INSPIRING PLASTICS PROFESSIONALS

THERMOPLASTIC ELASTOMERS

Special Interest Group

August 2020

LETTER FROM THE CHAIR — BRAD GUILANI

Dear Fellow Members of the TPE Industry,

What a year it has been! I am sure everyone has their favorite expression to describe 2020 such as "challenging times," "unprecedented times," "uncertain times," etc. We are in the midst of a global pandemic and I hope everyone who reads this newsletter is healthy and staying well. We were looking forward to our TPE technical session of ANTEC 2020 in San Antonio before the decision was made to host the first ever virtual ANTEC. I give special thanks to our TPC chair Zehra Sevinc for her hard work in coordinating the virtual technical session. Our TPE papers were spread across multiple sessions and received positive remarks from attendees including SPE President Brian Landes. As a reminder, you will have access to the recordings of most technical papers if you attended the virtual ANTEC.

Our focus now is on TOPCON 2020 which is the single most comprehensive technical conference on TPE's. Our virtual TOPCON will be held on September 15-16 and we hope that all of our readers and SIG members will attend. Details about the registration and technical program can be found on the SPE website and in this newsletter for your convenience. I give special thanks to our board members Bill Blasius and Homaira Naseem as well as the Akron SPE section for coordinating and finalizing the technical program. This will be our first virtual TOPCON, and similar to ANTEC, will feature access to recorded technical papers for registered attendees.

Our SIG remarkably has over 2,500 members residing in 63 countries around the world. You will be excited to read details about our SIG membership in this newsletter. We continue to be a non-profit organization committed to promoting the knowledge and sharing of technical information about TPE's within our SIG and greater technical community, especially among students and young engineers. Our Scholarship Committee chaired by Ed Tam has been reviewing applications and will be rewarding three scholarships that will be announced in our next newsletter.

As we continue to remain vigilant in protecting ourselves and our loved ones during this pandemic, I am reminded about the vital use of TPE's in the manufacture of personal protective equipment as well as life-saving medical equipment. I applaud the efforts of scientists and engineers who continue to develop and explore new applications for these unique materials.

I welcome your comments and hope to see or hear you at an upcoming technical conference.

Warmest regards,

Brad Guilani
Technical Fellow, Otis Elevator Company

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CORNER OF THE NEWSLETTER EDITOR

Greetings and welcome to the August edition of the Thermoplastic Elastomer Specialty Interest Group (TPE SIG). I would like to start congratulating all who kept up well with ever evolving new normal amid pandemic. We are in an unprecedented era that changed our farewell messages to 'Stay Safe' from 'Have a Nice Day'. The good news is that we all survived the last school year without losing our mind while managing the kids' new learning styles, babysitting, keeping track of multiple Zoom invites or alike for kids and above, working from home, or managed staying home most the time as part of containment efforts. Not surprisingly, Industry is also adopting to the changes within this timeframe where earnings forecasts cannot be declared by many due to high level of uncertainty. Regardless, information sharing continued within plastics industry among peers and academia by agile adaptation of virtual technologies. In August edition, we would like to bring joy by sharing the exciting news of the TPE Specialty Interest Group.

August edition will bring you news about the past ANTEC 2020, upcoming TPE TOPCON 2020, updates from our board on areas of membership and scholarship. We continue to seek support from our readers, industrial partners, academia and companies who wish to contribute or sponsor events. We welcome the advertisement requests or one-pagers for your business in our newsletter. Taking proactive role in the upcoming TPE TOPCON 2020 by sponsoring events is much more meaningful amid uncertainties. Please contact Robert Wegelin for sponsorship or advertisement requests.

I would like to provide my special thanks to Brad Guilani for his inspiring leadership of the board, Tom Bell for the analysis of membership demographics, Bill Blasius and Homaira Naseem for their incredible efforts in preparing TPE TOPCON, Edwin Tam and scholarship committee for their continuous passion to support students in the plastics field.

Finally, I would like to provide my farewell as I transition our Newsletter to Santosh Bawiskar. I would like to thank him for his efforts putting this edition together. I would like to thank our board members as each one of them provided their support and cherished each edition of the newsletter with full of excitement. In an era communication is the upmost important, I was proud to take on this role and grateful for the wonderful opportunity. I will miss you all.

Should you have any comments and questions, please e-mail me or Santosh Bawiskar.

As always honored to work with you,

Zehra Sevinc, PhD, CM, CSSGB
TPE SIG Newsletter Editor

SUGGESTIONS FOR THE NEWSLETTER?

Would you like to submit an article for the next newsletter?

Please contact:
Zehra.sevinc@bd.com or sbawiskar@dow.com

ANTEC® 2020: THE VIRTUAL EDITION

SPE demonstrated great agility this year adopting quickly to ever changing news about health guidance and procedures from authorities. Adaptation to the new way generated ANTEC® 2020: The Virtual Edition. Our members were flexible to accept the changes that resulted in attendance over 300 for some of the ANTEC sessions!

The Thermoplastic Elastomers and Foams technical sessions were conducted on the morning of April 28th. Zehra Sevinc moderated the joint Thermoplastic Elastomers and Foams session. Our speakers were Li-Yang Chang, Anna-Maria Persson, Christoph Zimmermann, Robert Breuer, Ernest Kumesh and Jin Jiang. Christopher Lewis presented in the afternoon of April 8th session as part of Bioplastics and Renewable Technologies. Below summarize the Abstracts of TPE topics as well as the biographies of presenters. The recorded sessions can be viewed at the SPE's website where permissions from authors were presented.

Paper Title

AGEING EFFECTS ON TWO-COMPONENT INJECTION MOLDED THERMOPLASTIC ELASTOMERS ON POLYAMIDE-12

Name:

Anna-Maria Persson

Abstract

The effect of ageing on the adhesion between thermoplastic elastomer materials and glass fiber reinforced polyamide-12 materials was evaluated. Test specimens were made by two-component injection molding, and the melt temperatures and the glass fiber fraction were varied. Adhesion before and after ageing was assessed via peel tests. Ageing (11 weeks at 70 °C with 62% relative humidity) severely reduced the adhesion strength. This could be explained by broken covalent bonds and/or disentanglement in the interphase. The individual materials were not severely affected by the ageing.

Biography

Anna-Maria Persson has a M.Sc. in Materials Engineering from both Luleå University of Technology, Sweden and from National Polytechnic Institute of Lorraine (2005). She has worked and lived 15 years in Norway. At the very beginning, as a CAE crash and safety R&D engineer for a supplier of injection molded automotive parts (2006-2009) and then as a project engineer and then a researcher in applied reasearch and innovation for SINTEF Manufacturing (2009-2018). Since 2018 she has been working on her PhD wich covers aspects of two component injection molding and it is planned to be defended early 2021. Her main expertice is applied polymer science and finite element modeling.

Paper Title

THERMOPLASTIC ELASTOMER BLEND EXHIBITING COMBINED SHAPE MEMORY AND SELF-HEALING FUNCTIONALITY

Name:
Dr. Christopher Lewis

Abstract

Here we report on a polymer blend consisting of a soft-thermoplastic polyurethane (TPU) elastomer and a low melting temperature thermoplastic healing agent (Polycaprolactone, PCL) capable of repairing highly deformed cracks without the need for an external load. In this study, a blend containing 30wt% PCL (30PCL) was shown to exhibit two well-separated melting transitions thus enabling shape memory behavior. Moreover, upon heating to above PCL's melting temperature the flow of PCL into an undeformed crack was shown to fill the crack void thus promoting self-repair. A combined healing mechanism relying on both shape memory and self-healing action was demonstrated. Through the simple action of mild heating (90C/30 minutes), fracture surfaces are brought into intimate contact through the action of shape memory recovery and subsequently healed. Healing efficiency was evaluated by comparing the tensile force restoration after healing of a highly deformed, notched sample to its behavior prior to notching. Here it was shown that the polymer blend exhibited full restoration of its originally mechanical integrity whereas the mechanical performance of pure TPU was only minimally restored (about 5%). This blend is based on thermoplastic ingredients and thus able to be converted using conventional melt processing. Applications of such blends can be extended to products prone to damage such as liner materials, protective coatings, sporting goods and shoe soles.

Biography

Christopher Lewis is an Assistant Professor at the Rochester Institute of Technology in the Manufacturing and Mechanical Engineering Technology Department. He holds a B.S. in Plastics Engineering Technology (Pennsylvania College of Technology), an M.S. in Polymer Engineering (University of Tennessee-Knoxville) and a PhD in Chemical Engineering (University of Rochester). Prior to joining RIT Chris worked for 10 years in the plastics industry where he was engaged in manufacturing, materials and product research and development activities for companies such as Delphi Corporation, General Motors and TE Connectivity. His current research interests include biodegradable plastics, shape memory and self-healing polymers and additive manufacturing.

Paper Title

OVERMOLDING OF THERMOPLASTIC ELASTOMERS ONTO HARD SUBSTRATE MATERIALS

Name:

Mr. Ernest Kumeh

Abstract

Historically, soft thermoplastic elastomer (TPE) materials have been applied onto the hard substrate materials via an overmolding process in order to enhance the performance of the molded articles. In this process, it is important that the soft TPE adheres well enough to the substrate materials to maintain the desired performance. Depending on the characteristics of the substrate material, a TPE must be formulated to facilitate the adhesion of a TPE onto the substrate during an overmolding process. KRAIBURG TPE has engineered and marketed TPEs that can bond to a variety of hard substrates including metals. The adhesion characteristics of these TPEs are presented in this paper.

Biography

Ernest Kumeh, has worked in the Thermoplastic Manufacturing Industry for the past 15 year in various capacities: Testing, Production, Technical Services, and Product Development. He is married and has two children. He currently lives and works near Atlanta, Georgia.

Paper Title

EXTENSION OF THE RIVLIN POLYNOMINAL FOR THE SIMULATION OF THE NON-LINEAR MATERIAL BEHAVIOUR OF TPE

Name:

Christoph Zimmermann

Abstract

The non-linear material behavior of thermoplastic elastomers (TPE) show a considerably higher stiffness compared to pure elastomers due to the presence of the thermoplastic phase. The approximation of non-linear material behavior via generally known hyperelastic material models illustrate some deficits regarding the initial stiffness and the course at higher deformation. In order to ensure a precise dimensioning of TPE parts via the finite element analysis (FEA), current hyperelastic material models have to be extended by user-defined formulations. For this purpose, the existing Rivlin polynomial is extended by an additional material parameter as exponent. This extension leads to a more accurate prediction of the non-linear material behavior. Even the simple extended Neo-Hooke material model shows a good accuracy regarding the determined material behavior and the initial stiffness of the used practical part.

Biography

Education/Study (2010 to 2016): Christoph Zimmermann studied mechanical engineering at the RWTH Aachen University with focus on plastics technology (Bachelor and Master). He wrote his master thesis at the IKV in the field of elastomer design. Career (2016 until now): Since August 2016, he has been working as a research assistant at the Institute of Plastics Processing at the RWTH Aachen University. He is employed in the department of part design and material technology, where he is involved in the modelling and design of elastomers as well as thermoplastic elastomers Current research focus: Modellin of the mechanical material behaviour of thermoplastic elastomers under complex stress conditions.

TPE TOPCON 2020

Our mission for TPE TOPCON has always been to offer the best opportunity for the interchange of thermoplastic elastomer knowledge. This year, we were challenged with finding a way to do that safely in the middle of a pandemic that continues to pose a significant threat to travelers and people in large gatherings. We considered postponing TPE TOPCON for a year, but it wasn't clear that companies would be investing in travel next year after having revenues slammed this year. A hybrid event was briefly considered to help bring some income into the Akron area. That appeared to be the most expensive option with the largest amount of extra effort required for the volunteers who put on TPE TOPCON. In the end, the TPE Special Interest Group Board of Directors and the Akron Section Conference Committee agreed to follow the Virtual ANTEC model and go with a remote version of TPE TOPCON. We've joined forces with SPE headquarters to make this happen over two days, September 15th and 16th over ZOOM. We chose to drop the TPE Primer this year because a large part of the value was having access to industry experts in real time and space and gathering in groups to work through the TPE case studies. This will be back in 2022.

The program's theme, "Exploring Sustainable Innovation", is carried through the program on multiple levels. We have highlighted technologies that will be future platforms for growth or could contribute to the development of a circular polymer economy. To do this we have a broad mix of papers coming from university research and industrial (automotive, medical, athletic) applications development. We have also added extra market trend analysis (automotive, regulatory, industrial design, processing) this year, to help create a forward looking context to frame material innovations.

The TPE Special Interest Group and Akron Section use the proceeds to the conference to further polymer knowledge through contributing to scholarships to university students and sponsoring Plasti-Van visits to high schools.

He hope you can virtually explore sustainable innovation with us as an attendee and would ask to help our mission as an exhibitor or sponsor. More information on registration and sponsorships can be found at 4spe.org/TPETOPCON2020.

See you on ZOOM,

Bill Blasius, Co-Chair TPE TOPCON 2020

TUESDAY, SEPTEMBER 15

8:45-9:00 am Welcome Remarks

Automotive Innovation and Sustainability

9:00-9:30 am TPE Opportunities in a Recessionary, Shifting Automotive Interior Environment
Robert Eller, Robert Eller Associates LLC

9:30-10:00 am Improving the Sustainable Content in Thermoplastic Elastomers
Dr. Alper Kiziltas, Ford Motor Co.

10:00-10:30 am HYBRAR™ SV-series, New Hydrogenated Styrenic Block Copolymers With Excellent Damping Performance
Shinya "Smokey" Oshita, Kuraray America, Inc.

10:30-11:00 am Kraton SEBS Polymers for Automotive Applications
Dr. Amit Desai, Kraton Polymers US LLC

11:00-11:30 am A Recycled Content Material Solution for TPV Applications
Edgar Gonzalez, Synesis LLC

11:30-12:00 pm PU-Based Composites as Sustainable Choice for Rubber Replacement
Dr. Sam Kharchenko, BASF

1:00-1:45 pm Keynote: Innovation Renewal and the Garage Group Story
Jason Hauer, The Garage Group

1:45-2-15 pm Innovative Santoprene™ B265 Grades for Automotive Corner Molding and End-Cap Weatherseals
Faith Howard, ExxonMobil

2:15-2:45 pm Method of Making Carbon Fiber Articles Laminated With Thermoplastic Urethane (TPU Films for Lightweight Automotive Application — A Disruptive Methodology
Dr. Sat Nistala, The Lubrizol Co

Biomedical Applications

2:45-3:15 pm Liquid Crystal Elastomers for Biomedical Applications
Dr. Elda Hegmann, Kent State University

3:15-3:45 pm Degradable Polyester Elastomer Platform
Dr. Abraham Joy, University of Akron

3:45-4:15 pm Innovative Santoprene™ TPVs for Medical, Industrial and Consumer Applications
Dr. Bhavesh Shah, ExxonMobil

4:15-4:45 pm Infinergy TPU Foam Beads for Cushioning and Rebound
Lindsay Sanders, BASF

4:45-5:15 pm — A 2020 View of the Evolving Global Regulatory Environment
Alicia Bergeron, Executive Polymer LLC

WEDNESDAY, SEPTEMBER 16

8:45-9:00 am — Welcome Remarks

Material Focus

9:00-9:30 am — An Ultra High Molecular Weight SEBS Polymer for High Temperature TPE Applcations
Chi Jui (Ray) Hsieh, LCY Group

9:30-10:00 am — Repolymerization and Compatibilization of Thermoplastics in Post-Consumer Recycling Processes by Using Titanate Ester Catalysts
Salvatore Monte, Kenrich Petrochemicals, Inc.

10:00-10:30 am — Novel Developments for Overmolding Thermoplastic Elastomers for Engineering Plastics
Dr. Prakash Sanjeevaiah, Star Thermoplastics

10:30-11:15 am — Keynote: Piezo Active Elastomers for Biomedical Applications
Dr. Judit Puskas, The Ohio State University

11:15-12:00 pm — Keynote: TPE Biomaterial Needs, Research at North Carolina State University and the Future
Dr. Rich Spontak, North Carolina State University

Integrating Process, Design, Materials for Tomorrow

1:00-1:15 pm — TPE Compounding 2030
Dr. Paul Andersen, Coperion

1:30-2:00 pm — Trends in Material Utilization From an Industrial Design Perspective
Rene Polin, Balance Innovation + Design

2:00-2:30 pm — Durability of 3D Printed Elastomer Structures
Dr. Will Mars, Enndurica LLC

2:30-3:00 pm — 3D Printing With Thermoplastic Elastomers
Dr. Rigoberto Advincula, Case Western Reserve University

3:00-3:30 pm — Thermal Mechanical Testing of Elastomers
Yash Adhia, TA Instruments — Waters LLC

3:30-4:00 pm — Low Loss Dielectric Polymeric Laminates for Electronics
Dr. Arthur Martin, Daikin America, Inc

4:00-4:30 pm — PEBAX Polyamide Elastomers in Athletic Footwear
Dr. Jake McDonough, Arkema

MEMBERSHIP DEMOGRAPHY

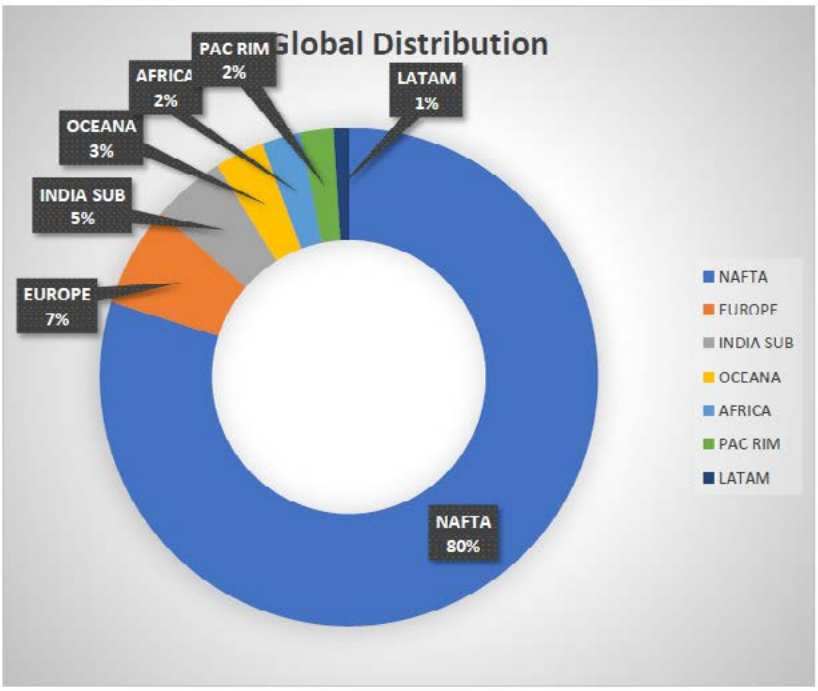
We would like to present the membership demographics data analysis over a few editions as there are many valuable information and key takeaways. The results are showing an amazing diversity. Below is the data about the total number of members to increase your curiosity.

Data based on 2019 SPE information

» The TPE SIG claims 2534 members

» Members reside in 63 countries

» Membership is dominated by North Americans, followed by India, Australia, UK, Singapore. All English speaking countries!



Current Members of our board with their new roles are shown below. Please feel free to connect them with any questions.

2019-2020 SPE TPE SIG BOARD OF DIRECTORS

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