

## KIT and Audi Are Working on Recycling Method for Automotive Plastics

**Closed Loop for Plastics from Automotive Engineering: Recycled Plastics Are Processed to Pyrolysis Oil Which Can Then Be Used for New Components**



*Pyrolysis oil from mixed wastes is to close the loop for plastics from automotive engineering. (Photo: Markus Breig, KIT)*

**A large number of components in automobiles are made from plastics. They have to meet high safety, heat resistance, and quality requirements. That is why so far only petroleum-based materials have been suitable for manufacturing plastic components in cars that are subjected to extremely high wear. In most cases, such materials cannot be recycled. Whereas plastics of the same type can often be recycled mechanically, recycling of mixed plastic waste poses a major challenge. The THINK TANK Industrial Resource Strategies of Karlsruhe Institute of Technology (KIT) and Audi are therefore launching a pilot project for chemical recycling in order to feed such mixed plastic fractions back into a resource-conserving circular system.**

“Recycling automotive plastics has not yet been possible for many components. That is why we are doing pioneering work here together with Audi,” says Professor Dieter Stapf, Head of KIT’s Institute for Technical Chemistry, who also is involved in the THINK TANK. “If we want to close these loops, we need to develop suitable methods.” So far, chemical recycling has been the only method that can be used to convert such mixed plastic wastes into products, whose quality matches that of new products. As a result, a wider range of plastics

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can be recovered, Stapf says. “Such closed material loops save valuable resources, because less primary material is required. This, in turn, saves energy and costs – and is beneficial to the environment,” says Dr. Rebekka Volk from KIT’s Institute for Industrial Production.

The pilot project “Chemical Recycling of Plastics in Automotive Engineering” is conducted by the THINK TANK Industrial Resource Strategies that has been established at KIT by the Baden-Württemberg State Government together with industry and the support of academia. “Responsible use of resources is the joint obligation of industry, science, and politics. The THINK TANK pools all competencies to master this big challenge and to serve society and the environment,” says Professor Thomas Hirth, KIT Vice-President for Innovation and International Affairs and Spokesperson of the THINK TANK.

“Chemical recycling can be a major component of comprehensive plastics recycling. This makes it an interesting proposition for the automotive industry. The THINK TANK and Audi are jointly addressing a central issue of making automobiles more sustainable and environmentally friendly in future irrespective of their type of powertrain. The THINK TANK is focused on a holistic view of raw material loops,” says Dr. Christian Kühne, Managing Director of the THINK TANK.

Audi is among the first automotive manufacturers testing this recycling method in a pilot project with plastics from automotive engineering. “We want to establish smart circular systems in our supply chains and make efficient use of resources,” says Marco Philippi, Senior Director Procurement Strategy of Audi. “Chemical recycling has a great potential for this: If plastic components can be produced from pyrolysis oil instead of petroleum, it would be possible to significantly increase the proportion of sustainably manufactured components in automobiles. In the long run, this method can also play a role in end-of-life vehicle recycling.”

The “Chemical Recycling of Plastics in Automotive Engineering” pilot project targets the creation of smart circular systems for plastics and establishing this method as a complement to mechanical recycling and replacement of energetic recovery. Partnering with KIT’s THINK TANK, Audi intends to initially test the technical feasibility of chemical recycling and to evaluate the method in terms of its economic efficiency and environmental impacts. For this purpose, the company provides plastic components that are no longer needed, such as fuel tanks, wheel trim parts, and radiator grills, from Audi models returning from the German dealership network, for example. The plastic components are processed to pyrolysis oil by chemical recycling. In the medium run, components based on pyrolysis oil can be used in

automobiles again. If technical feasibility will be demonstrated, Audi will industrialize the technology and progressively apply it to more and more components.

### **Pyrolysis Methods for more Sustainable Products**

Research and technology development for sustainable circular economy are major topics at KIT. "We are systematically studying the potentials of pyrolysis and how pyrolysis processes have to be designed on a large scale for maximum recycling of resources," Stapf says. Chemical recycling of plastic wastes can help make modern products more sustainable and prevent greenhouse gas emissions.

### **About the THINK TANK Industrial Resource Strategies**

The THINK TANK Industrial Resources Strategies is a joint initiative of politics and industry with the support of science. It provides politics and industry with scientific advice on central technological and strategic aspects of resource efficiency, use of resources, and resource policy. The THINK TANK compiles data and facts in an objective way, processes them understandably, and produces results that are recognized equally by politics and industry, thus contributing largely to fact-based decisions of all parties. The THINK TANK was established on January 09, 2018 and is located at Karlsruhe Institute of Technology (KIT). Spokesperson of the THINK TANK is Professor Thomas Hirth, KIT Vice-President for Innovation and International Affairs. Operative management of the THINK TANK lies in the hands of Managing Director Dr. Christian Kühne.

The THINK TANK Industrial Resource Strategies is financed from funds of the Baden-Württemberg Ministry of Environment, Climate Protection, and the Energy Sector.



Baden-Württemberg

MINISTERIUM FÜR UMWELT, KLIMA UND ENERGIEWIRTSCHAFT

### **Virtual Event on Chemical Recycling**

The virtual event "Highway or Holzweg - Chemisches Recycling von Kunststoffen" on January 25, 2021, 18.00 hrs, at the Baden-Württemberg State Representation in Berlin will provide a platform to discuss opportunities and challenges of chemical recycling of plastics. The

event will be organized by the Baden-Württemberg Ministry of Environment, Climate Protection, and the Energy Sector.

More information: <https://um.baden-wuerttemberg.de/en/home/>

**Being “The Research University in the Helmholtz Association,” KIT creates and imparts knowledge for the society and the environment. It is the objective to make significant contributions to the global challenges in the fields of energy, mobility and information. For this, about 9,300 employees cooperate in a broad range of disciplines in natural sciences, engineering sciences, economics, and the humanities and social sciences. KIT prepares its 24,400 students for responsible tasks in society, industry, and science by offering research-based study programs. Innovation efforts at KIT build a bridge between important scientific findings and their application for the benefit of society, economic prosperity, and the preservation of our natural basis of life. KIT is one of the German universities of excellence.**

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