The Role of Catalysis for the Energy-Transition
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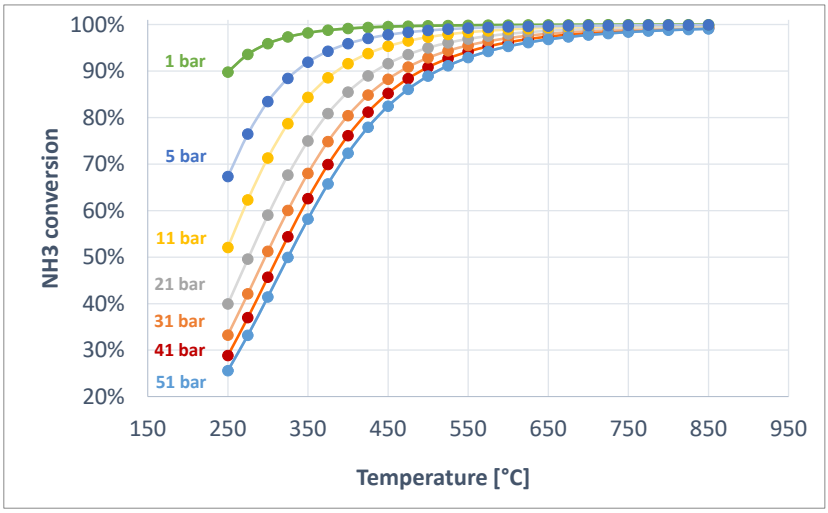
Insights to the NH3 Reforming Process beyond Catalyst Design

E. Frei[1], N. Bottke[1], L. Karwacki[2], M. Schwab[2], M. Felischak[3]
[1]BASF SE, RCC/PP, Ludwigshafen
[2]BASF SE, G-CCP/MD, Ludwigshafen
[3]BASF SE, RCP/CD, Ludwigshafen

Abstract
Ammonia (NH_3) is seen as an energy vector of the future, able to chemically store significant amounts of H_2 and be produced on a large scale from regenerative energy sources. The reforming of NH_3 (equation 1) on site, where the H2 is needed, might be the last step in closing a H2 value chain based on renewable electricity.

(1) $2\ NH_3 \rightleftharpoons N_2 + 3\ H_2 \quad \Delta Hr = +91.2\ kJ/mol$

For the endothermic reforming of ammonia, significant amounts of energy are needed. So, the reaction temperature is an important measure from the process perspective. Since the thermodynamic limitation at lower temperatures are huge, it is a clear trade-off between kinetics and thermodynamics. The same holds for the reaction pressure, at lower pressures the thermodynamic limitation is also lower, but the hydrogen is produced on a lower pressure level. This means, dependent on the down-stream application, a lot of energy for compressor work is needed.



Within our contribution, we want to show possible catalytic and process solutions for the entire pressure and temperature range. Based on our catalytic solutions we developed kinetic models, allowing us to simulate the ammonia reforming process itself and optimizing the CapEx and OpeEx of a plant. The process simulations will be discussed within the thermodynamic frame and certain applications.