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REPORT FROM POLYCHAR 22

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POLYCHAR 22 World Forum on Advanced Materials was hosted April 7–11, 2014, by the Department of Chemistry & Polymer Science of the University of Stellenbosch in South Africa. Thus, for the first time in its history our annual Forum took place in Africa. Earlier the conferences took place in Denton, Texas, (1992–2003), Guimaraes, Portugal (2004), Singapore (2005), Nara, Japan (2006), Buzios, Rio de Janeiro, Brazil (2007), Lucknow, India (2008), Rouen, France (2009), Siegen, Germany (2010), Kathmandu, Nepal (2011), Dubrovnik, Croatia (2012) and Gwangju, Republic of Korea (2013).

Our Forum is different from other Materials conferences in several aspects. Young scientists have ‘equal rights’ as established ones, make oral as well as poster presentations, sometimes reporting strikingly new ideas and results. A number of prizes for students and young scientists serve to strengthen this feature. We try to have many countries represented. Overall, we go for maximizing originality, not the number of participants. We do not publish conference proceedings; participants are encouraged to publish their results in worldwide journals.

There were 8 Conference Sessions focused around the following areas:

- Nanomaterials and Smart Materials (15 contributions).
- Physical Morphology (15).
- Biomaterials and Green Materials (11).
- Materials Properties in Relation to Performance (11).
- Property Prediction and Simulations (11).
- Processing, Rheology and Mechanical Properties (11).
- New Developments in Polymer Characterization (7).
- General Materials Science (6).

There have been 87 oral contributions and 51 posters presented. There were 171 delegates from 31 countries and 5 continents. 46 participants were students. Participants from countries other than South Africa came from Australia, Austria, Belgium, Brazil, Canada,

China, Colombia, Croatia, Czech Republic, Egypt, France, Germany, India, Italy, Japan, Korea, Malaysia, Nepal, New Zealand, Nigeria, Poland, Portugal, Republic of Korea, Saudi Arabia, Sweden, Thailand, The Netherlands, Turkey, United Kingdom and USA.

As every year, it is very difficult to select those presentations that can be named in a short report. Here are some to provide a flavor, but read also about the Prizes later on: **Michael Brook** (McMaster University, Hamilton, Ontario), Manipulating polysiloxane surfaces using Nature’s polymers; **Alan Rowan** (Radboud University, Nijmegen), Strain stiffening the key to biomimetic cytoskeletal materials; **Sadhan Jana** (University of Akron, Akron, Ohio), Functional materials design at nanoscale; **Benjamin Hsiao** (Stony Brook University, Stony Brook, New York), High flux nanofibrous membranes for water purification; **Andrew Whittaker** (University of Queensland, St. Lucia, Australia), ¹⁹F Molecular imaging agents responsive to in vivo signals; **Richard Olsson** (Royal Institute of Technology, Stockholm), Making flexible magnetic aerogels for fluidics and tough magnetic nanopapers as speaker devices – cellulose nanofibrils as reactor templates; **Jiasong He** (Chinese Academy of Sciences, Beijing), Supercritical CO₂ pre-conditioning promotes γ -crystal formation in amorphous syndiotactic polystyrene for enhancing mechanical properties; **Frans Maurer** (Lund University), Network formation of graphene oxide as poly(3-hydroxy butyrate) nanocomposites; **Chunye Xu** (University of Science and Technology of China, Hefei), Electroactive polymers and devices; **Rameshwar Adhikari** (Tribhuvan University, Kathmandu), Nanostructured blends of styrenic block copolymer and epoxy resin: Morphology-deformation mechanism correlation; **Jean-Jacques Pireaux** (University of Namur), Polymer in depth chemical and molecular characterization; **Masaru Matsuo** (Dalian University of Technology), Studies on dynamic tensile modulus and structural changes of polymer-conductive filler composites under electric field investigated as low frequency earthquake countermeasures; **Wolf Hiller** (Technical University of Dortmund), Molar masses of

block copolymers determined by SEC and LCC: A LC-NMR study; **Riaan Luyt** (University of the Free State, Qwaqwa Campus, South Africa), Preparation and characterization of polymer nanocomposites with piezoelectric properties; **Herbert Jennissen** (University of Duisburg-Essen), Multimodal hybrid biomaterials: PDLA scaffolds for the binding and release of growth factors in bone tissue; **Ralph Cooney** (University of Auckland), Anti-microbial conducting polymers: Summary & commercialization; **Witold Brostow** (University of North Texas), Simulation of scratching behavior in polymers through molecular dynamics.

The Short Course on Polymer Characterization consisted of 7 lectures and had 43 participants:

- Glass Transition and Disorder in Polymer Materials – How to Characterize What Happens at the Glass Transition: Jean-Marc Saiter, University of Rouen
- Comprehensive Analysis of Macromolecules by Chromatographic Methods: Peter Kilz, PSS Polymer Standards Service, Darmstadt.
- Dynamic-Mechanical and Calorimetric Properties of Polymers: Michael Hess, University of Antioquia, Medellin.
- Electron Microscopy of Polymers: Sven Henning, Fraunhofer Institute for Mechanics of Materials, Halle.
- Characterization of Polymer Structure, Transitions and Reactions by Pressure-Volume-Temperature Measurements: Jürgen Pionteck, Leibnitz Institute for Polymer Research Dresden.
- Advanced Fractionation Techniques for the Analysis of Complex Polyolefines: Harald Pasch, University of Stellenbosch.
- Polymer Tribology: Witold Brostow, University of North Texas, Denton.

The Conference was opened by the welcome address of Prof T.E. Cloete, Vice-Rector, Research and Innovation, University of Stellenbosch; Witold Brostow, University of North Texas, Denton, TX, the President of POLYCHAR; and Michael Hess, the IUPAC Representative, Chosun University, Korea, and University of Antioquia, Medellin, Colombia.

As every year, a number of prizes were awarded by the Prize Committee, currently chaired by Jean-Jacques Pireaux:

The prestigious **Paul J. Flory Research Prize** was given *ex aequo* to **Eric Baer**, Herbert-Henry-Dow Professor of Science and Engineering, Case Western Reserve University, Cleveland, Ohio, for his impressive work on new nanofibers and nanolayered systems produced by solvent-free coextrusion processing; and to **Andrew Whittaker**, Australian Institute for Bioengineering and Nanotechnology, Institute for Advanced Imaging, The University of Queensland, St. Lucia, Queensland, for his impressive work on NMR-based *in vivo* imaging, in particular ¹⁹F- molecular imaging used to track therapeutic particles and cells *in vivo*.

The **International Materials Research Prize** was awarded to **Chunye Xu**, formerly University of Washington, Seattle – now at CAS Key Laboratory of Soft Matter, National Laboratory for Physical Sciences at Microscale, University of Science and Technology of China, Hefei, for her ingenious research in electro-responsive polymers, devices and their application.

One of the prominent goals of POLYCHAR is to support young scientists, *i.e.* graduates not older than 32 years. This is reflected by the **Bruce Hartmann Young Scientist Prize**, awarded *ex aequo* to **Marilia Horn**, Universidade de Sao Paulo, Sao Carlos, for her work on the rheology of chitosan-containing Pequi oil gels; and to **Lola Olantunji**, Polymer & Textile Research Laboratory, Federal Institute of Industrial Research, Lagos, Nigeria, for her presentation about production and mechanical properties of penetration enhancers from natural polymers from fish scales.

The **Jurgen-Springer Young Scientists Prize** went also *ex aequo* to **Rueben Pfuka**, Stellenbosch University, for his presentation on finite nanostructures by controlled hierarchical self-assembly; and also to **Alexandre Dhotel**, Institute des Materiaux de Rouen, University of Rouen, St. Etienne du Rouvray, for his presentation on molecular motions with self-assembled monolayers.

The three **IUPAC Students' poster prizes** went to **Qiong Wu**, Royal Institute of Technology, Stockholm, for her report on a new type of flame retardant foam based on a sustainable biohybrid material of wheat gluten and silica; **Jonas Daenicke**, Institute of Polymer Materials, Friedrich-Alexander-University, Erlangen-Nuremberg, on resilience of silicone breast implants – new insights by mapping the mechanical properties of implant; **Aliza Janse van Rensburg**, Cardiovascular Unit, Chris Barnard Building, Anzio Road, Observatory 7925, Cape Town, for report on Heparin and heparan sulfate hydrogels for cardiovascular tissue regeneration.

After 5 days of concentrated work during the conference with many challenging contributions, discussions and meetings that each year strengthens international contacts and cooperations, the conference ended with a visit to Robben Island with the prisoner's cell of Nelson Mandela, the Table Mountain and a drive down the South Coast to Houtebay. The participants left for their home countries, again with the feeling of having had a pleasant meeting of the POLYCHAR family; there are now already the scientific 'children' and even 'grandchildren' of the early participants from more than 20 years ago coming together.

POLYCHAR 23 is scheduled for May 11–15, 2015 in Lincoln, Nebraska, hosted by Mehrdad Neghaban of the University of Nebraska – Lincoln and his team. Many thanks are due to Peter Mallon and his colleagues at the University of Stellenbosch for an efficiently organized conference and nice impressions the participants have taken away with them.