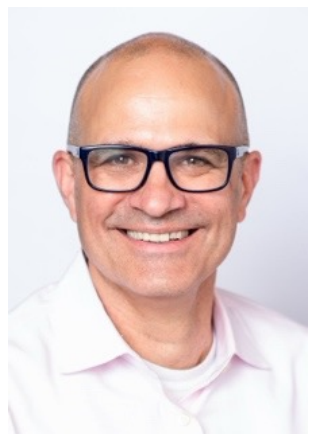


訪日学者講演会



Prof. Marc Hillmyer

<https://hillmyer.chem.umn.edu/hillmyer>

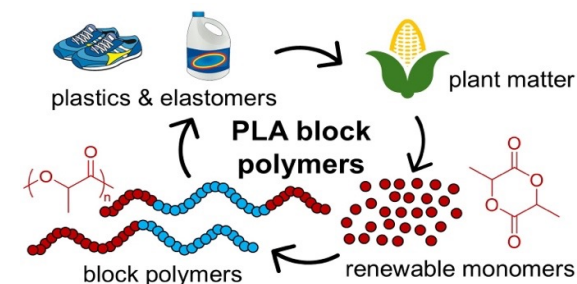
University of Minnesota, USA



“Renewable, Recyclable, and Remarkable Aliphatic Polyester Block Polymers as Sustainable Plastics and Elastomers”

令和7年3月4日(火) 16:30~18:00

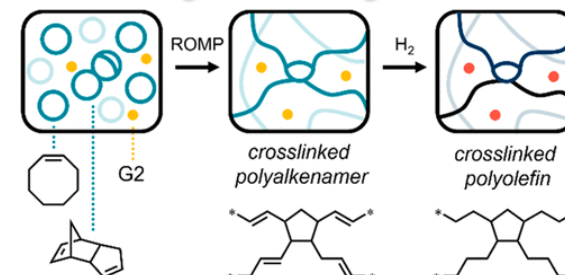
名古屋工学部1号館 3F 132講義室



“Tandem Ring-Opening Metathesis Polymerization and Post-Polymerization Saturation Using a Single Catalytic System”

令和7年3月5日(水) 16:00~17:30

名古屋工学部IB館 1F IB011講義室

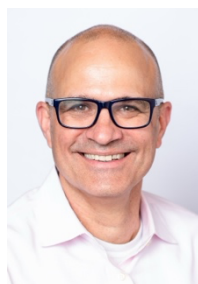


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Prof. Marc Hillmyer, 1st Seminar
March 4, 2025, 16:30-18:00
@名古屋大学 工学部 1 号館 3F 132 講義室

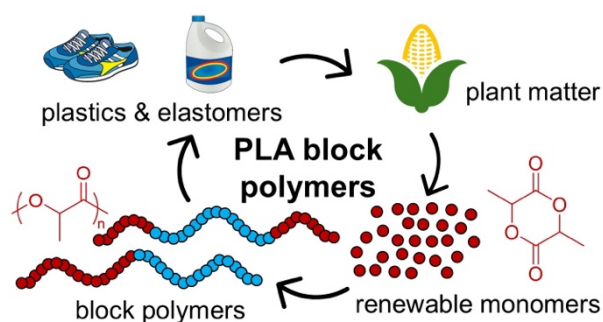
Renewable, Recyclable, and Remarkable Aliphatic Polyester Block
Polymers as Sustainable Plastics and Elastomers

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Abstract

Sustainable polymers must be the future. A working definition of a sustainable plastic is one that is produced from renewable or recovered or waste feedstocks using energy efficient processes that minimize water use, greenhouse gas emissions, and other forms of pollution. Over its life cycle, a sustainable plastic generates negligible amounts of waste and can be practically recycled, reprocessed, or reclaimed after use. A full life cycle assessment of a new sustainable polymer technology is thus critical to make informed decisions about the potential integrated benefits for society. In early stages of sustainable polymer development, this is often not possible given the focus on the research required to move a potential technology forward. However, there is a clear need to address at least four major questions when developing new sustainable polymers: where do the polymers come from, how are they made, how do they perform in use, and what are sensible end-of-use scenarios. Promoting a circular economy depends critically on the answers to all these questions. With these combined aspects in mind, in this presentation I will emphasize our work on aliphatic polyester block polymers for resilient elastomers and tough plastics with an emphasis on addressing these questions in a holistic manner. Solutions to the global plastics predicament require such comprehensive investigations to practically realize the next generation of sustainable plastics. The main components I will emphasize in this work are the various forms of polylactide (i.e., amorphous and semi-crystalline) combined with amorphous, low glass transition temperature aliphatic polyesters prepared from alkyl-substituted caprolactones and valerolactones in various ways. I will cover strategies for controlled block polymer synthesis, fundamental structure property relationships, their degradation behavior, and how then can be effectively recycled through depolymerization. Targeted applications include (i) tough plastics for packaging, and (ii) highly recoverable rubbers for adhesives, polyurethane elastomers, and thermoplastic elastomers.



Prof. Marc Hillmyer, 2nd Seminar
March 5, 2025, 16:00-17:30
@名古屋大学 工学部 IB 館 1F IB011 講義室

Tandem Ring-Opening Metathesis Polymerization and Post-Polymerization Saturation Using a Single Catalytic System

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Abstract

Ring-opening metathesis polymerization (ROMP) continues to be a very powerful technique for the preparation of polymeric materials from cyclic olefins. The examples of functional group tolerance of ruthenium-based metathesis catalysts developed by Grubbs for the preparation of functional polymers are manifold. At the end of the polymerization, the metathesis catalyst can be

liberated from the chain ends of the polymer chains by adding an end-capping reagent such as ethyl vinyl ether. However, the ruthenium carbene species can also be converted into a hydrogenation catalyst upon the addition of molecular hydrogen. We took advantage of the dual reactive nature of such ruthenium-based compounds to generate telechelic polyethylene utilizing a hydroxy-containing chain transfer agent during ROMP to install functional endgroups. These telechelics can be used as reactive compatibilizers in blends of polyethylene and polyethylene terephthalate. We also utilized this tandem approach to generate crosslinked polyethylene/hydrogenated polydicyclopentadiene thermosets that were resistant to oxidation as compared to their unsaturated precursors. Importantly, in both examples we utilized very low levels of ruthenium and carried out the hydrogenations in the absence of solvent. In this talk, I will report on both approaches and our current efforts in this area.

