn, Nikolai Blinov & Andriy Kovalenko (National Institute for Nanotechnology, Edmonton, Alberta; University of Alberta, Edmonton): 'Multiscale Theoretical Modeling Study of the Effect of Surface Charge and Chemical Modifications on the Dispersion of Cellulose Nanocrystals in Solution'

Jung-Hyun Kim (Yonsei University, Seoul): Highly Conductive Film of Silver Nanowire / PEDOT:PSS Composite with Good Electrical Uniformity'

Qing Wang (Pennsylvania State University, University Park): 'Ferroelectric Polymers and Nanocomposites for Electrical Energy Storage'

Abdullah AISunaidi (King Fahd University of Petroleum and Minerals, Dhahran): 'Morphology and Chain Conformations in Self-assembled Confined Triblock Copolymers'

Lei Jiang (Chinese Academy of Sciences, Beijing): 'Bio-Inspired Smart, Multiscale Interfacial Materials'

Christophe Antoinette, Witold Brostow, Jack Chang, Haley E. Hagg Lobland, Nathalie Hnatchuk, Shannon Shipley & Joshua Wahrmund (University of North Texas, Denton): 'Improvement of Performance of Thermoelectric Devices'

Chin Han Chan, H.W. Kammer, Siti Nor Hafiza Mohd Yusoff, Lar Har Sim & Tan Winie (MARA University of Technology, Shah Alam, Selangor): 'Solubility of Li-salt in Solid Polymer Electrolytes based on Modified Natural Rubber'

Er-Qiang Chen (Beijing University): 'Mesogen-Jacketed Liquid Crystalline Polymer: "Jacketing" Effect and Molecular Shape Persistency'

Ralph P. Cooney & Mark P. Taylor (The University of Auckland): 'Researcher-Industry Multi-Materials Partnerships'

As always in POLYCHAR, the focus was on originality and innovation, not on having a large number of participants. There were 71 oral contributions and 134 posters in two sessions. A special grant from IUPAC allowed the support of students from developing countries from Asia, Africa and South America to be financially supported. As every year, an important objective was to provide a forum for students and young scientists - to give them opportunity to meet with their peers and with well-known scientists and to exchange experiences, make contacts and present their results to the scientific community. Some of the students were speaking publicly for the first time – presenting original work at least not worse than that of established scientists and engineers.

The conference was accompanied with the SWEET 2013 (**S**olar, **W**ind & **E**arth **E**nergy **T**rade Fair), hosted by Gwangju City.

The broad span of contributions to POLYCHAR 21 is probably best represented by the awardees of the Forum and their contributions:

The conference concluded with the **Paul J. Flory Polymer Research Prize** awarded to:

- Betty L. Lopez, University of Antioquia, Medellin, Colombia, for her work on Synthesis and Application of Meso-Nanoscopic Polymer Systems and her merits in fostering Polymer Science in Colombia.



*Jean-Jaques Pireaux, Chair of the Prize Committee (left) and Betty Lopez (right)*

The **International Materials Science Prize** has been awarded at POLYCHAR 21 to:

- Holger Schoenherr, University of Siegen, for his work on Chemistry and Physics of Organic Biointerfaces and for his successful international cooperation.



*Jean-Jacques Pireaux, Chair of the Prize Committee (left) and Holger Schoenherr (right)*

The **Jürgen Springer Prize for a Young Scientist** was awarded to:

- Jelena Ciric (University of Groningen), 'Size-Exclusion Chromatography with Multidetector in Combination with MALDI-TOF MS as a Tool for Unravelling the Mechanism of the Enzymatic Polymerization of Polysaccharides'

The **Bruce Hartman Prize for a Young Scientist** has been awarded to:

- Nicolas Delpouve (University of Rouen), 'Evidence of two Mobile Amorphous Phases in Semicrystalline Polylactide From Calorimetric Investigations'

The **Carl Klason Prize for an Outstanding Student Presentation** has been awarded to the three *ex aequo* winners:

- Mathias Bechert (Friedrich-Alexander University, Erlangen), for the poster: 'Application-Oriented Modeling of Draw Resonance in Polymer Melt Spinning'
- M. Elizabeth Welch (Cornell University, Ithaca, New York), for her oral presentation: 'Characterization of Polymer Brush Membranes'
- Nowsheen Goonoo (University of Mauritius, Réduit), for her oral presentation: 'Novel Poly(ester-ether) Based Materials for Tissue Engineering Applications'

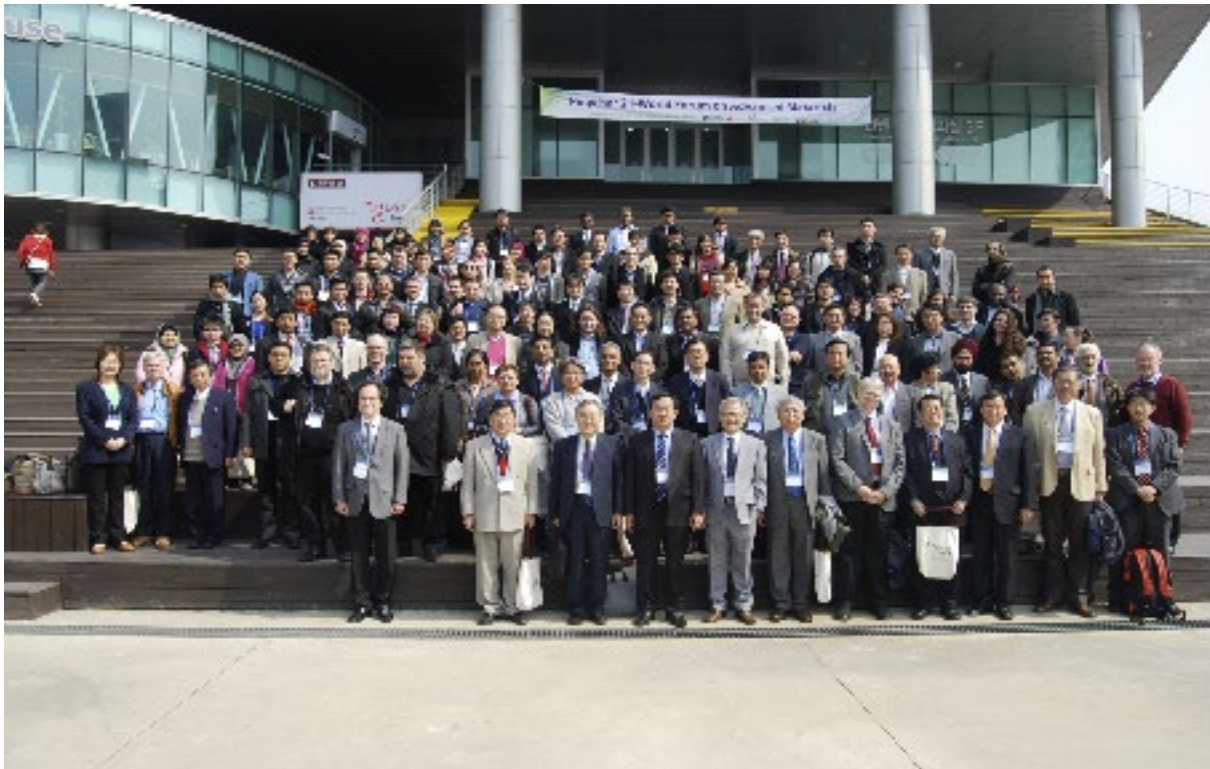
POLYCHAR 21 awarded **three IUPAC Poster Prizes** to the following winners:

- Shuk Ping Wong (University of Hong Kong), 'Direct Visualization of Penetrant Transport Crossing Nanocomposite Film'
- Kwang-Ho Ko (Chosun University, Gwangju), 'Dynamic-Mechanical Properties of Ethylcellulose Containing Various Vegetable Oil-Based Plasticizers'
- Jeremiah Millare (Mapua Institute of Technology, Manila ), 'Chitosan Infused Polycaprolactone Electrospun Membrane: Functional Properties and Sorptive Effects in Cu(II) Wastewater'

Because of the great number of very good student presentations, five **Diplomas of Distinction for a Student Presentation** has been given to:

- Phawittra Sonsilchai (Chulalongkorn University, Bangkok)
- Nordiana Nabilla Ramly (MARA University of Technology, Shah Alam, Selangor)
- Mohd Syafiq Azmi (University of Malaysia, Kuala Lumpur)
- Johannes Krüchel (Friedrich-Alexander University, Erlangen)

Manuscripts of the POLYCHAR 21 contributions will be published after the usual process of peer reviewing. For more information see: [www.polychar21-korea.org](http://www.polychar21-korea.org)



*POLYCHAR 21(almost) all participants*

The participants left Gwangju expressing their appreciation of a very effective conference - with the familiar atmosphere they are used to from the earlier meetings. They were impressed by the kindness and great hospitality of the Korean people wherever they had met them and the prospering Korean culture. Many thanks to Byung-Wook Jo for his leadership in organization of POLYCHAR 21 ! Contributions of Michael Hess who used his experience starting with POLYCHAR 1 to provide guidance to the Korean hosts also deserve to be mentioned.

POLYCHAR 22 will be held at the University of Stellenbosch in South Africa: the Course on Polymer Characterization on April 7, World Forum on Advanced Materials on April 8 - 11. More information from the convener Peter E. Mallon and his colleagues soon.