

Gennady Zaikov and Marina Artsis

FIRST INTERNATIONAL CONFERENCE ON BIODEGRADABLE POLYMERS AND SUSTAINABLE COMPOSITES

*N. M. Emanuel Institute of Biochemical Physics, Russian Academy of Sciences
4, Kosygin str., Moscow 119334, Russia
chembio@sky.chph.ras.ru*

The First International conference on biodegradable polymers and sustainable composites was held at Alicante University (Alicante, Spain) in the period of October 3-5, 2007. The chairperson of the conference was Prof. Alfonso Jimenez from Alicante University (AU). Jose M. Kenny, Terni, Italy, Inaki Mondragon, San Sebastian, Spain, Philippe Dubois, Mons-Hainaut, Belgium, Sigbritt Karisson, Stockholm, Sweden, Luc Averous, Strasbourg, France, David Plackett, Roskilde, Denmark, Carmen Mijangos, Madrid, Spain, Alessandro Gandini, Aveiro, Portugal, Alain Dufresne, Grenoble, France, Ton Peijs, London, UK, Kristina Oksman, Trondheim, Norway, Carlos Pascoal Neto, Aveiro, Portugal, Andrea Pipino, Amaro, Italy, Sabu Thomas, Calcutta, India, Analia Vazquez, Mar del Plata, Argentina, G. E. Zaikov, Moscow, Russia have been members of Scientific Committee.

The conference has been aimed at providing a forum for researchers and engineers from all over the world to exchange up-to-date ideas and opinions on current research and new applications of biodegradable polymers and biocomposites. The meeting has addressed mainly new developments in packaging, agriculture, and automotive applications.

The conference programme has included review lectures delivered by expert speakers from throughout the world. An industrial exhibition has encouraged an open discussion between developers, manufactures, and users of biodegradable polymers and biocomposites. Current research work in the field has been presented in the format of short oral communications and posters within the programme of the conference.

The programme has included the following topics:

- Biodegradable polymers and blends.
- Biobased composites and nanocomposites.
- Characterization and properties.
- Vegetable oil. Polymer and composites.
- Biodegradation and environmental fate.
- New and emerging markets and applications.
- Regulatory and ecological issues.

The conference has been sponsored by Alicante University along with 10 companies.

Scientific programme consisted of 40 invited lectures and oral presentations and 100 posters. About 150

scientists from 45 research centers representing 17 countries (Spain, Portugal, France, Italy, Argentina, Russia, Germany, Sweden, USA, Australia, Hungary, Romania, China, Danmark, Austria, Chile, Peru) have taken part in the conference.

The scientific programme has been divided to 8 sessions for invited lectures and oral presentations. Posters have been presented in two other sessions.

Prof. Alfonso Jimenes (the chairman of the conference) has taken part in the opening ceremony.

The first session has included two invited lectures (IL) and two oral communications (OC). Prof. Luc Averous Laboratoire d'ingenieria des Polymers pour les Hantes Technologies, Strasbourg, France) has chaired this session.

Alessandro Gandini (University of Aveiro, Aveiro, Portugal) has delivered IL-1 about partial or total oxypropylation as a means to prepare novel composites and macromonomers from renewable resources. In IL-2 Jose Maria Kenny (University of Perugia, Terni, Italy) has shared information about biodegradable matrix nanocomposites for biomedical applications.

Nanocomposites based on renewable materials has been the subject of OC1 lecture by Kristina Oksman (University of Lund, Lund, Sweden); OC2 lecture has been devoted to polymer nanocomposites reinforced with polysaccharide nanocrystals (Alain Dufresne, University of Grenoble, France).

J. M. Kenny and Alfonso Maffezzoli (University of Lecce, Lecce, Italy) have chaired the second session.

There have been five OC lectures in the programme of this session. An information about preparation and characterization of biodegradable plasticized starch-g-poly(butylene adipate-co-terephthalate)-based nanocomposites in film applications has been presented by J. M. Raquez (University of Mons-Hainaut, Mons, France) while Celine Chaleat (University of Queensland, Brisbane, Australia) has spoken about fracture toughness in plasticized starch/poly(vinyl alcohol) blends. Nanostructured composites based on cellulose, effects of structure on mechanical properties have been discussed in a lecture of Marielle Henriksson (Royal Institute of Technology, Stockholm, Sweden). Data about environmentally advantageous mild oxidative transformation of poly(vinyl-chloride) for

sustainable composites has been presented in a speech of Bela Ivan (Institute of Chemistry, Hungarian Academy of Sciences, Budapest, Hungary). The last lecture of this session about PVC plasticizers from renewable resources has been presented by Alfonso Maffezzoli.

Alain Dufresne has been a chairman of the third session. One IL lecture and three OC reports have been included in this session. Luc Averous has spoken about the improvement of green plastics: nano- and microbiocomposites from renewable resources. Three OC reports have been devoted to sustainable packaging from starch (Kishan C. Khemani, Plastic Technology Ltd., Altona, Victoria, Australia) and poly (*p*-dioxanone)/clays nanocomposites prepared by *in-situ* polymerization of *p*-dioxanone initiated by lanthanum isopropoxide (Ke-Ke Yang, Department of Materials, Sichuan University, Chengdu, China). Xiu-Li Wang (from the same university) has spoken about properties of poly (*p*-dioxanone) based blends.

Alessandro Gandini has been a chairman of the fourth session. There have been 2 IL lectures and three OC reports in this session.

G. E. Zaikov (Institute of Biochemical Physics, Moscow, Russia) in IL 4 has spoken about bio-damages of materials (adhesion of microorganisms on materials surface). Environmental degradation of biodegradable polymers and biobased composites have been discussed in IL5 by Sigbritt Karlsson (KTH Chemical Science and Engineering, Dept. of Fibre and Polymer Technology, Stockholm, Sweden).

Information about assessing the biodegradability and the mechanical performance of a biocomposite based on thermoplastic starch reinforced with cotton fibre has been presented in the OC by Rosana Moriana (Valencia University of Technology, Spain). Two last OC reports of this session have been devoted to degradation in soil study of stereocopolymers of poly (lactic acid) by thermal analysis (L. J. Santonja Blasco, Polytechnic University of Valencia, Spain) and system of biodegradability evaluation on leather used in the footwear industry (M. A. De la Casa, The Technological Institute, Elche, Spain).

The fifth session has been chaired by David Plackett (Polymer Department, Technical University of Denmark). Six OC reports have been included in this session.

In the first OC M. J. A. van den Oever (Wageningen UR Biobased Products, Wageningen, The Netherlands) has reported about natural fibre-PLA composites (processing and mechanical properties). In the second OC R. Forstner (Transfercenter for Polymer Technology, Upper Austrian Research GmbH, Wels, Austria) has given information about the influence of natural rubber content processing parameters on degradable PLA composites with high impact strength. The next four OC reports have covered the following topics: copolymers from lactic acid, ε-caprolactone, poly(ethylene oxide) and toluene diisocyanate (Novel biodegradable thermoplastics) (Sandor Keki,

University of Debrecen, Debrecen, Hungary), new multistar sensor-DSC goes submicrowatts (Francesc Catala, Mettler Toledo Co., Spain), correlation between poly(vinyl alcohol) cryogel swelling capacity and synthesis parameters (Silvia F. C. Patachia, "Transilvania" University of Brasov, Department of Chemistry, Romania), and Biodegradable composite films for food packaging (I. M. Coelho, University of Lisbon, Portugal).

Gennady E. Zaikov has been a chairman of the sixth session. Five OC reports have been presented in this session.

In the first OC Jonas Enebro (Fire and Polymer Technology, School of Chemical Science and Engineering, Royal Institute of Technology, Stockholm, Sweden) has spoken about investigation of endoglucanase selectivity towards carboxymethyl cellulose. Effects of a maleated polypropylene coupling agent onto the rheological properties of cellulose-reinforced polypropylene composites have been discussed in a presentation by Carlos Gonzalez Sanchez (University of Oviedo, Oviedo, Spain). The third OC has been delivered by Zoubida Pilato (University of Le Mone, France) and had title "Chemical characterization of by-products degradation of polymers by fungal action". Analia Vazquez (Institute of Material Science and Technology, University of Mar del Plata, Argentina) in the fourth OC has spoken about recent results in biodegradable composites based on natural fibres. The last OC has been on biodegradable films from a galactose-rich polysaccharide produced by a pseudomonas strain from glycerol (V. D. Alvez, University of Lisbon, Portugal).

Session seven has been chaired by J. M. Kenny. The session has included 1 IL and 4 OC presentations. In his IL David Plackett has spoken about developments in biopolymer nanocomposites for food packaging applications. Inaki Mondragon (Polytechnical School, Bielao, Spain) in the first OC of this session has presented data about lignins and tannins as substitutes for phenol in novolac resins. Autohydrolysis of lignocellulosic substrates as a strategy for producing green composites has been discussed in OC of Juan Carlos Parajo (University of Vigo, Vigo, Spain). Data about biodegradable and biomass based plastics as the plastics of Europe perspective has been presented in the OC of Juan Ruiz (Plastics Europe Perspective Association, Madrid, Spain), and the last OC of this session has been on laccase mediated lignin degradation in the bleaching of Eucalyptus Globulus kraft pulp (J. C. Villar, Center of Investigation of Biogas, Sant Yago, Chile).

Sigbritt Karlsson has been the chairperson of the last 8th oral session. There have been six OC reports in this session.

Andreia F. de Sousa (The Chemical Faculty, University of Aveiro, Portugal) has shared information about novel biopolyesters from suberin monomers. Development and characterization of novel nanobiocomposites of

thermoplastic biopolymers and layered silicates have been discussed in the OC of M.D. Sanchez-Garcia (Institute of Agrochemistry and Food Industry, Valencia, Spain). Cristian J. Grande (Catholic University in Peru, Lima, Peru) has spoken about characterization of the collagenhydroxyapatite nanocomposite laminate structure of fish scales from *arapaima gigas*. The last three OC reports have covered benefits of MDSC technique on biopolymers: reversing and non reversing signals (C. A. Gracia-Fernandez, Analysis Thermico Reologia Instruments Co., Madrid, Spain), biodegradable adhesives (M. J. Escoto, Institute of Technology, Alicante, Spain), and synthesis, characterization, and degradation of cyanoacrylate based medical adhesive specially formulated for strabismus surgery (University of Alicante, Alicante, Spain).

Poster sessions 1 and 2 have featured most interesting and important topics.

Poster session 1: a comparison of thermal stability, mechanical properties and structure of nanofibres based on cellulose and collagen; preparation and characterization of films of cellulose whiskers crosslinked with a poly(methyl vinyl ether-co-maleic acid)-poly(ethylene glycol)matrix; nanocomposite materials containing cellulose whiskers extracted from palm tree; synthesis by co-grinding of composites reinforced by cellulose; acylated cellulose fibres as reinforcing elements in composites with thermoplastic matrices; bionanocomposites from polycaprolactone reinforced with cellulose or starch nanocrystals; fabrication and characterization of biodegradable plastic based on tapioca starch;

characterization of polypropylene with cassava starch compounds; renewable materials based on starch, clays and fine birch pulp fibres; biodegradable composites based on starch foam and natural fibers; formulation and characterization of chitosan/whey protein films; new investigations on the mechanism of thermal polymerization of vegetable oils and thermomechanical behaviour of biodegradable plasticizer.

Poster session 2. Physical blends of different biodegradable aliphatic polyesters to broaden their area of application; amino acid modified montmorillonite as reinforcement in polyhydroxybutyrate matrices; Biodegradable poly(vinyl alcohol)hydrogel membranes containing nutraceuticals (controlled-release case study); degradation of polymer and fungal action; modeling degradation of polymers, biobased composites and nanocomposites; the research of the biochemical decomposition of hydrocarbons and polymers using enzymes to product functional compositions; transport of water as structurally sensitive process characterizing morphology of biodegradable polymer system; behaviour of polymer composites materials under soil microorganisms; synthesis and properties of biodegradable hybrid polymer based on peptides and synthetic substances; etc.

The conference has shown that the problems of biodegradable polymers and sustainable composites are quite topical and of great importance for pure and applied chemistry (Research and Development and Production). The next (second) conference will be held in 2009 in Italy.