

## **Using hydrotreatment for upgrading plastic pyrolysis oil: Approaches and future challenges**

Carola Jendrzok, Klaus Raffelt, Jörg Sauer

Institute of Catalysis Research and Technology, Karlsruhe Institute of Technology, Germany

### **Abstract**

There is an increasing interest in the chemical recycling of plastics for achieving a circular economy and closing the carbon gap. One chemical recycling option for plastics is pyrolysis whereby plastic pyrolysis oil (PPO) is produced. Current research is focused on the utilization of the PPO in various applications such as a feedstock for steam crackers.

For this use, the PPO has to meet the threshold value for industrial steam crackers. Some of the important heteroatom thresholds are  $< 3$  ppm Chlorine and  $< 100$  ppm Nitrogen. Furthermore, some metals thresholds are  $< 0.001$  ppm Iron and  $< 1$  ppm Silicon. Moreover, the olefin content has a limitation of 2 wt%. [1]

The PPO of real plastic waste does not meet the above-mentioned industrial threshold, while the exceeding of the limit values is strongly dependent on the composition of the plastic waste. That is why the PPO has to be upgraded otherwise PPO can only be used in a small dose as a drop-in in fossil-based naphtha feedstock. The saturation and decontamination of the PPO can be achieved via catalytical hydrotreatment.

This work gives an overview of the developed and tested catalysts for the hydrotreatment of PPO, such as Pd- and Ni-based catalysts. A focus is set on the achieved decontamination. Further, it presents the experimental parameters like the pressure. Concluding, the catalysts are compared based on the results obtained and an outlook is given on which focus can be set for future research.

[1] Kusenberg, Marvin, et al. "Opportunities and challenges for the application of post-consumer plastic waste pyrolysis oils as steam cracker feedstocks: To decontaminate or not to decontaminate?." *Waste Management* 138 (2022): 83-115.