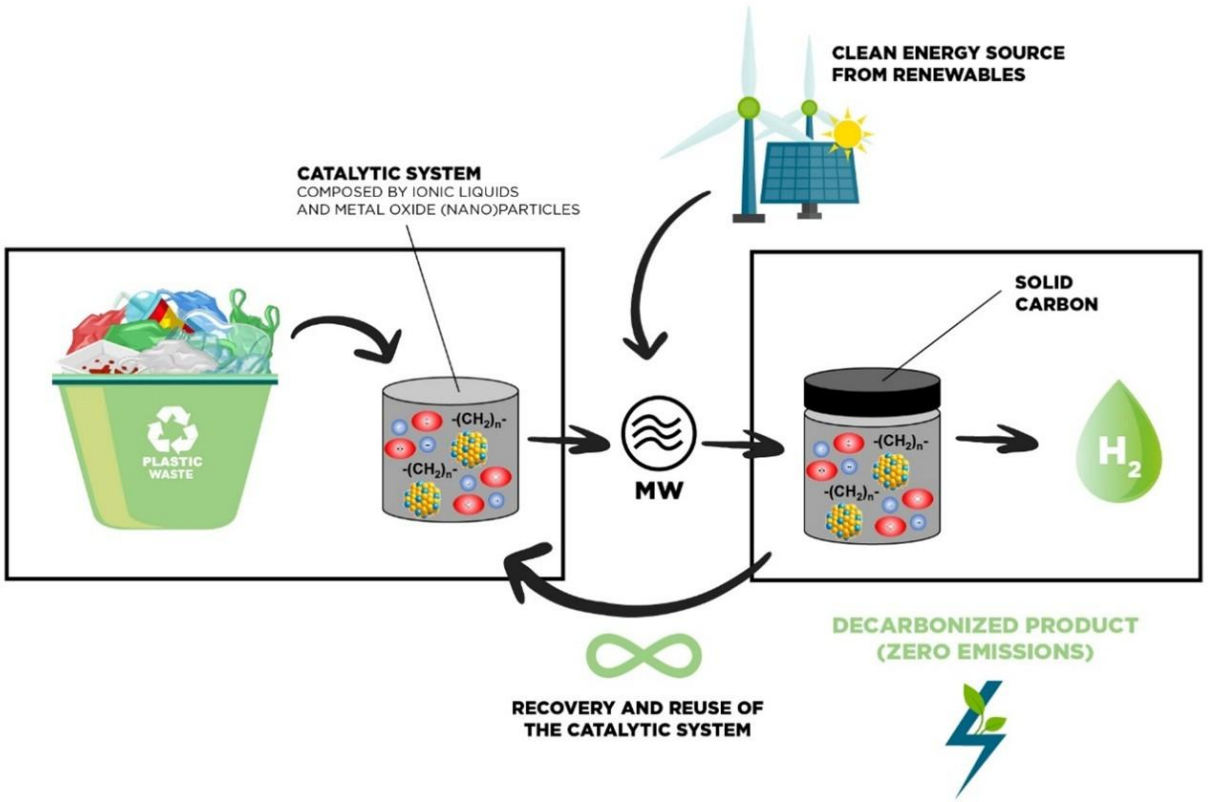
A-127

Low Temperatures Catalytic Polymer Cracking into Hydrogen and Carbon under Microwave Heating

K. Bürner, M. Haumann
Friedrich-Alexander-Universität, Chemical Reaction Engineering, Erlangen, Germany

Processes for resilient supply of carbon carriers, fuels and chemicals requires scalable technologies that replace fossil feedstocks while remaining economic competitiveness using the existing infrastructures. In this context, the conversion of polymer waste into clean hydrogen and carbon materials offers a dual opportunity: closing carbon cycles through recycled feedstocks and contributing to the emerging hydrogen economy.
This EU-funded project presents a novel catalytic concept for low-temperature polymer conversion aimed at producing a high-yield hydrogen stream below 300 °C. The approach combines the dissolution of polymers in high-temperature-stable ionic liquids (ILs) with nanoparticle catalysts to enhance mass transfer and catalytic activity.



Waste2H2 concept

Microwave-assisted heating is applied as an alternative energy input, allowing rapid and selective energy transfer directly to the catalyst. This targeted heating strategy has the potential to reduce overall reaction temperatures and improve energy efficiency. Furthermore, the use of ILs enables simplified catalyst recovery and may significantly mitigate deactivation through coking, thereby improving catalyst stability.
The concept is designed with scale-up considerations in mind, addressing compatibility with existing infrastructure, energy integration, and cost-efficiency. Ultimately, the approach aims to demonstrate how innovative catalytic technologies can support the transition toward defossilized hydrogen production while maintaining global competitiveness.