



PPS Newsletter

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May 2011

Information to Polymer Processing Society Members

PPS-27 in Marrakech, Morocco, More than a Success Story!

The PPS-27 annual meeting of the Polymer Processing Society (<http://www.pps-27.com>) took place in Marrakech, Morocco, in May 9-13, 2011. Despite the terrible event which happened in the heart of Marrakech on April 28, 2011, PPS members showed an overwhelming support for the meeting, while the Organizer, Prof. Bousmina, and his superb team made sure that the Meeting was a huge success, both scientifically and culturally. Around 450 registered participants from 50 countries made this meeting another solid success for the Society. More people came from Brazil (75) followed by France (67), Morocco (55), Germany (45), Japan (33). The venue was the fabulous Palais des Congrès, a world-class congress facility. The meeting featured a special symposium to honor Prof. Pierre Carreau (Ecole Polytechnique, Montreal, Canada). There were about 650 presentations, with plenary (8), keynote (80), and oral (325) lectures from leading scientists and engineers, while 245 of these presentations were posters. The terrific site of the city of Marrakech, with a 1000-year history, its picturesque Casbah and Medina within the city walls, and the snow-covered Atlas Mountains in the background, made this an amazing trip for the PPS participants. The banquet featured superb entertainment, a tough act to follow. PPS-27 showed that our society is really unique in its dynamism and internationality, and this bodes well for its future.



Prof. Bousmina, PPS-27 Organizer, opens the Conference at the Palais des Congrès. The Conference was under the high patronage of His Majesty, King Mohammed VI of Morocco (background picture).



The Lambla Award winner Prof. João Maia is given his award by the new PPS President Prof. Ica Manas-Zloczower during the banquet.



Prof. Carreau was honored for his many achievements in Rheology and Polymer Processing. Here he delivers his Plenary Lecture.



Another type of plenary lecture :) during PPS-27, at the banquet in Marrakech, Morocco.



Part of the banquet celebrations featured exotic dances highlighting the rich cultural heritage of Morocco.



Prof. Mosto Bousmina (left) and PPS former President Han Meijer relaxing after the Meeting.

PPS prepares for its Regional Meeting, PPS-2011, in November in Kish Island, Iran

The PPS-2011 Asia/Australasia Regional Meeting will take place in Kish Island, Iran, in November 15-17, 2011. This is the first time a PPS meeting is held in Iran. The venue of the meeting will be the superb Kish International Convention Center. The meeting is organized by the Department of Polymer Engineering, Amirkabir University of Technology, Tehran, Iran, under the able direction of Prof. Hossein Nazockdast. More information can be found at <http://www.pps2011.com>. Prof. Nazockdast and his team are working hard in putting together an excellent and stimulating scientific program. All important sessions on polymer processing will be covered in the meeting, while several giant petrochemical and plastics Iranian companies will be represented for fruitful collaboration with the Conference attendees.

Kish Island has an important history owing to its location near the strategic Strait of Hormuz in the Persian Gulf. It is designated as a Free Zone area, where no visas are required by traveling foreigners. Access to Kish Island airport is through any of the Gulf's major airports (Dubai, Abu Dhabi, Doha, Kuwait, etc.). Check Kish Island Airport for air connections.



Kish Island, Iran, is the site of PPS-2011. The island is situated off the Iran mainland near the Strait of Hormuz in the Persian Gulf.



The Dariush Grand Hotel, near the Kish International Convention Center, venue of the PPS-2011 Regional Meeting in Kish Island, Iran.



Kish Island offers many attractions, such as the Flower East Hotel and Beach, pictured above.

Future Meetings

In its continuing effort to be a truly international society, PPS strives to have meetings every year in different parts of the world. The following list of upcoming meetings is a good indication of these efforts.

2012 Meetings

Annual meeting (PPS-28), Pattaya, Thailand, December 11-15

Conference Chair: Prof. Suchiva

Americas Regional Meeting PPS-2012, Niagara Falls, Canada, May 21-24

Conference Chair: Prof. Park

2013 Meetings

Annual meeting (PPS-29), Nuremberg, Germany, July 15-19

Conference Chair: Prof. Altstaedt

Asia/Australasia Regional Meeting PPS-2013, Bangalore/Kerala, India, December

Conference Chairs: Profs. Ghosh, Misra

2014 Meetings

Annual meeting (PPS-30), Cleveland/Akron, OH, USA, June

Conference Chairs: Profs. Jana, Maia

Europe/Africa Regional Meeting PPS-2014, Tel Aviv, Israel, mid-October

Conference Chair: Prof. Kenig

Morand Lambla Award Winner for 2011 is Prof. João Maia

The 2011 MORAND LAMBLA award of the PPS was bestowed on Prof. *João MAIA* of Case Western Reserve University in Cleveland, Ohio, USA. The Morand Lambla Award is awarded to Prof. Maia in recognition for his achievements and creativity among young researchers in the polymer science and technology field, especially in elongational rheology of polymer melts. The award was officially presented during the PPS-27 Annual Meeting in Marrakech, Morocco.



João MAIA is Associate Professor of Macromolecular Science and Engineering at Case Western Reserve University in Cleveland, Ohio, USA. He completed his undergraduate studies in Physics Engineering at the Technical University of Lisbon in Portugal in 1992 and in 1996 he completed his Ph.D. degree at the Department of Applied Mathematics at the University of Wales in Aberystwyth, in the United Kingdom, with Prof. Ken Walters. His PhD work was on the experimental and theoretical study of rheology of polymer solutions and melts. Upon graduating he joined the faculty at the University of Minho, Portugal, where he became an Associate Professor in 2005. Since 2009 he is with Case Western in the States. His current research interests include Extensional Rheology and Rheometry, Viscoelasticity of complex multiphase systems, including polymer blends and composites and micro- and nano-layered polymer films, On- and in-line sensing for materials processing, and Computational Rheology and Processing.

His work has produced over 260 scientific publications, including 75 scientific papers in international refereed journals, 7 scientific book chapters, 8 patents and 175 communications to conferences of which 18 were Plenary or Invited. He is or has been the Principal Investigator (PI) or co-PI of 25 scientific, technological and curricular projects with a total external funding of more than \$14,000,000.

He is the Organizer and Co-Chairman of the XVIth International Congress on Rheology, to be held in Lisbon, Portugal, in August 2012 (the ICR Congresses are the most important Rheology meetings in the world and only take place once every four years). He was the Coordinator of the EURHEO – European Masters in Engineering Rheology, one of only 103 Erasmus Mundus Masters in all areas of knowledge (and the only one in Rheology), involving 6 Universities from 5 different countries, destined to promote the European Union as a centre of excellence in learning around the world, until 09/2009. He was also the Co-Chairman of AERC 2003 – First Annual European Rheology Conference.

He is the recipient of the 2010 Annual Award of the British Society of Rheology, one of the oldest and more prestigious awards in the area of Rheology. He was a Fulbright Fellow in 2007. He also had the position of Invited Professor at both the University of Yamagata, Japan, in 2004, and University of Calabria, Italy, in 2005 and 2009. He is Vice-President of the Portuguese Society of Rheology (SPR) and a member of the Polymer Processing Society (PPS), European Society of Rheology (ESR), Society of Rheology (SoR), Society of Plastics Engineers (SPE), American Chemical Society (ACS) and American Physics Society (APS).

1st J.L. White Innovation Award Goes to Idemitsu Group, Japan



The 1st JAMES L. WHITE Innovation Award of PPS was bestowed on four engineers working for the Idemitsu Group of Companies in Japan. The awardees are: Prof. Toshitaka Kanai, Dr. Akira Funaki, Mr. Hiroshi Odaka and Mr. Kaname Kondo. The award is given for an innovative development in the field of polymer processing technologies with recent commercial impact, namely the development of highly transparent polypropylene (PP) film (see longer write-up below). Thanks to this research, high volumes of PP sheets with unprecedented transparency are produced at the rate of 6500 tons/year. The first award was presented at the PPS-27 Annual Meeting, in Marrakech, Morocco, in May 2011. Prof. Kanai gave the JLW Innovation Award Plenary Lecture to the participants of PPS-27 on May 13, 2011.

The awardees of the JLW Innovation Award:

1st row (seated): Prof. Kanai (left) and Dr. Funaki.

2nd row: Odaka (left) and Kondo.

Other Meetings of Interest to PPS Members

2011

EUROTEC 2011, Society of Plastics Engineers

November 14-15, 2011, Barcelona, SPAIN

For information visit: <http://www.4spe.org/spe-eurotec-conference>

2012

PLASTINDIA 2012

Feb. 2012 | Delhi, INDIA

For information visit: <http://www.plastindia.org>

NPE 2012

01 - 05 Apr 2012 | Orlando, FL, USA

For information visit: <http://www.npe.org>

ANTEC 2012, Society of Plastics Engineers

April 2-4, 2012, Orlando, FL, USA

For information visit: <http://www.4spe.org/conferences-and-events>

PLAST 2012

08 - 12 May 2012 | Milan

For information visit: <http://www.plast12.org>

**The XVIth International Congress on Rheology
August 5-10, 2012, Lisbon, PORTUGAL**

For information visit: <http://www.rheology-esr.org/ICR2012>

PPS Membership Website

A complete list of all PPS members, their addresses, phone numbers and e-mails, is available at the PPS membership website: <http://pps.mcmaster.ca>.

The user ID is "ppsmember" and the password "ppsmember".

Next Newsletter – November 2011

If you have comments on how to improve this newsletter or want to share some information in the next one, please contact the Newsletter Editor Prof. Evan Mitsoulis at mitsouli@metal.ntua.gr. The next issue of the Newsletter is due in November 2011.

2011 James L. White Innovation Award

Development of Highly Transparent Polypropylene Sheets

Dr. Akira Funaki ^a, Prof. Toshitaka Kanai ^{a,c}, Kaname Kondo ^b, Hiroshi Odaka ^b

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Accomplishments

In order to obtain highly transparent isotactic polypropylene (PP) sheets using an industrial process, various factors contributing to transparency were analyzed.

At first, the observation was experimentally conducted by using a lot of different screws with various geometries. The transparency of the melted web was obtained through screw geometry so that the specific energy consumption was small.

Then the higher order structure of the higher tacticity PP sheets was investigated. After the heat treatment of quick quenched sheets, the matrix was transformed from a smectic structure to an α -monoclinic crystal phase. The density and refractive index differences between spherulite and matrix were decreased, and the transparency was drastically improved.

Additionally, the influence of the isotacticity, molecular weight distribution, crystallization control material and the multilayer extrusion process were analyzed. The lower tacticity PP generated fewer and smaller spherulites and showed improved behavior in regards to transparency by heat treatment. In the case of the addition of LLDPE with a specific density to PP, the transparency was markedly improved by heat treatment. This phenomenon could be explained by the refractive index difference of the PP matrix and the fine distribution particles of LLDPE.

The shear stress was reduced by laminating resin with low melt viscosity on both surfaces, and therefore it can be surmised that the stress induced crystallization was restrained.

Applications

Thanks to this research, the highly transparent sheets which have a haze value of 2% are being produced at a rate of 6,500 ton/year. The sheets are known as Super Purelay® and Purethermo®.

Super Purelay® is a clear PP sheet having unprecedented transparency, a brilliant surface and high stiffness and Purethermo® is a highly transparent PP sheet for thermoforming clear food containers.

Technological Accomplishments

Polypropylene is an excellent resin from the view point of it having a reasonable price, good physical properties and good recycling features etc. However, because it is a crystalline resin, it is rather difficult to obtain a highly transparent sheet, and there had been limited development with regards to usage in which a high transparency is required. The primary factors to obtain a highly transparent polypropylene sheet are how to reduce internal haze and external haze, and also how to make an excellent gloss surface.

In order to obtain highly transparent isotactic PP sheets using an industrial extrusion process under the influence of stress rather than the ideal cooling conditions, various factors contributing to transparency were analyzed. At first, the observation was experimentally conducted by using a lot of different screws with various geometries. The transparency of the melted web was obtained through the screw geometry so that the specific energy consumption was small. Then the higher order structure of the higher tacticity PP sheets was investigated. After the heat treatment of quick quenched sheets, the matrix was transformed from a smectic structure to an α -monoclinic crystal phase. The density and refractive index differences between spherulite and matrix were decreased, and the transparency was drastically improved.

Additionally, the influence of the isotacticity, molecular weight distribution, crystallization control material and the multilayer extrusion process were analyzed. The lower tacticity PP generated fewer and smaller spherulites and showed improved behavior in regards to transparency by heat treatment. In the case of the addition of LLDPE with a specific density to PP, the transparency was markedly improved by the heat treatment. This phenomenon could be explained by the refractive index difference of the PP matrix and the fine distribution particles of LLDPE. A multilayer extrusion was conducted using a resin with lower melt viscosity for the surface layers than the one for the core layer. By using multilayer extrusion, the number of spherulites near the surface decreased dramatically and the internal haze of the sheet was improved. The distribution of the flow velocity, shear rate and shear stress in the die lip section was calculated using a finite element method. The shear stress in the sheet thickness direction was reduced when the resin with a lower melt viscosity was laminated on both sides, and so it was surmised that the stress induced crystallization was considerably restrained in these layers. From this research, highly transparent polypropylene sheet, which was controlled by the higher order structure especially the spherulites number and size, was produced commercially. It had a very low haze value of 2%, compared with ordinary PP sheet which has a value of over 30% for 300 μm thickness.

Commercialization

Thanks to the above mentioned research, we developed the following products without nucleators:

(1) Super Purelay® is a clear PP sheet having unprecedented transparency, a brilliant surface and extremely high stiffness by utilizing crystallinity control technology and the glazing process. The main applications are for clear boxes and clear packaging for non-food products (cosmetic and toiletry, stationary, gift, toy, cigarettes, etc.). Production rate: 3500 ton/year.

(2) Purethermo® is a highly transparent PP sheet for thermoforming clear food containers (blister packaging, lids for containers, portion packs, containers for desserts, food & daily products). Compared with conventional PP sheets with nucleators, it has wide a process window for the thermoforming process, good thermoformability and much clearer sheets can be produced. Production rate: 3000 ton/year.



Highly transparent polypropylene film