



3/29
—
3/31

2024 ESG+ 化學年會 AI=∞

2024 Chemistry National Meeting
Tamkang University, Taiwan

大會手冊 PROGRAM BOOK

Organizers



Co-Organizers



Supervisor



Sponsor



CONTENT

- 1** WELCOME MESSAGE
- 2** ORGANIZING COMMITTEE
- 3** ACKNOWLEDGMENT
- 6** CONFERENCE INFORMATION
- 7** CAMPUS MAP
- 8** FLOOR PLAN
- 11** EXHIBITION & POSTER
- 13** PLENARY SPEAKERS
- 17** THE 4TH CSLT-CSJ JOINT SYMPOSIUM SPEAKERS
- 25** SPECIAL EVENTS
- 26** PROGRAM AT A GLANCE
- 31** DAILY PROGRAM
- 52** POSTER LIST



HIROAKI SUGA

The University of Tokyo, Japan

Hiroaki Suga is a Professor of the Department of Chemistry, Graduate School of Science in the University of Tokyo. He received his Bachelor of Engineering (1986) and Master of Engineering (1989) from Okayama University, and Ph. D. in Chemistry (1994) from the Massachusetts Institute of Technology. After three years of post-doctoral work in Massachusetts General Hospital, he became Assistant Professor in the Department of Chemistry in the State University of New York at Buffalo (1997) and promoted to the tenured Associate Professor (2002). In 2003, he moved to the Research Center for Advanced Science and Technology in the University of Tokyo. In 2010, he changed his affiliation to the Department of Chemistry, Graduate School of Science.

He is the recipient of Akabori Memorial Award 2014, Japanese Peptide Society, Max-Bergmann Gold Medal 2016, Vincent du Vigneaud Award 2019, The Research Award of the Alexander von Humboldt Foundation 2020, MIT T.Y. Shen Lectureship 2022, ETHZ Prelog Medal Lecture 2022, Wolf Prize in Chemistry 2023 and others. He is also a founder of PeptiDream Inc. Tokyo, a publicly traded company in the Tokyo stock market, having many partnerships with pharmaceutical companies in worldwide. He is also a founder of MiraBiologics Inc. since 2017.

PLENARY LECTURE I

主持人：陳玉如理事長 (中國化學會)

Pseudo-Natural Peptides, Products and Neobiologics for Therapeutic Applications

Macrocyclic peptides possess a number of pharmacological characteristics distinct from other well-established therapeutic molecular classes, resulting in a versatile drug modality with a unique profile of advantages. Macrocyclic peptides are accessible by not only chemical synthesis but also ribosomal synthesis. Particularly, recent inventions of the genetic code reprogramming integrated with an in vitro display format, referred to as RaPID (Random non-standard Peptides Integrated Discovery) system, have enabled us to screen mass libraries (>1 trillion members) of non-standard peptides containing multiple non-proteinogenic amino acids, giving unique properties of peptides distinct from conventional peptides, e.g. greater proteolytic stability, higher affinity (low nM to sub nM dissociation constants similar to antibodies), and superior pharmacokinetics. The field is rapidly growing evidenced by increasing interests from industrial sectors, including mega-pharmas, toward drug development efforts on macrocyclic peptides and more recently extended to pseudo-natural products. This lecture discusses the aforementioned screening technology, the RaPID system, and several showcases of therapeutic potentials of macrocyclic peptides. This lecture also discusses the most recent advance in the display of pseudo-natural products generated by thiopeptide post-translationally modifying enzymes and the development of neobiologics using LassoGraft technology.

The 4th CSLT-CSJ Joint Symposium

"Chemistry for the Circular Economy" I



Keiji Numata has been a team leader (PI) of Biomacromolecules Research Team, RIKEN (2012-), a full professor of Department of Material Chemistry, Kyoto University (2020-), and a project professor of Keio University (2023-), Japan. He was Research Director for JST-ERATO Numata Organelle Reaction Cluster Project (2016-2023) and has been Research Director for JST-COI-NEXT as well as Research Director for MEXT Program: Data Creation and Utilization-Type Material Research and Development Project (2022-). He received JSPS Prize (2024), Japan Innovation Prize (JOIP) Minister of Science and Technology Policy Award, Cabinet Office, Japan (2023), Nagase Prize from the Frontier Salon Foundation (2022), the 2020 ACS *Macro Letters/Biomacromolecules / Macromolecules* Young Investigator Award (American Chemical Society, 2020), and so on. He was appointed as an associate editor of *Polymer Journal* (2018-2020) and is currently an associate editor of *ACS Biomaterials Science and Engineering* (2020-). He also serves on the editorial advisory boards of international journals, including *Biomacromolecules* and *ACS Polymers Au*.

14:30-16:00, March 30, 2024 (Sat)

KEIJI NUMATA

Kyoto University, Japan

Big Data-driven Molecular Design of Artificial Spider Silk with Nano-scale Hierarchical Structures

Structural protein such as silk, collagen, and keratin, is one of the key molecules to realize the unique properties and functions of natural tissues and organisms. Spider silks are among the toughest known materials and thus provide models for renewable, biodegradable, and sustainable biopolymers. However, the entirety of their diversity still remains elusive, and silks that exceed the performance limits of industrial fibers are constantly being found. We sampled over 1000 spider species and developed a spider silk database, SILKome. Our global sampling, comprehensive testing, integrated analysis, and open data will provide a solid starting point for future biomaterial designs. Our research group also reported the new finding in spider silk spinning, which is essential to clear the hierarchical structure of spider silk. The scalable and sustainable synthesis method along the clarified structure-function relationship of natural proteins provides a new insight for structural and functional material design of amino acids-based polymers.

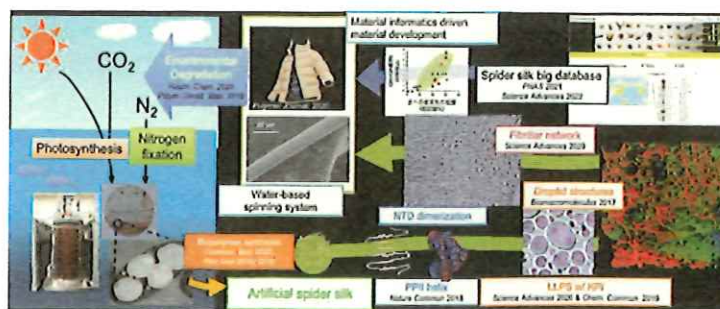


Figure: Sustainable design and biosynthesis of artificial spider silk.

The 4th CSLT-CSJ Joint Symposium

"Chemistry for the Circular Economy" II



鈴木 美和

Miwa Suzuki has been an Assistant Professor at the Gunma University Center for Food Science and Wellness since 2021. She obtained her Ph.D. from Gunma University in 2018, specializing in biodegradable plastics. Her research primarily revolves around investigating the biodegradation mechanisms of plastics in various environments.

16:30-18:00, March 30, 2024 (Sat)

MIWA SUZUKI

Gunma University, Japan

Differences between Biodegradable and Non-Biodegradable Plastics as Revealed by Microbiome

n-Alkanes are known to exhibit biodegradability^[1]. In contrast, polyethylene (PE), a high molecular mass form of *n*-alkanes, does not display biodegradability. This suggests a threshold in microbial metabolism between the molecular mass of *n*-alkanes and their biodegradability. Our study aims to elucidate the environmental degradation mechanisms of *n*-alkanes of different molecular masses by conducting meta-omics analyses.

n-Alkanes with carbon numbers from 6 to 40 showed over 58% biochemical oxygen demand (BOD) biodegradability within 100 ds in soil environment. C₄₄H₉₀ and PE do not show biodegradability.

The microflora during the BOD biodegradability tests were revealed by 16S rRNA gene amplicon sequencing analysis. The microflora in the presence of *n*-alkanes with carbon numbers below 36 were similar, whereas that in the presence of C₄₀H₈₂ was distinguishable. The microflora of C₄₄H₉₀ did not alter it compared to the absence of a carbon source.

Soil extracts were incubated with C₁₄H₃₀, C₂₀H₄₂, C₃₆H₇₄, C₄₀H₈₂, and C₄₄H₉₀ and their microflora were investigated by meta-omics analysis. A metagenome assembly genome (MAG) was created based on metagenomic DNA data of the soil microflora in the presence of each alkane. In the biodegradation process of alkanes, the initial reaction involves terminal oxidation by alkane monooxygenases produced by microorganisms^[2]. The MAGs having the alkane monooxygenase genes, which were constructed in the presence of C₁₄H₃₀, C₂₀H₄₂, and C₃₆H₇₄ were classified into the genera *Nocardioidea* and *Acinetobacter*. In contrast, the MAGs in the presence of C₄₀H₈₂ were classified into the class of Bacterioidea, and genera of *Sphingorhabdus*, and *Prostheco bacter*. The results revealed that the expressed alkane monooxygenase genes in the presence of C₄₀H₈₂ were different from those of lower molecular mass *n*-alkanes.

The 4th CSLT-CSJ Joint Symposium

"Chemistry for the Circular Economy" II



EDUCATION

Sept. 2013: PhD, Department of Chemistry and Biotechnology, Graduate School of Engineering, The University of Tokyo

JOB CAREER

- Oct. 2013-Mar. 2015: Postdoctoral researcher, Department of Chemistry, Graduate School of Science, Tokyo Institute of Technology
- Apr. 2015-Mar. 2022: Assistant professor, Department of Chemistry, Graduate School of Science, Tokyo Institute of Technology
- Apr. 2022-: Chief Researcher, Department of Chemistry and Biotechnology, Graduate School of Engineering, The University of Tokyo

Research Interest

Organometallic Chemistry, Organic Synthesis, Polymer Chemistry

16:30-18:00, March 30, 2024 (Sat)

KOHEI TAKAHASHI

The University of Tokyo, Japan

Metal-catalyzed Degradations of Epoxy Resins and Olefin-based Polymers

Environmental pollution by waste plastic is an urgent problem in human society. Polyolefins are the most consumed polymer materials but hardly degradable due to the difficulty to cleave the C-C bond in their main chain, and poor processability owing to their low solubility, high melting point, high viscosity, etc. Epoxy resin is another kind of widely used polymer, which is also challenging material to degrade because of the stability of the C-O bond in its main chain and insolubility to any solvent. Here, metal-catalyzed degradations of polyolefins and epoxy resins have been developed.

Polyethylene bearing COOH group is an easily available material via late transition metal catalyzed copolymerization reaction, bearing enhanced properties in adhesivity, mechanical strength, etc. When the polymer was subjected to a cerium-catalyzed photo-induced decarboxylation reaction, radical species was generated in the main chain, followed by fragmentation to give low molecular weight fragments (Figure a). Notably, the reaction proceeds at low temperature (60-80 °C), with O₂ in the air as the oxidant, as solid without swelling in nearly quantitative recovery of carbon atoms. A general structure of most widely used bisphenol A based epoxy resin is presented in Figure b. Degradation of the epoxy resins was realized by a nickel-catalyzed hydrogenolysis of the C-O bonds to recover bisphenol A in good yield. By DFT analyses, the key C-O cleavage step was suggested to proceed through unique transition state where nickel center does not directly interact with both of the carbon and the oxygen atom of the cleaving C-O bond.

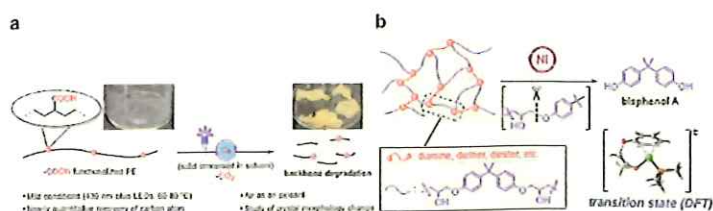


Figure a: Ce-catalyzed photodegradation of PE-COOH, b: Nickel-catalyzed degradation of epoxy resin.

The 4th CSLT-CSJ Joint Symposium

"Chemistry for the Circular Economy" I



Kotaro Satoh received his Ph.D. degree in polymer chemistry from Kyoto University under supervision of Professor Mitsuo Sawamoto in 2000. During 2000–2004, he worked for Kuraray Co., Ltd. as a researcher. In 2004, he moved to Nagoya University as an Assistant Professor working with Professor Masami Kamigaito and was promoted to an Associate Professor in 2007. In 2009–2010, he was a visiting scientist at University of California, Santa Barbara, working with Professor Craig J. Hawker. In 2019, he moved to Department of Chemical Science and Engineering, Tokyo Institute of Technology as a full professor. He received the Awards for the Encouragement of Research in Polymer Science SPSJ (2008), The Young Scientists' Prize by the Minister of Education, Culture, Sports, Science and Technology, Japan (2012), SPSJ Asahi Kasei Award (2012), and SPSJ Wiley Award (2015). His research interest includes exploring new precision polymerization systems, as well as developments of bio-based and degradable polymers.

14:30-16:00, March 30, 2024 (Sat)

KOTARO SATOH

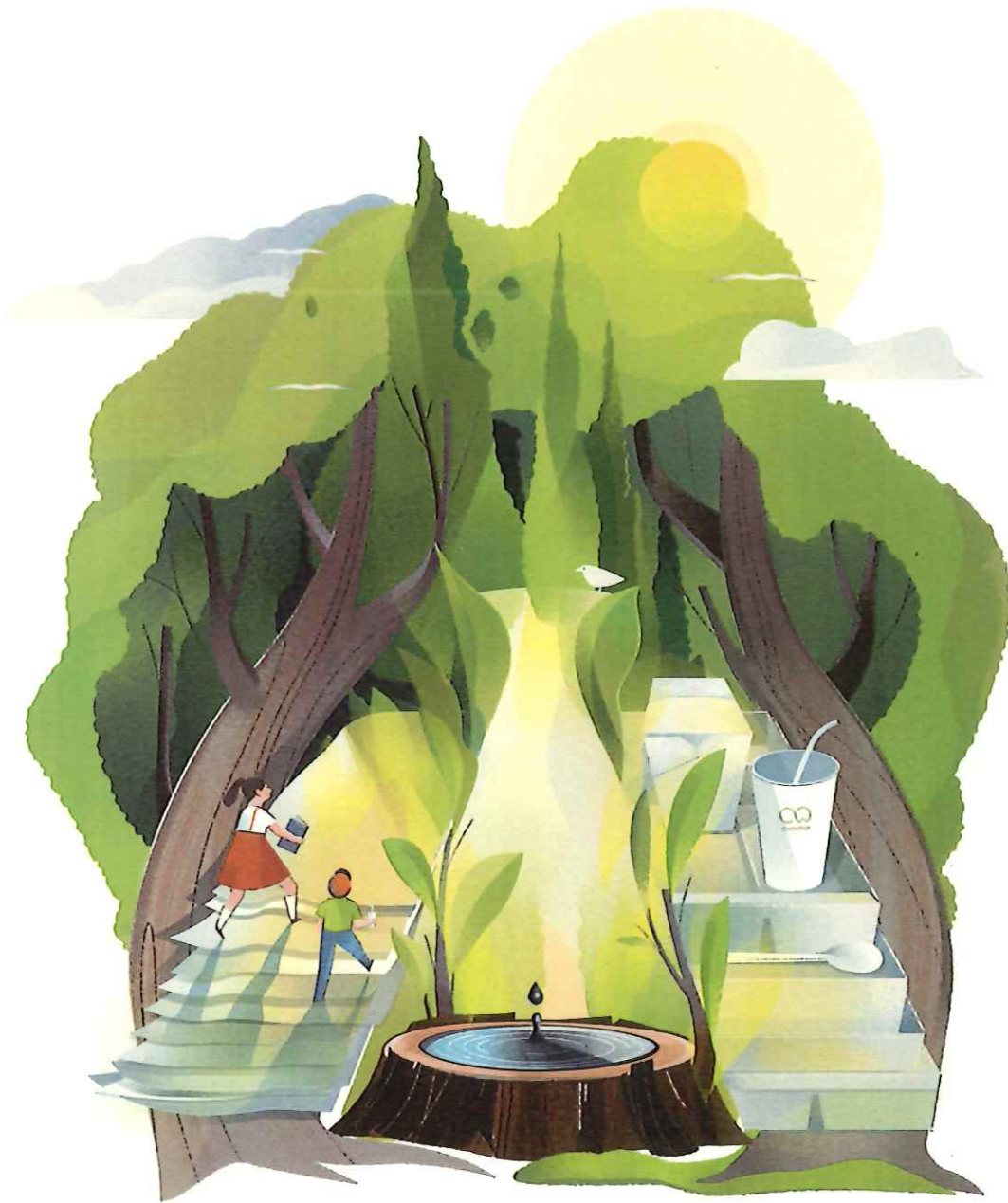
Tokyo Institute of Technology,
Japan

Novel Bio-Based and/or Degradable Polymers Using Controlled/Living Polymerization

Increasing number of techniques for vinyl polymerizations have been developed and one can easily access various polymers with well-defined primary structures by controlled/living polymerization systems. However, the environmental issue caused by polymeric material has become a serious problem nowadays. To dissolve this problem, we now must consider the beneficial materials from birth to grave. Bio-based polymer materials from renewable resources have recently been attracting much attention from the viewpoint of environmentally benign and sustainable chemistry, i.e., reducing our reliance on fossil fuels. The specific or complicated structures originating from natural products are also definitely beneficial for developing high performance or functional bio-based polymeric materials.

In this talk, I will present the controlled/living polymerization of a series of naturally-occurring and/or -derived vinyl monomer for creating novel bio-based polymers. In addition, we tried to synthesize novel degradable polymers that is composed of C-C bonds as the main chain but decomposes upon a specific stimulus by using the chemistry of controlled/living polymerization for efficient chemical recycling.

化學力量 從分子到生態 為地球繪製循環永續藍圖



環保永續，綠色會議。

本會議冊採用100%回收再生紙張，由中華紙漿股份有限公司贊助印製



中華紙漿持續投入研發和技術創新確保纖維材料滿足生產需求，符合環保和可持續性發展標準，永續經營植基於與環境和諧共處的綠色技術，期待對人類未來發揮的巨大綠色影響力。

f CircoWell益利家族

中華紙漿

in Chung Hwa Pulp Corp

