

The role of hydrogen and syngas for coupling energy transformation and circular economy

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Abstract

Hydrogen is a key element for the energy transition, as well as for the path towards a circular carbon economy. Both transformation processes face individual challenges, such as clean energy demand, import technologies and transport infrastructure in case of hydrogen. Circular carbon economy has to address feedstock varieties, technology development needs and specific customer demand for sustainable hydrocarbon products. However, hydrogen as energy carrier and feedstock will be an important contact point between energy transition and future circular economy. This presentation will give an overview of the different perspectives on this interplay.

In case of hydrogen, supply and distribution are key questions. According to the German National Hydrogen Strategy up to 70% of the German hydrogen demand have to be covered by import of hydrogen or its derivatives in short to mid-term. Different hydrogen import options, such as liquid hydrogen, ammonia, methane or methanol will be evaluated in terms of energy efficiency and infrastructural demand. Additionally, Germany has to build up a hydrogen gas grid infrastructure, which will be embedded in the European hydrogen backbone. Current hydrogen grid plans will be evaluated with hydraulic grid models.

In case of circular carbon economy, the presentation will focus on the role of syngas production via entrained flow gasification. Biogenic or anthropogenic (mainly mixed plastic waste) sources may offer an entry into circular carbon value chains with existing gasifier assets. However, the switch from conventional fossil gasifier feedstocks to biogenic or plastic-based pyrolysis oils poses significant thermochemical challenges on the conversion process. Thus, feedstock switch requires detailed understanding of the underlying physical and thermochemical processes, such as atomization, flame stabilization, fuel conversion, slagging and heat release.

This presentation will shed a light on the German's gas industry view on hydrogen and the work of the DVGW (Deutscher Verein des Gas- und Wasserfaches e.V.) research center at the Engler-Bunte-Institut in Karlsruhe. And it will give insights into the multi-scale work at the gasification department in the Institute for Technical Chemistry (ITC) as part of the Helmholtz research program.