Chemical Technologies for Closed-Loop Recycling of Thermoset Plastics

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Plastics are indispensable for our modern society possessing a multitude of purposes in healthcare, transportation, packaging, construction, etc. The global production of plastic materials has surpassed 400 million tons annually, but the major faith of end-of-life plastics is by far still landfilling or incineration. Thermoset plastics are notorious for the lack of existing recycling technologies. Because of their cross-linked structure, they cannot be remelted and remolded. In this talk, I summarize our efforts to explore the science of catalysis for disassembling two of the most prominent representatives of this class of plastics, epoxy resins/composites[1-3] and polyurethane [4-7], down to original building blocks and fibers. It is our goal to provide chemical technologies allowing this important class of plastics to enter the realm of sustainability.

Reference

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Short CV: Troels Skrydstrup is currently a Professor at the Department of Chemistry, Aarhus University and Villum Investigator devoted to research in plastic recycling. He is a former center leader of the Carbon Dioxide Activation Center at Aarhus University, funded by the Danish National Research Foundation, and is currently theme leader at the Novo Nordisk Foundation CO_2 Research Center. He is an elected fellow of the Royal Danish Academy of Sciences and Letters and was knighted by the Queen of Denmark in 2012. His awards include the Melvin Calvin Award 2018, the Bjerrum, Brønsted, Lang award in 2022, and recently also the prestigious Chinese Governmental Friendship Award (2024). Troels Skrydstrup has over 300 publications.

Research and Innovation: Recent efforts have been focused on the development of innovative isotope labeling techniques, methods for polymer disassembly and carbon dioxide capture and conversion, all through the application of transition metal chemistry.