

Opportunities for the catalytic valorization of methane

Emiel J.M. Hensen[†]

Eindhoven University of Technology

(e.j.m.hensen@tue.nl[†])

Methane has huge potential as a chemical feedstock as it is an abundant and relatively cheap carbon source with a lower negative environmental footprint than other fossil resources. Despite the clear potential of methane, efficient and industrially applicable direct methane-to-products conversion is not yet available for the chemical industry. In this lecture, I will provide a brief overview of the catalytic challenges encountered in developing direct routes for the conversion of methane to chemicals. The activation of methane by metal, metal oxide and other catalytic materials will be discussed in the framework of oxidative and non-oxidative conversion routes. In general, oxidative routes suffer from a low selectivity, whereas catalyst stability is a key challenge in non-oxidative approaches that require high reaction temperatures to overcome thermodynamic limitations. I will specifically discuss recent progress in the understanding of methane oxidation to methanol by Cu-modified zeolites and the dehydroaromatization of methane to aromatics. Emphasis will be on the understanding of the molecular