Overview of catalyst development in CARENA

Yves Schuurman

Workshop: "Catalytic Membrane reactors, what's next?"

29 & 30 April 2015
ECN Petten, the Netherlands
CAtalytic membrane REactors based on New mAterials for C1-C4 valorization

objective

• Develop *catalytic membrane reactors* for the efficient conversion of light alkanes and CO₂ into higher value chemicals resulting in the reduction of the number of process steps and the increase in feedstock flexibility for the European chemical industry

Workshop: “Catalytic Membrane reactors, what's next?”
– ECN Petten (NL) 29 & 30 April 2015
Project focus:

Increasing the overlap in operating windows of membrane and reaction

Operating window defined by the process

Operating window defined by the membrane

Workshop: "Catalytic Membrane reactors, what's next?"
– ECN Petten (NL) 29 & 30 April 2015
Project focus

A larger process operating window:

- Novel catalysts
- Innovative reactor designs optimizing catalyst and membrane proximity
- Process synthesis

Workshop: "Catalytic Membrane reactors, what's next?"
- ECN Petten (NL) 29 & 30 April 2015
Mismatch between operating window of membrane and reaction.
Dimethylcarbonate production

\[ E_{\text{act}} = 77 \text{ kJ/mol} \]
Propane dehydrogenation

C\textsubscript{3}H\textsubscript{8} \rightarrow \textcolor{red}{\text{H}_2} \rightarrow \textcolor{red}{\text{H}_2} \rightarrow \text{C}_3\text{H}_6

Better coke resistant catalysts

Workshop: "Catalytic Membrane reactors, what's next?"
– ECN Petten (NL) 29 & 30 April 2015
Ethylene production

\[ 2\text{CH}_4 \rightarrow \text{C}_2\text{H}_4 + \text{H}_2\text{O} \]

Tight contact between catalyst and membrane
Nano-structured catalyst/membrane
Thank you for your attention