



“The overall concept of the ROMEIO project, the combination of reaction and membrane based separation of the product within one reactor is fascinating.”

#### **H**i Björn. Can you please tell us a little bit about yourself?

I was born in the near of Frankfurt, Germany. After school I studied Chemistry with main focus on chemical engineering at Technische Universität Darmstadt. During my studies I spent one year at the University of Bath in the UK where I focused mainly on courses in chemical engineering. I finalised my studies at Technische Universität Darmstadt with a PhD in chemical engineering and joined Linde Engineering in Munich, in November 2007.

#### **W**hat does your daily job look like?

I work at Linde Engineering in the department for chemical development and services (RDC). My main focus within the department is the field of Hydrogen (steam reformer and water gas shift reactors) and Synthesis gas plants (coal, crude oil or natural gas gasification processes) and gas scrubbing (e.g. Rectisol plants) or gas separating processes (e.g. adsorption or membrane based). I was project leader for a Rectisol pilot plant project in Singapore and currently I am member of our steam reformer pilot plant project team, where I am responsible for analytics and plant operation.

Furthermore, I am involved in new commercial projects as analytical expert or for troubleshootings in existing plants.

#### **W**hat excites you in ROMEIO?

The overall concept of the ROMEIO project, the combination of reaction and membrane based separation of the product within one reactor, is fascinating. The approach of ROMEIO will complement the effort of Linde in the sector of new membrane based gas separation techniques for synthesis gas or other gas streams. The developments achieved in the ROMEIO project can help Linde either in the main goal of ROMEIO for combination of reaction and separation within one reactor or in an independent low temperature membrane based separation process for Hydrogen.

Furthermore, if the overall concept of the project works out, there will be a lot of other applications for this concept in chemical industry which could benefit from it. There are several challenges we have to overcome within the project but I am satisfied that we can handle these challenges. We have a good combination of partners!

#### **F**rom your perspective, what is innovative with ROMEIO?

For me, there are two main innovative aspects within ROMEIO. First, is the usage of ceramics (SiC, zeolitic and/or alumina based

materials) and carbon nano tube based support structures for an integrated reaction/separation process. Second, is the challenge to select a good system of reaction (catalyst) and separation (membrane) which works together in regard of reaction rate and diffusion rate, they have to be adjusted to be in an equilibrium.

### **What are, according to you, the major challenges to be overcome in ROMEO?**

The main challenge will be to find appropriate membranes which achieve high selectivities to the desired products at elevated temperatures. Furthermore, the anchoring of the ionic liquid based catalytic system (SILP) and the membrane to the support structure will be challenging, therefore new innovative concepts have to be developed to achieve a long-term stable reaction/separation system. If this has been achieved, the next challenge will be the up scaling of the coated (catalyst and membrane) support modules for large scale production.

### **Could you give us a concrete example of a benefit that could be expected from ROMEO?**

The benefit of integration of two process steps (reaction and separation) into one process step will be huge regarding energy savings (reducing of CO2 emissions) as well as reduction of CAPEX costs for new plants (reduction of downstream process units) for the chemical industry.

For example, if it is possible to generate Hydrogen from biomass via a biomass gasification combined with an integrated Water-gas-shift/ Membrane separation reactor system, this would save several million € in CAPEX costs (due to not needed investment for a gas separation unit (PSA)). There would also be savings of up-to 40 % in emissions per cubic meter of hydrogen. If we can achieve the targets of the ROMEO project, this will have a huge impact on the "green" Hydrogen market!

### **You attended the first progress meeting in Aachen in March 2016. What will you remember most from this meeting?**

Overall the meeting was well organized and we had a good discussion on the further steps to be made. Everybody was ambitious to help the partners to solve the issues they already came up with. I think this showed very well that everybody is interested in bringing this project on a good way. Besides this we had a very nice guided tour through the historic center of Aachen and the evening continued with a marvelous dinner.

### **Thanks for answering my questions and all the best in ROMEO!**



#### **ROMEIO in brief**

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14 September 2015

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13 September 2019

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6 Million €

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