IUPAC MACRO 2026

28th – 31st July

51ST WORLD POLYMER CONGRESS

28th - 31st July 2026

Borneo Convention Centre Kuching, Sarawak, Malaysia

S02 SCIENCE AND ENGINEERING ASPECTS OF POLYMER CIRCULARITY

Next-Gen Recycling

Advances in chemical depolymerization and enzyme-based breakdown for closed-loop systems.

Design-for-Recycling

Creating cleavable molecular structures and mono-material systems that are easier to process.

Digital Innovation

Using AI-driven design and kinetic modeling to optimize recycling efficiency.

Holistic Approaches

Combining mechanical and chemical recycling while using Life Cycle Assessments (LCA) o measure true environmental impact.

Symposium Chair

Prof Dr Xiao Hu, Singapore

Submit your Abstracts Today!

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macro2026.org/symposium

secretariat@macro2026.org

Under the Auspices of: IUPAC International Union of Pure and Applied Chemistry

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Introduction

Polymer circularity has emerged as a critical paradigm in addressing the global plastic waste crisis while sustaining the benefits of polymeric materials. Moving beyond the traditional linear "take–make–dispose" model, circularity integrates advanced recycling, material redesign, and lifecycle optimization to retain value within polymer systems. Recent advances in chemical, biological, and catalytic recycling processes, alongside design-for-recyclability strategies, are enabling the transformation of polymer waste into high-value resources within a circular economy framework.

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Objectives

- To explore the fundamental science and engineering principles underpinning polymer circularity
- To examine advances in reaction engineering, material design, and process integration
- To bridge fundamental research with industrial-scale implementation
- To highlight life cycle assessment (LCA) and sustainability evaluation approaches
- To foster interdisciplinary collaboration among chemists, engineers, and policymakers

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Highlights

- Advances in chemical depolymerization and catalytic recycling for closed-loop systems
- Enzyme-enabled and bio-based degradation pathways
- AI-driven polymer design for improved recyclability and performance
- Development of mono-material systems and cleavable polymer architectures
- Kinetic modeling and process optimization for recycling technologies
- Integration of mechanical and chemical recycling approaches
- Digitalization and smart manufacturing in circular polymer systems
- Current challenges in scalability, energy efficiency, and environmental impact

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