Kemijski inštitut
Ljubljana
Slovenija

National
Institute of Chemistry
Slovenia

http://www.ki.si

VABILO NA PREGLOV KOLOKVIJ /
INVITATION TO THE PREGL COLLOQUIUM

Prof. Dr. Freek Kapteijn

Catalysis Engineering, ChemE-Delft University of Technology, The Netherlands
f.kapteijn@tudelft.nl

Četrtek / Thursday 17. 11. 2016, ob / at 13:00

Velika predavalnica Kemijskega inštituta / Lecture Hall, National Institute of Chemistry; Hajdrihova 19, Ljubljana

Catalysis Engineering - Structuring Catalysts and Reactors for Energy and Atom Efficient Multiphase Operation

Many catalytic processes, including recent routes to process renewables, are multiphase operations, comprising mostly a solid catalyst and reactants and products in the gas and liquid phase. Intrinsic reaction kinetics, mass and heat transport processes in the catalyst, G/L and L/S phase equilibria and reactor hydrodynamics are coupled and determine together the overall process.

Catalyst particle size, pore size and liquid phase determine the diffusion time for molecules to reach the active sites. Hydrodynamics in the reactor control the mass and heat transfer rates between gas and liquid, between liquid and solid catalyst, and with the surroundings. These characteristic transport times should be compatible with the intrinsic catalytic reaction time(s) for an optimal productivity or selectivity. The increasing use of zeolites with strongly restricted diffusion poses even larger challenges.

Various multiphase reactor types are being used, with the slurry bubble column reactor and the trickle-bed reactor as the two extremes of the most common operations. In these systems the reaction steps and transport phenomena are strongly coupled. Alteration of one step in a process to improve it affects the other. In an ideal situation one would like to optimize each step in the process independently of the other.

Structuring of catalysts and reactors from the nm to the m scale allows decoupling the scale-dependent and independent phenomena that play a role in multiphase catalytic processes. Following this approach allows optimizing and fine-tuning the reactor operation. This is illustrated for the classical FTS process where a considerable productivity improvement is predicted. The use of bifunctional catalysts further extends the application scope of this approach and may contribute to more sustainable developments. Advances in materials science for the controlled manufacture of such structured systems are crucial.

Vljudno vabljeni / Kindly invited

info: Prof. Dr. Albin Pintar (albin.pintar@ki.si)