2021 PM14

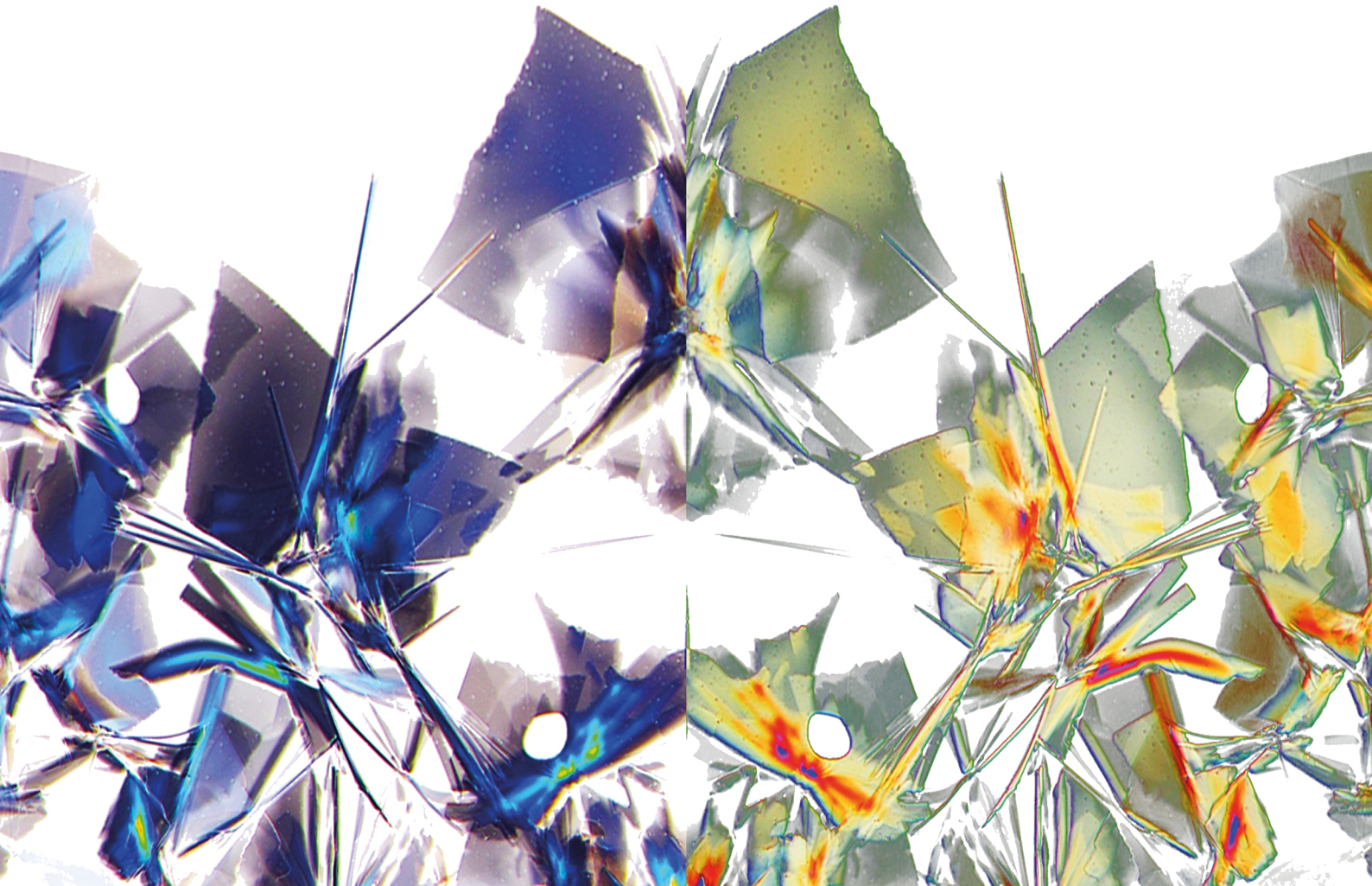
TU Graz
Graz University of Technology

Polymer Meeting 14

Graz University of Technology

Aug. 30-Sept. 2, 2021

BOOK OF ABSTRACTS



Impress

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Foreword

Welcome to the 14th Polmyer meeting PM14!

We cordially welcome you to the Graz University of Technology. It is a great honor and pleasure to us to be the host of the 14th polymer meeting.

The 14th Polymer Meeting in Graz is the continuation of the very successful three river DVSPM-conference series (Danube-Vltava-Sava-Polymer meeting) which became one of the most important meeting in polymer science in Central Europe, as well as on the predecessor conferences "Austrian Slovenian Polymer Meetings" and "Advances in Polymer Science & Technology". However, the origin can be traced back to the Austrian Polymer Meetings, which started more than 25 years ago in Seggau, very close to Graz
Polymers are everywhere in today´s life and find applications in packaging, storage, buildings, agriculture, transportation, mobility, electronics, medicine, energy and many more.

The 14th Polymer Meeting in Graz will address all major aspects of polymer science spanning from novel synthetic approaches, the creation of new functional polymers, the characterisation of macromolecules and polymers, innovative processing technologies, polymer testing, and polymers@work in many applications, but will also include topics of renewable polymers, recycling and sustainability aspects.

In memoriam of Prof. Klaus Hummel, who passed away on May 15th 2021 the Klaus Hummel prize will be established and awarded for the most outstanding contributed lecture.

We are very thankful for your support in these difficult times caused by the Covid-19 pandemic. Thus, for us it is important to restart "normal" academic life. We hope that you enjoy this conference and get inspired by the presentations and vivid discussions within the polymer community.

Sincerely,

Gregor Trimmel,

on behalf of the organizing committee

In memory of
Em. Univ.-Prof. Klaus Hummel

Klaus Hummel (born: 14 May 1930 in Jena, died: 15 May 2021 in Graz) attended various schools in Stadtroda, Jena, Eisenberg and graduated from high school in Bremen in 1949. He studied first physics and then chemistry at the Free University (FU) Berlin-Dahlem and obtained his Diploma in chemistry at the FU Berlin-Dahlem (with R. Riemschneider) in 1956. Afterwards he wrote his Doctoral thesis at the Rubber Institute of the TH Hannover (with W. Scheele) and became Dr. rer.nat. in 1959. He became scientific assistant at the same institute and later he moved to Munich where he conducted his Habilitation at the Technische Hochschule München, Institute for Technical Chemistry (with F. Patat). He received Habilitation for Technical Chemistry in 1967. After a short period at Chemische Werke Hüls AG, he accepted a substitute position at the Technische Hochschule Munich. In 1971 Klaus Hummel accepted a full professor position at Technische Universität Graz and became co-chairman of the Institute for Organic Chemistry and Organic Chemical Technology. In 1979 he became head of the newly founded Institute for Organic Chemistry and Technology of TU Graz. He held this position until his retirement in 1998. In the years 1991-1993 he was appointed dean of the faculty of natural sciences of TU-Graz. After his retirement he was given Emeritus status and continued research with enthusiasm and creativity for several years and remained an active part of the Austrian polymer community.

The research of Klaus Hummel mainly focused on the field of rubber chemistry and technology. He considerably contributed with over 200 publications to the advancement of vulcanization, crosslinking of polymers, and olefin metathesis. With the application of the well-defined metathesis degradation reaction, he introduced new ways and opened far reaching perspectives to the analysis of crosslinked rubbers.

As an academic teacher he introduced the field of Polymer Chemistry and Technology to the Curriculum of Chemistry at the Graz University of Technology, in addition to general Technical Chemistry and Organic-chemical Technology. With his appointment the foundation for the later Institute for Chemistry and Technology of Organic Materials was laid, now part of the Institute for Chemistry and Technology of Materials after fusion of twin institutes. He supervised far more than 100 PhD-theses and several Habilitations and was also a highly acknowledged reviewer for various journals, academic projects, and audits.

Klaus Hummel received various awards such as the R. Zsigmondy Fellowship of the Colloid Society in 1961, the Medal of the University of Helsinki in 1988, the Grand Golden Decoration of Honor of the Province of Styria in 1991, the Golden Decoration of Honor of the Graz University of Technology on ribbon in 1993, or the H. F. Mark Medal in 2000.

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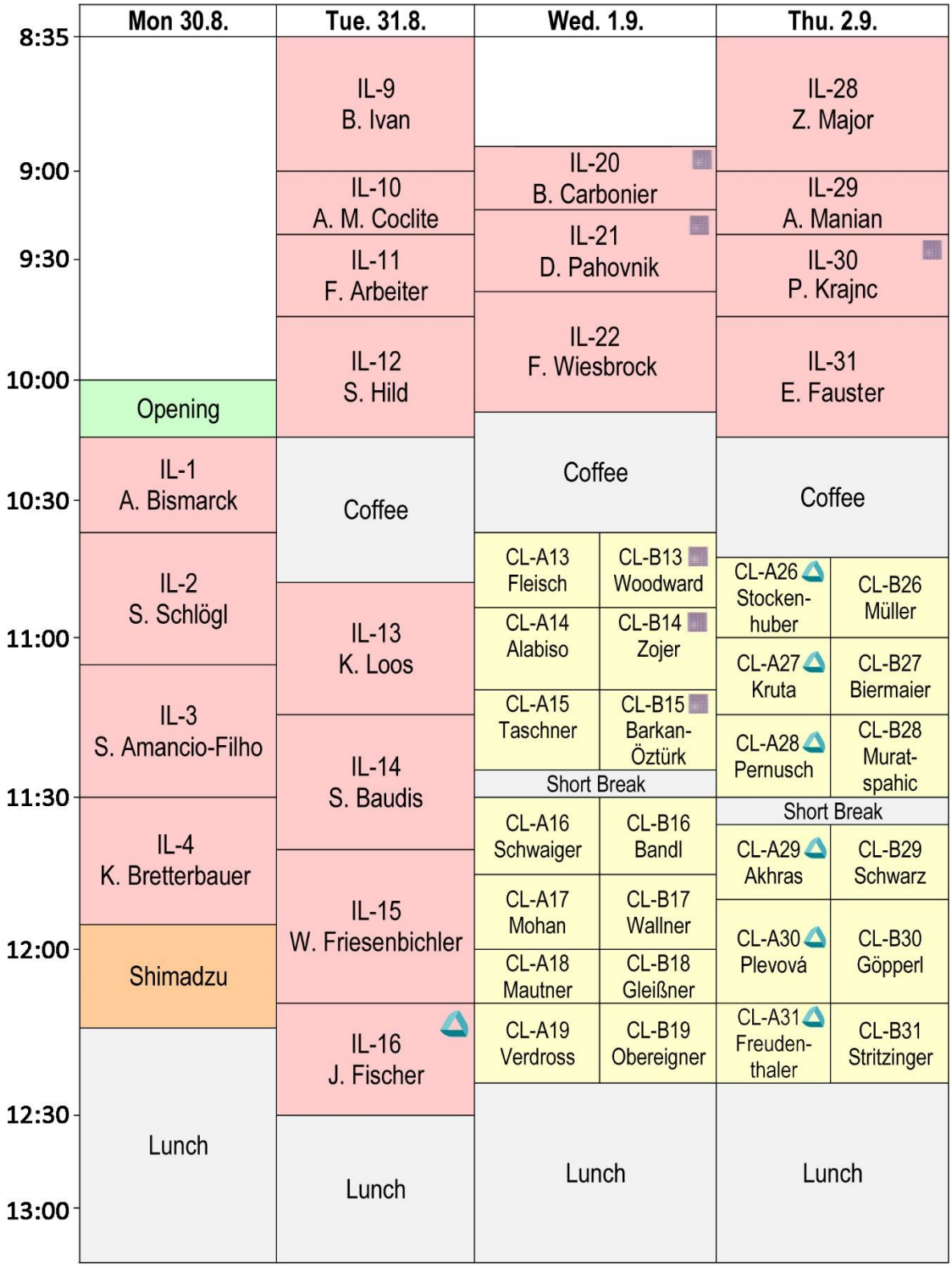
TIMETABLE

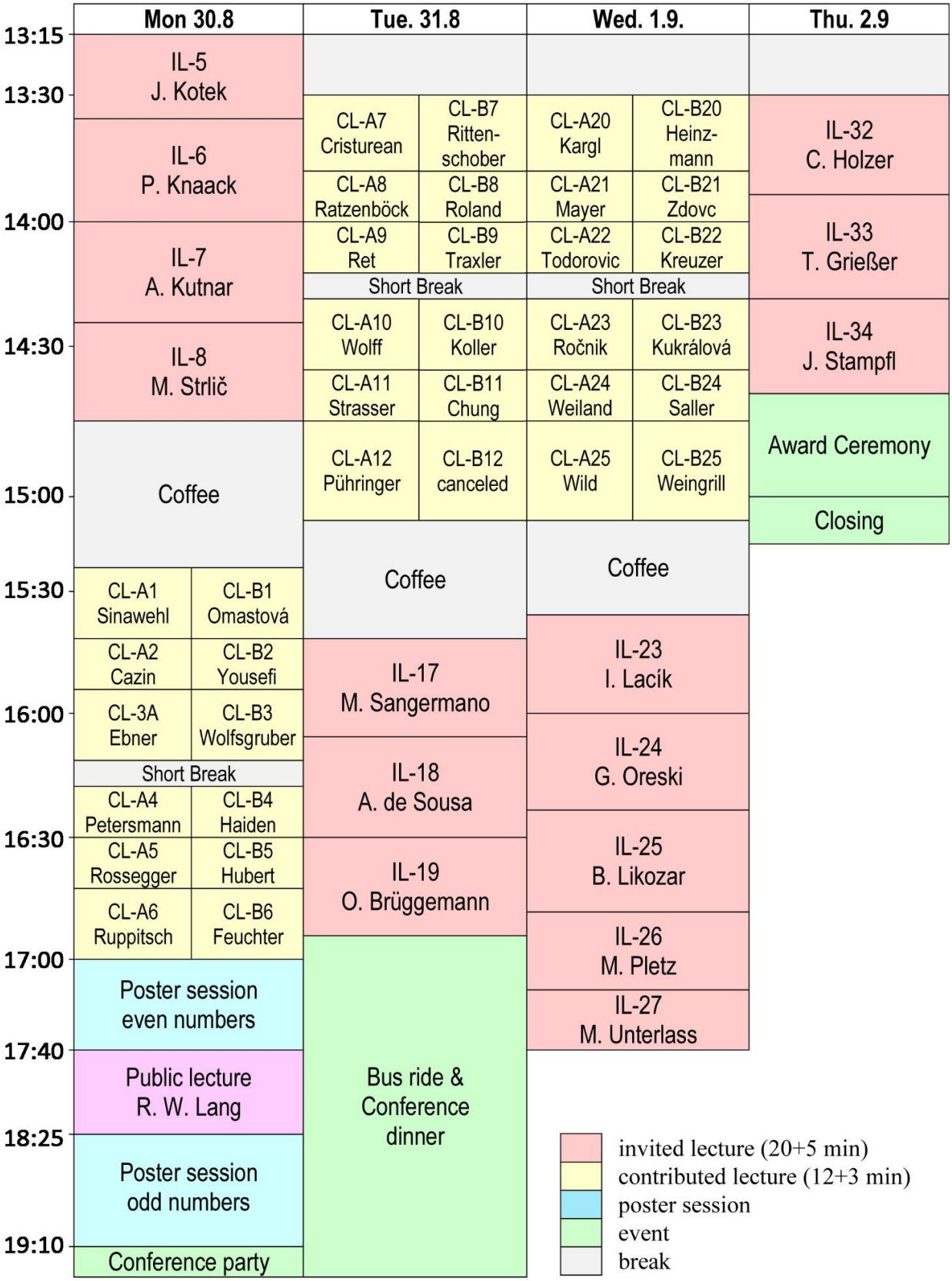
Morning-Sessions



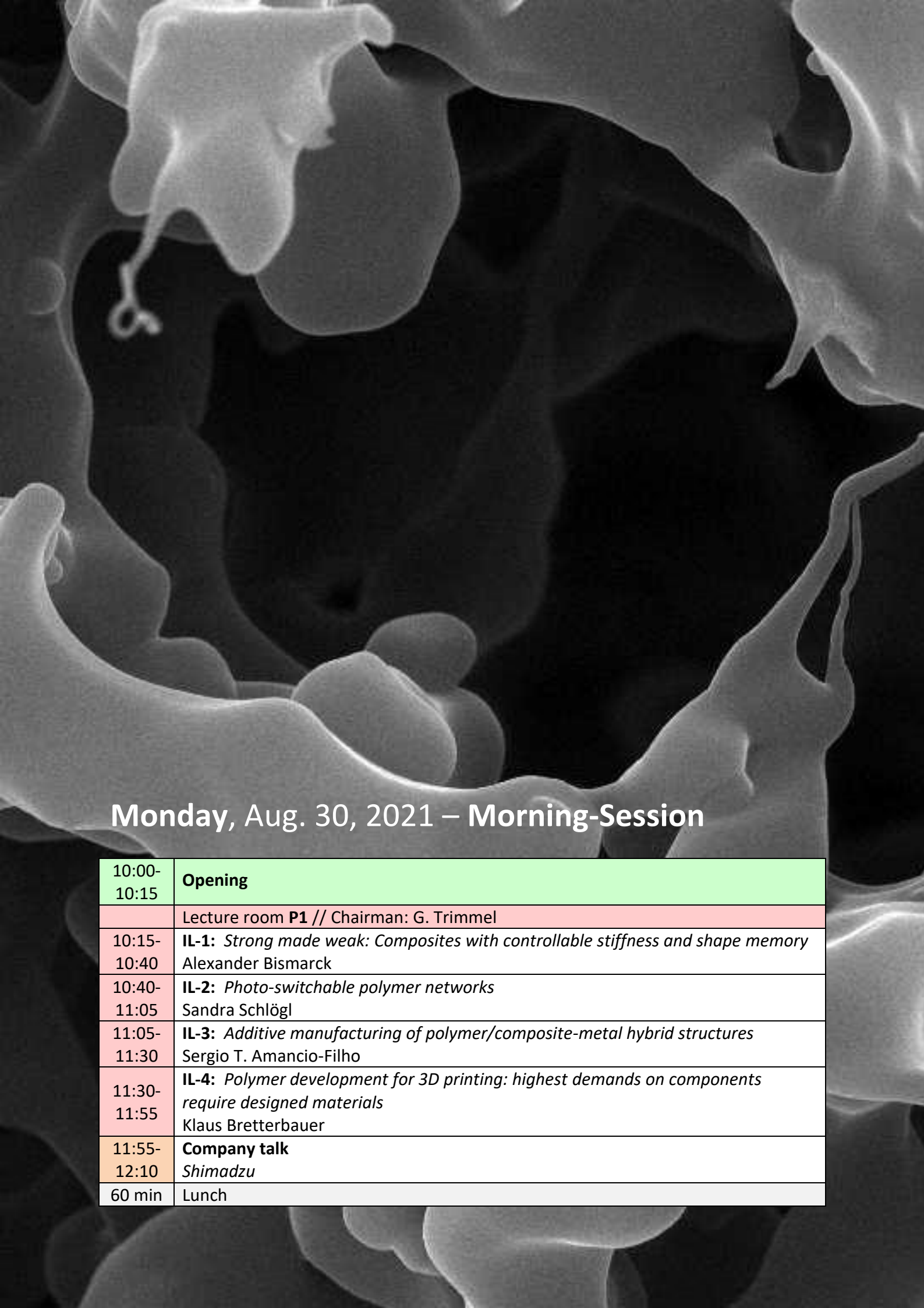
CHASE GmbH
Recycling Session

Porous Materials@Work
Porous Polymer Session

Afternoon-Sessions



PROGRAM



Monday, Aug. 30, 2021 – **Morning-Session**

10:00-10:15	**Opening**
	Lecture room **P1** // Chairman: G. Trimmel
10:15-10:40	**IL-1:** *Strong made weak: Composites with controllable stiffness and shape memory* Alexander Bismarck
10:40-11:05	**IL-2:** *Photo-switchable polymer networks* Sandra Schlögl
11:05-11:30	**IL-3:** *Additive manufacturing of polymer/composite-metal hybrid structures* Sergio T. Amancio-Filho
11:30-11:55	**IL-4:** *Polymer development for 3D printing: highest demands on components require designed materials* Klaus Bretterbauer
11:55-12:10	**Company talk** *Shimadzu*
60 min	Lunch

Monday, Aug. 30, 2021 – **Afternoon-Session**

	Lecture room **P1** // Chairwoman: K. Stana-Kleinschek	
13:10-13:35	**IL-5:** *Degradable all-aliphatic polyurethane films* Jiří Kotek	
13:35-14:00	**IL-6:** *Cationic frontal polymerization* Patrick Knaack	
14:00-14:25	**IL-7:** *Cascade use of wood - from boards to fibers and chemicals* Andreja Kutnar	
14:25-14:50	**IL-8:** *Lifetime modelling of heritage polymers* Matija Strlič	
35 min	Coffee	
	P1 // Chairwoman: S. Schlögl	**P2** // Chairman: S. T. Amancio-Filho
15:25-15:40	**CL-A1:** *High-performance photo-curable adhesives for bone repair* Lisa Sinawehl	**CL-B1:** *Polymeric composites and hybrids with 2D nanofillers* Mária Omastová
15:40-15:55	**CL-A2:** *Multi-material digital light processing 3D printing based on a dual-curing acrylate-epoxy system: Myth or reality?* Ines Cazin	**CL-B2:** *High CNT loading nano and hierarchical composites* Neptun Yousefi
15:55-16:10	**CL-A3:** *Frontal photopoly-merization of photobleachable resins based on long-chain polyetherpolyol dimethacrylates* Catharina Ebner	**CL-B3:** *Influence of filler and matrix on the thermal conductivity and mechanical properties of the composite* Nina Wolfsgruber
5 min	Break	
16:15-16:30	**CL-A4:** *Changing morphological features in a semi-crystalline polymer in material-extrusion based additive manufacturing* Sandra Petersmann	**CL-B4:** *Optical reflectivity of fiber-reinforced epoxy laminates modified by nanoparticle decorated carbon fibers* Lukas Haiden
16:30-16:45	**CL-A5:** *Digital light processing 3D-printing of covalent adaptable networks* Elisabeth Rossegger	**CL-B5:** *Polymer electrolyte as separator for structural super-capacitors* Olivier Hubert
16:45-17:00	**CL-A6:** *Difunctional low shrinkage monomers performing light-induced cyclopolymerization* Larissa Alena Ruppitsch	**CL-B6:** *Functional hierarchical composites for structural applications* Michael Feuchter
17:00-17:40	**Poster session** // even numbers	
17:40-18:25	**Public lecture:** *The Role of Plastics in Navigating the Great Societal Transformation. A story on the future of plastics narrated as "Wag the Dog" puzzle* Reinhold W. Lang	
18:25-19:05	**Poster session** // odd numbers	
19:10-	**Conference party**	

Tuesday, Aug. 31, 2021 – **Morning Session**

	Lecture room **P1** // Chairman: R. Liska
8:35-9:00	**IL-9:** *Bicontinuous nanophasic amphiphilic polymer conetworks with broad composition range: A novel nanostructured material platform* Béla Iván
9:00-9:25	**IL-10:** *Development of devices based on stimuli-responsive polymer thin films deposited by iCVD* Anna Maria Coclite
9:25-9:50	**IL-11:** *Fracture of layered polymers* Florian Arbeiter
9:50-10:15	**IL-12:** *Raman spectroscopy: A tool for polymer characterization from the macroscopic to the microscopic scale* Sabine Hild
35 min	Coffee
	Lecture room **P1** // Chairman: J. Kotek
10:50-11:15	**IL-13:** *Enzymatic polymerizations – Making polymer synthesis more sustainable* Katja Loos
11:15-11:40	**IL-14:** *Additive-manufactured polymer-based biomaterials for regenerative medicine* Stefan Baudis
11:40-12:05	**IL-15:** *Viscoelastic modelling of polymer melt flow for thermoplastics and rubber compounds* Walter Friesenbichler
12:05-12:30	**IL-16:** *Challenges and approaches for specification-compliant plastics recycling* Jörg Fischer
60 min	Lunch

CHASE Competence Center CHASE GmbH
Recycling Session

Tuesday, Aug. 31, 2021 – **Afternoon Session**

	P1 // Chairman: C. Paulik	**P2** // Chairman: W. Friesenbichler
13:30-13:45	**CL-A7:** *Diels-Alder cycloaddition for the preparation of highly aromatic polyimide copolymers* Doris Cristurean	**CL-B7:** *Simulating a multistage polymerization process in a bench-scale setup* Gerold Rittenschober
13:45-14:00	**CL-A8:** *Water as monomer: Polymerizing divinyl sulfone and water via oxa-Michael addition* Karin Ratzenböck	**CL-B8:** *A hybrid approach for modelling polymer processing problems* Wolfgang Roland
14:00-14:15	**CL-A9:** *Preparation of functional polymers for glycan purification based on hydrazone solid phase extraction* Davide Ret	**CL-B9:** *Effect of processing and filtering in a two-stage injection molding process on thermos-analytical, rheological, and mechanical properties* Ines Traxler
5 min	Break	
14:20-14:35	**CL-A10:** *3D printing of pure phenolic resins by hot lithography* Raffael J. B. A. Wolff	**CL-B10:** *Influence of the material on the melt filtration using different screens* Kerstin Koller
14:35-14:50	**CL-A11:** *Bottlebrush, high molecular weight poly-phosphazene-g-poly(l-glutamic acid) fully biodegradable polymer therapeutics with enhanced biodistribution profiles* Paul Strasser	**CL-B11:** *Modeling of the devolatilization process in an extruder* Chi Nghia Chung
14:50-15:05	**CL-A12:** *Exploration of synthetic strategies to access catechol-based monomers for application in bioinspired adhesives* Manuel Pühringer	**CL-B12:** canceled
35 min	Coffee	
	Lecture room **P1** // Chairman: I. Lacik	
15:40-16:05	**IL-17:** *Cationic UV-curing of epoxidized biobased resins and composites* Marco Sangermano	
16:05-16:30	**IL-18:** *The quest for sustainable polymers - contributions from furan-based polyesters* Andreia F. Sousa	
16:30-16:55	**IL-19:** *Binary molecular stamps – a novel data storage technique: imprinting polymers with sequence-defined polymeric templates* Oliver Brüggemann	
16:55	Bus ride to the conference dinner	
17:50	**Conference dinner** – Weinschloss Koarl Thaller	

Wednesday, Sept. 1, 2021 – **Morning Session**

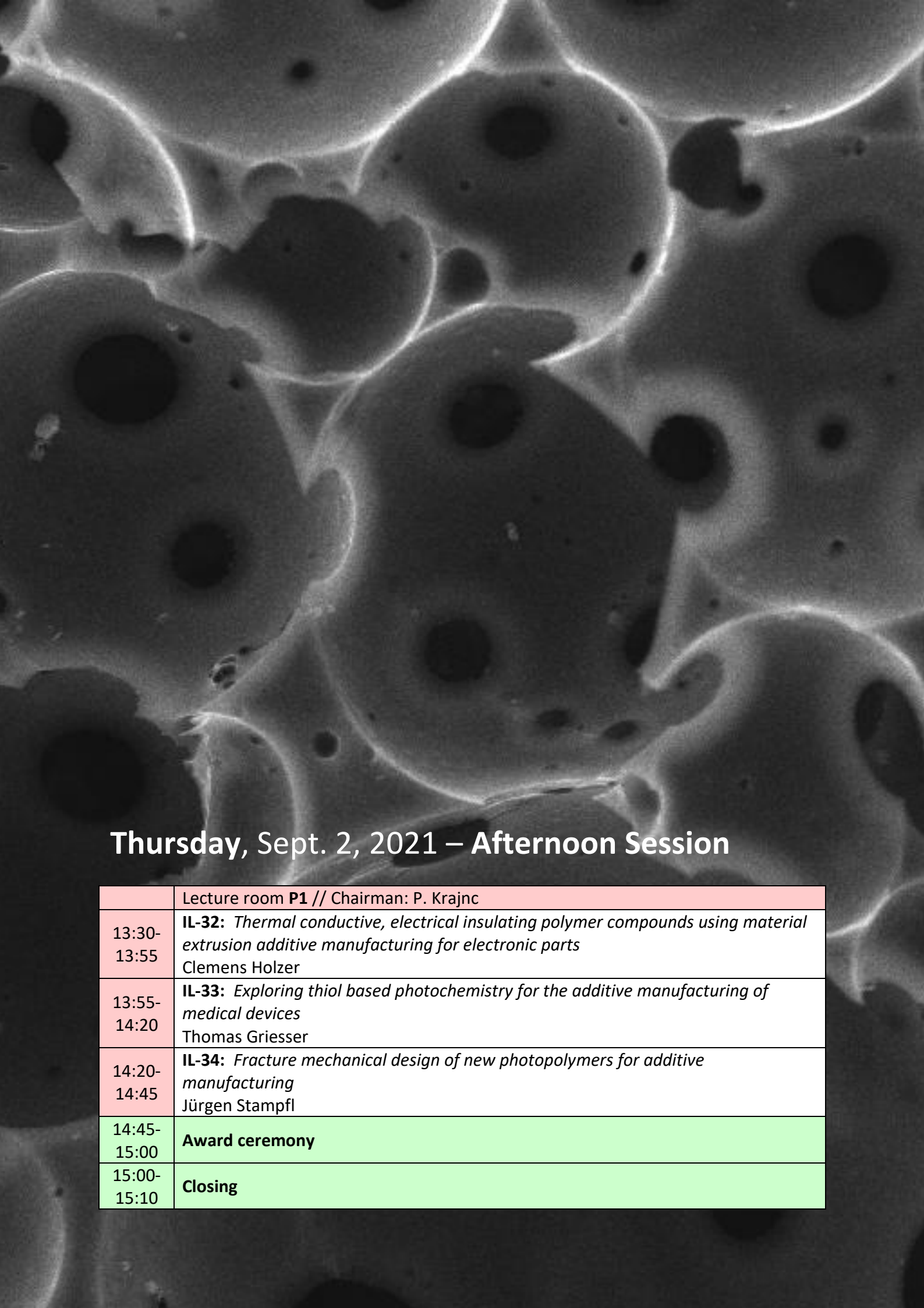
	Lecture room **P1** // Chairman: C. Slugovc	
8:55-9:20	**IL-20:** *New trends in functional porous and permeable polymer materials for sustainability and life sciences* Benjamin Carbonnier	
9:20-9:45	**IL-21:** *Porous polymers prepared by ring-opening polymerization* David Pahovnik	
9:45-10:10	**IL-22:** *Compensation of volumetric shrinkage by expanding monomers* Frank Wiesbrock	
30 min	Coffee	
	P1 // Chairman: R. Kargl	**P2** // Chairman: C. Slugovc
10:40-10:55	**CL-A13:** *A novel mechanical meta-material with customizable stiffness distribution* Mathias Fleisch	**CL-B13:** *Hypercrosslinked polymers for visible-light-driven CO_2 photoreduction* Robert T. Woodward
10:55-11:10	**CL-A14***: Investigation of shape memory-assisted self-healing of thiol-acrylate vitrimers* Walter Alabiso	**CL-B14:** *Understanding intermolecular bonding in organic materials and its impact on electronic properties* Egbert Zojer
11:10-11:25	**CL-A15:** *Bismuth- and pyrylium-based onium salts as initiators for radical induced cationic frontal poly-merization* Roland Taschner	**CL-B15:** *Hypercrosslinked polyHIPEs as Pd-catalyst supports* Hande Barkan-Öztürk
5 min	Break	
11:30-11:45	**CL-A16:** *Curing of epoxidized plant oils with solid acid hardener* Markus Schwaiger	**CL-B16:** *Anti-adhesive organosilane coatings functionalized with markers for visibility-on-demand* Christine Bandl
11:45-12:00	**CL-A17:** *3D printing and stabilization of nanofibrillated cellulose-alginate scaffolds by different crosslinking methods* Tamilselvan Mohan	**CL-B17:** *Water-borne model epoxy varnishes for µm-thin adhesive bonding of electrical steel laminates* Gernot M. Wallner
12:00-12:15	**CL-A18:** *Plastic or elastic: Fungi-derived composite nanopapers with tunable properties* Andreas Mautner	**CL-B18:** *Activation of polyamide fibers for subsequent metallization* Carolin Gleißner
12:15-12:30	**CL-A19:** *Catalytic metal bonding of phosphinated cellulose and form-ation of nanocellulose in the process* Philip Verdross	**CL-B19:** *A study on the mechanism of blistering of pigmented organic coatings in warm-humid environments* Barbara Obereigner
60 min	Lunch	

Wednesday, Sept. 1, 2021 – **Afternoon Session**

	P1 // Chairman: D. Pahovnik	**P2** // Chairwoman: S. Hild
13:30-13:45	**CL-A20:** *Biomimetic models of the aortic arch for surgical planning* Rupert Kargl	**CL-B20:** *Software-based simulation and method optimization for polymer- and nanoparticle separa-tions by Field-Flow Fractionation* Gerhard Heinzmann
13:45-14:00	**CL-A21:** *Balancing strength and ductility – Tough and transparent nanopapers through mercerisation* Florian Mayer	**CL-B21:** *Effect of sequence blockiness on the retention behavior of gradient copolymers with various liquid chromatographic techniques* Blaž Zdovc
14:00-14:15	**CL-A22:** *Fully bio-based high-performance composite* Andrea Todorovic	**CL-B22:** *Degradation of monomers during hydroxyl-terminated polyester synthesis and their influence on the polymer structure* Viktoria Kreuzer
5 min	Break	
14:20-14:35	**CL-A23:** *Solvent and operating condition effects on the reaction rates of typical lignin bond cleavage during organosolv pretreatment* Tina Ročnik	**CL-B23:** *Differential Scanning Calorimetry with pressure cell for determining the polymer crystallinity changes in presence of gaseous penetrant* Martina Kukrálová
14:35-14:50	**CL-A24:** *Bio-Pulping: Delignification and hybridisation of lignocellulosic material utilising fungi* Kathrin Weiland	**CL-B24:** *Sulfonation of unsaturated polyester – analytical challenges due to solubility change* Klara M. Saller
14:50-15:05	**CL-A25:** *Bio-based polymers for transport packaging – possibilities & limitations* Nadine Wild	**CL-B25:** *Integrative material characteri-zation of crystalline nanocellulose reinforced filaments for fused filament fabrication* Helena Weingrill
30 min	Coffee	
	Lecture room **P1** // Chairman: W. Kern	
15:35-16:00	**IL-23***: Impact of counterions on the propagation rate coefficient in radical polymerization of ionized monomers* Igor Lacík	
16:00-16:25	**IL-24:** *Improving the quality of recycled polymer waste through advanced mechanical sorting* Gernot Oreski	
16:25-16:50	**IL-25:** *Engineering catalytic conversion pathways of lignocellulose to functional alcohol or carboxylic monomers* Blaž Likozar	
16:50-17:15	**IL-26:** *Modeling macro-effects of micro-structures* Martin Pletz	
17:15-17:40	**IL-27:** *Polyheterocyclics by hydrothermal synthesis* Miriam M. Unterlass	

Thursday, Sept. 2, 2021 – **Morning Session**

	Lecture room **P1** // Chairman: B. Ivan	
8:35-9:00	**IL-28:** *Digital materials – Vision or reality? Applicability of micromechanical modeling for material design* Zoltan Major	
9:00-9:25	**IL-29:** *Environmental impact of the textiles sector and the role of bio-based resources* Avinash P. Manian	
9:25-9:50	**IL-30:** *Tricks with polyHIPEs: Combined templating approaches for hierarchical porosity* Peter Krajnc 	
9:50-10:15	**IL-31:** *Processing of fibre-reinforced polymer composites based on phenomenological models* Ewald Fauster	
30 min	Coffee	
	P1 // Chairman: J. Fischer	**P2** // Chairman: E. Fauster
10:45-11:00	**CL-A26***: Investigation on the recycling of biobased polymers on the example of PHBV* Sabine Stockenhuber	**CL-B26:** *Destiny of drag reducing agents in turbulent pipe flows* Hans Werner Müller
11:00-11:15	**CL-A27:** *Effect of different experimental setups on the removal efficiency of surface and matrix contamination in PE-LD* Konstanze Kruta	**CL-B27:** *Impact of silver seed formation on electroless copper deposition for conductive textiles* Christian Biermaier
11:15-11:30	**CL-A28***: Poison study based on chemically recycled plastic waste impurities and their influence on the performance of Ziegler-Natta catalysts* Daniel Christian Pernusch	**CL-B28:** *Hydrophobically modified copolymer associations - A promising path to improve drag reduction?* Emina Muratspahic
5 min	Break	
11:35-11:50	**CL-A29:** *The influence of the sample preparation steps on the properties of pre-treated polyolefin waste – Problems & Solutions* M. Hassan Akhras	**CL-B29:** *Viscosity reduction of magnesium alkyls used for Ziegler-Natta catalysts* Julia Schwarz
11:50-12:05	**CL-A30:** *Recycling of multilayer films from food packaging* Kateřina Plevová	**CL-B30:** *Effects of different process parameters on improved comonomer incorporation distribution in Ziegler-Natta catalysis* Lukas Göpperl
12:05-12:20	**CL-A31:** *Comparison of chromatographic, spectroscopic, thermal, and mechanical measurement techniques for polyethylene recyclate characterization* Paul J. Freudenthaler	**CL-B31:** *Application of hybrid modeling in polymer processing* Ursula Stritzinger
70 min	Lunch // in parallel: **Board meeting**	



Thursday, Sept. 2, 2021 – **Afternoon Session**

	Lecture room **P1** // Chairman: P. Krajnc
13:30-13:55	**IL-32:** *Thermal conductive, electrical insulating polymer compounds using material extrusion additive manufacturing for electronic parts* Clemens Holzer
13:55-14:20	**IL-33:** *Exploring thiol based photochemistry for the additive manufacturing of medical devices* Thomas Griesser
14:20-14:45	**IL-34:** *Fracture mechanical design of new photopolymers for additive manufacturing* Jürgen Stampfl
14:45-15:00	**Award ceremony**
15:00-15:10	**Closing**

INVITED LECTURES

Cascade use of wood - from boards to fibers and chemicals

Andreja Kutnar, Kelly Peeters

InnoRenew CoE, Livade 6, 6310 Izola, Slovenia; University of Primorska, Titov trg 4, 6000 Koper, Slovenia; e-mail: andreja.kutnar@innorenew.eu

Wood products can contribute to climate change mitigation as they (1) act as a carbon pool during their service lives, (2) withdraw CO_2 from its natural cycle, and (3) can substitute for more energy-intense products after their service life.
In this presentation the potential to improve the re-usability and recyclability of wood composites and construction material as well as utilization of industrial sidestreams will be presented.
Efficient resource use is the core concept of cascading, which is a sequential use of a certain resource for different purposes. This means that the same unit of a resource is used for multiple high-grade material applications (and therefore sequestering carbon for a greater duration), followed by a final use for energy generation and returning the stored carbon to the atmosphere. Intelligent concepts for reuse and recycling of valuable materials at the end of single product life will reduce the amount of waste to be landfilled.
Industrial stream residues contain bioactive compounds with a wide range of potential high-value applications. Of these compounds, polyphenols are present in large amounts and are of commercial interest because they can act as alternatives to oil-based chemicals. Many polyphenols are shown to have a high antioxidative activity and free-radical scavenging capacity and have therefore a high potential to be used in the pharmaceutical, cosmetic or functional food sector. They can be also applied in research programs for coronary heart disease prevention, anticancer activity, and anti–HIV functions. These biochemicals are also a potential source of numerous product innovations. Finding methods to remove large amounts of these extractives is of great environmental importance and presents an economic opportunity.
The activities of the project Selective extraction of high value molecules from forest products processing residues in the speciality chemicals sector will be discussed and challenges in industrial applications outlined.

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Presenting Participants