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Northeastern Section of the American Chemical Society (NESACS)

MatChem
MATERIALS CHEMISTRY COMMITTEE OF NESACS

Sustainable Innovations in Materials Science and Engineering (SIMSE)

Thursday, July 23, 2026
2:00 pm – 7:00 pm
(Registration opens at 1:00 pm)

Linda K. Paresky (LKP) Conference Center
Main Building - 3rd Floor, Simmons University
300 Fenway, Boston, MA 02115

Agenda

1:00 pm – 2:00 pm	**Registration**
2:00 pm – 2:10 pm	**Welcome & Introductory Remarks** **Katherine Lee, NESACS** **Kapil Dev Sayala, MatChem Committee**
2:10 pm – 2:40 pm	**Jan Roosenboom, Macrocycle Technologies** **"SolvoGenesis" Recycling for Textiles: From the Lab to Market Deployment**
2:45 pm – 3:15 pm	**Diego Alzate-Sanchez, Northeastern University** **From Energy to End-of-Life: New Metrics and Materials for Sustainable Polymer Chemistry**
3:20 pm – 3:30 pm	**Flash Talks [SIMSE ID# 1,2,4,11]**
3:30 pm – 4:00 pm	**Networking break with coffee and snacks**
4:00 pm – 4:30 pm	**Nicole Richards, Allonnia** **Waste is the New Gold: How Multi-Disciplinary Science Are Transforming the Circular Economy**
4:35 pm – 5:05 pm	**William Dichtel, Northwestern University** **Cyclodextrin-Based Polymers to Capture and Degrade Per- and Polyfluorinated Alkyl Substances (PFAS) *Keynote Talk**
5:10 pm – 5:25 pm	**Flash Talks [SIMSE ID# 14,15,16,20 &** **Michelle Muzzio, Cell Press]**
5:30 pm – 6:55 pm	**Reception concurrent with poster session**
7:00 pm	**Concluding remarks**

Dr. Jan-Georg Rosenboom
CTO, Co-Founder
MacroCycle Technologies

Title: "SolvoGenesis" Recycling for Textiles: From the Lab to Market Deployment

Abstract: Textiles are the fastest growing waste stream in the United States, with the vast majority of textile waste landfilled, incinerated or shipped to less developed nations. At the same time, virgin PET production is expected to increase from currently ~75 MT/y to >100 MT/y by 2030, contributing to the 6-8% of global CO2 emissions by the textile industry. Polyester-based textiles are inherently blended with cotton, elastane, nylon and contain dyes, finishes, zippers and buttons, all of which make these materials impossible to recycle through traditional (thermo)mechanical means. This global waste and energy problem has caught widespread attention from consumers, government and investors. MIT startup company MacroCycle is commercializing and scaling a new process termed SolvoGenesis (instead of Solvo-Lysis), which produces virgin-grade recycled PET from blended textile waste using highly selective solvent systems and macrocyclic polymerization chemistry. TEA shows an energy demand reduction of around 80% compared with virgin PET, paving a path for cost competitiveness with oil-based resin and financeable factory builds. Yet, the path from promising laboratory results to industrial scale is long and non-trivial. This talk will explore MacroCycle's tech commercialization journey through technology pivots, fundraising strategies, customer discovery, feedstock variability and scaling challenges.

Biographical Sketch: Dr. Jan-Georg Rosenboom is co-founder and CTO at MacroCycle Technologies, an MIT startup company focused on making polymers circular through non-destructive chemistry. He trained as a Chemical Engineering postdoc focused on Polymer Science at MIT's Langer Lab and has a PhD from ETH Zurich where he developed polymerization processes based on Ring-Opening Polymerization. His industrial work includes Polymer Process Engineering work at Apple, BASF, and SULZER. He is an author on 18 scientific papers with >3000 citations, and 9 patents.

Prof. Diego Alzate-Sanchez
Department of Chemistry and Chemical Biology
Northeastern University

Title: From Energy to End-of-Life: New Metrics and Materials for Sustainable Polymer Chemistry

Abstract: Our research group advances sustainable polymer chemistry along two complementary directions. In frontal polymerization, an energy-efficient polymerization process that harnesses self-sustained reaction fronts, we introduce apparent power (Papp) as a unifying metric that integrates reaction thermodynamics and kinetics to predict front behaviour, ranging from quenched to uniform propagation. We extend this framework to frontal foaming, where in-situ blowing agent vaporization enables the single-step fabrication of hierarchically ordered, multi-material porous monoliths with gradient thermomechanical properties. In parallel, we engineer hydrogels crosslinked by dual dynamic covalent imine boronic ester networks, revealing that ortho-substituted crosslinkers form 3-amino-benzoxaborole heterocycles that enhance elasticity beyond what crosslink density alone predicts. These materials support true closed-loop recyclability: self-healing restores at least 90% of original rheological properties, while full monomer recovery yields recycled hydrogels exceeding their initial performance. Together, these programs establish new design principles for energy-efficient synthesis and end-of-life circularity in advanced polymer materials.

Biographical Sketch: Prof. Diego Alzate-Sanchez is a member of the DMAS lab, where he develops cutting-edge macromolecule-based technologies at the interface of polymer chemistry and materials science to help manufacture materials more sustainably. Born and raised in Bogotá, Colombia, he earned his undergraduate degree from the National University of Colombia, then completed a master's with Professor César Sierra there before moving to Manizales to work as a volcanologist. He later moved to the United States, completed graduate studies at Northwestern University with Professor William Dichtel, and finished postdoctoral training at the University of Illinois Urbana-Champaign with Professor Jeffrey Moore. He is now an assistant professor in the Department of Chemistry and Chemical Biology at Northeastern University, and outside of work he enjoys socializing with friends and colleagues, watching soccer, and traveling.

Nicole Richards
Chief Executive Officer
Allonnia

Title: Waste is the New Gold: How Multi-Disciplinary Science Are Transforming the Circular Economy

Abstract: As demand for critical minerals, clean water, and sustainable manufacturing continues to grow, the world's most valuable resources are increasingly found in places we once considered waste—low-grade ores, mine tailings, industrial wastewater, and contaminated sites. Meeting these challenges will require more than incremental improvements in chemistry or engineering. The convergence of engineering biology and materials science is creating entirely new approaches to recovering valuable resources, removing impurities, and transforming industrial processes.

Drawing on Allonnia's experience developing and commercializing biological solutions for mining and water treatment, Nicole Richards will explore how multidisciplinary innovation is moving from the laboratory to industrial deployment. She will discuss the opportunities and challenges of scaling breakthrough technologies in conservative, capital-intensive industries, including customer adoption, technology validation, and commercialization. Attendees will gain insight into how scientists, engineers, and entrepreneurs can work together to translate breakthrough research into sustainable solutions with real-world impact.

Biographical Sketch: Nicole Richards is the Chief Executive Officer of Allonnia, a biotechnology company transforming environmental and industrial challenges through breakthrough biology and chemistry. With more than 30 years of experience in the specialty chemicals, water, and mining industries, she has led the commercialization and scaling of innovative technologies that improve sustainability while delivering measurable business value. At Allonnia, Nicole is driving the deployment of technologies that address PFAS contamination, critical minerals recovery, and low-grade ore upgrading to help strengthen global supply chains. A chemical engineer by training, she is a frequent speaker on innovation, sustainability, the energy transition, and scaling deep-tech companies from breakthrough science to commercial impact.

Professor William Dichtel
Robert L. Letsinger Professor of Chemistry
Northwestern University

Title: Cyclodextrin-Based Polymers to Capture and Degrade Per- and Polyfluorinated Alkyl Substances (PFAS)

Abstract: Crosslinked β-cyclodextrin (β-CD) polymers are promising adsorbents for the removal of per- and polyfluoroalkyl substances (PFAS) from contaminated water sources, including contaminated groundwater, drinking water, and wastewater. We recently introduced porous, styrene-functionalized β-cyclodextrin (StyDex) polymers derived from radical polymerization with vinyl comonomers. Because of the versatility of these polymerizations, StyDex polymer compositions are tunable, which facilitates efforts to establish structure-adsorption relationships and to discover improved materials. Insight into structure-property relationships for PFAS adsorption of 20 StyDex derivatives with varied comonomer structure and loading, regiochemistry of styrene placement on the CD monomer, and CD size will be presented. The development of methods to control polymer morphology is also important for the intended application of removing PFAS in flow using columns with short contact times and low back pressure. Finally, I will describe the ability of these materials to be regenerated, which enables convenient PFAS degradation to safe byproducts.

Biographical Sketch: William Dichtel earned his B.S. in Chemistry from MIT (research with Prof. Tim Swager) and his Ph.D. from UC Berkeley with Prof. Jean M. J. Fréchet. He was a joint postdoctoral researcher with Prof. Fraser Stoddart at UCLA and Prof. James Heath at Caltech, then began his independent career at Cornell in 2008 and became an Associate Professor in 2014. In 2016, he joined Northwestern University as the Robert L. Letsinger Professor of Chemistry. His research focuses on using organic synthesis and noncovalent assembly to control molecular, materials, and interface structure and reactivity, including work on COFs, porous polymers for water purification, and polymer recycling. He has received major honors including a MacArthur Fellowship, a Guggenheim Fellowship, the ACS Baekeland Award, and was named the 2020 National Laureate in Chemistry by the Blavatnik Awards for Young Scientists.

Flash Talks

#	Presenting author	Affiliation	Poster Title
First Set. 3:20 – 3:30 pm			
SIMSE01	Vladislav Khamraev	Tufts University	Robust and Sustainable Aqueous Electrosynthesis of 2,5-Disubstituted Tetrazole through an Unexpected Skeletal Reorganization
SIMSE02	Jenna King	Northeastern University	True Closed-Loop Recyclable Hydrogels Enabled by Imine Boronic Ester Crosslinking
SIMSE04	Cara Megill	Northeastern University	Characterization of burnt plastics–pyroplastics–collected from Palm Beach, FL, USA reveals combustion-driven polymer transformations relevant to source identification and environmental monitoring
SIMSE11	Kyoungwon Lee	University of Massachusetts Amherst	Stepwise Modification of Unsaturated Polyolefin Backbones via Ring-Opening Insertion-Metathesis Polymerization
Second Set. 5:10 – 5:25 pm			
SIMSE14	Jin Yan	Boston University	Modular Functionalization of Orthogonally Reactive Polymer Network Coatings Toward PFAS-Free Liquid Repellency
SIMSE15	Isha Farook	University of Massachusetts Amherst	Biopolymer Foams Composed of Sawdust: Fabrication and Structural Integrity
SIMSE16	Ali Hamoda	Milton Academy	Forever Chemicals: A Magneto-Potentiometric Approach to Lipid-Based PFOS Capture Detection
SIMSE20	Mubarak Ayinla	University of Massachusetts Lowell	Pores with Purpose: Modulation-Driven Nitrogen-Rich Frameworks for Environmental Remediation
Invited	Michelle Muzzio	Cell Press	

Poster Session. 5:30 – 6:55 pm

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SIMSE01	Vladislav Khamraev	Tufts University	Robust and Sustainable Aqueous Electrosynthesis of 2,5-Disubstituted Tetrazole through an Unexpected Skeletal Reorganization
SIMSE02	Jenna King	Northeastern University	True Closed-Loop Recyclable Hydrogels Enabled by Imine Boronic Ester Crosslinking
SIMSE04	Cara Megill	Northeastern University	Characterization of burnt plastics–pyroplastics–collected from Palm Beach, FL, USA reveals combustion-driven polymer transformations relevant to source identification and environmental monitoring
SIMSE06	Mohak Desai	University of Connecticut	Scale up of novel polyolefins for high temperature dielectric film processing and testing for capacitor films
SIMSE07	MK Jutze	University of Massachusetts Amherst	Addition-Fragmentation-Transfer Monitored by Fluorescence Lifetime Imaging Microscopy
SIMSE08	Vinh Le	University of Connecticut	Rational Modification and Scale-up of Polyetherimide for Enhanced Energy Storage Application
SIMSE09	Andrew Vogler	Northeastern University	Insights into the Fabrication of Complex Polymeric Foams via Frontal Polymerization
SIMSE11	Kyoungwon Lee	University of Massachusetts Amherst	Stepwise Modification of Unsaturated Polyolefin Backbones via Ring-Opening Insertion-Metathesis Polymerization
SIMSE13	Luying Louise He	University of Massachusetts Amherst	Kombucha Non-Woven Membranes for Sustainable Water Filtration

SIMSE14	Jin Yan	Boston University	Modular Functionalization of Orthogonally Reactive Polymer Network Coatings Toward PFAS-Free Liquid Repellency
SIMSE15	Isha Farook	University of Massachusetts Amherst	Biopolymer Foams Composed of Sawdust: Fabrication and Structural Integrity
SIMSE16	Ali Hamoda	Milton Academy	Forever Chemicals: A Magneto-Potentiometric Approach to Lipid-Based PFOS Capture Detection
SIMSE17	Omar Albarbari	Belmont High School	Integrating Aerial Imagery and Water Quality Sensing for Hyperlocal Harmful Algal Bloom Prediction and Detection
SIMSE18	Yassin Abdelazim	Belmont High School	Real-Time Spatial Mapping of Heavy Metal Contamination Using a 3D-Printed Electrochemical Sensing Boat
SIMSE19	Gayan Kanchana Aluthwala Acharige	University of Massachusetts Lowell	Synthesis of Monolithic Covalent Organic Framework/reduced graphene oxide Aerogels
SIMSE20	Mubarak Ayinla	University of Massachusetts Lowell	Pores with Purpose: Modulation-Driven Nitrogen-Rich Frameworks for Environmental Remediation
SIMSE21	Evelyn Lyu	Brandeis University	The Degradation of Polymers in the Environment: Disappearing Amorphous Regions

Logistics

Getting there

Detailed guide to get to Simmons

The **Linda K. Paresky (LKP) Conference Center** is located on the **3rd floor of the Main College Building** at **Simmons University, 300 Fenway, Boston, MA 02115.** Simmons University is conveniently located in Boston's Longwood Medical and Fenway area and is easily accessible by public transportation or car. Visitors traveling by **MBTA** can take the **Green Line E to the Museum of Fine Arts station**, which is just a short 5-minute walk from campus. Those arriving by train or bus can connect through South Station to the Green Line E. If driving, visitors should use **One Palace Road, Boston, MA** as the GPS destination for the Simmons parking garage. Public transportation is recommended, as traffic in the Fenway/Longwood area can be heavy during peak hours.

Parking Passes: If you requested a subsidized parking pass during registration, please pull a parking ticket upon entering the garage and park in any available open space. There are no designated or reserved parking spaces for conference guests. During event check-in, we will provide you with a parking validation sticker. When exiting the garage, scan both your original parking ticket and the validation sticker.

Wifi

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- Click 'login as guest'.
- Review the terms and conditions, you may have to enter in your email address, check 'I agree', and click the login button. You should now be connected to the Simmons wireless network as a guest.

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Nakul Bende
CFS

Diego Alzate-Sanchez
Northeastern University

Kapil Dev Sayala
SEQENS

Lipin Ji, MAK Scientific

With thanks to the NESACS Leadership and Board for their support of the MatChem Committee.

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With thanks to the NUCLEUS team, NSYCC for their support of the MatChem Committee.

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