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AmoMax®-Casale: from the concept to the implementation in industrial reactors

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Catalytic ammonia synthesis from H_2 and N_2 represents one of the most important industrial reactions today. The catalyst used in this reaction is made from iron oxide with small amounts of other oxides added as promoters to enhance activity and stability. Despite the Haber-Bosch process being more than 100 years old [1-3], only incremental improvements have been achieved until recently. Combining the catalyst expertise of CLARIANT and the engineering knowledge of CASALE, a breakthrough has been realized leading to the new ammonia synthesis catalyst AmoMax®-Casale. The catalyst is a customized design by CLARIANT for CASALE reactors (patent pending) with significantly improved activity compared to state-of-the-art iron-based catalysts. When introducing a new catalyst into the market, performance evaluation is of utmost importance, but simple tests of the catalyst in powder form are not representative enough for industrial applications and only suitable for screening purposes. Therefore, a precise and rigorous methodology must be applied. The AmoMax®-Casale was awarded with the ICIS Best Sustainable process 2020 [4] and with the Sandmeyer Award 2021 [5].

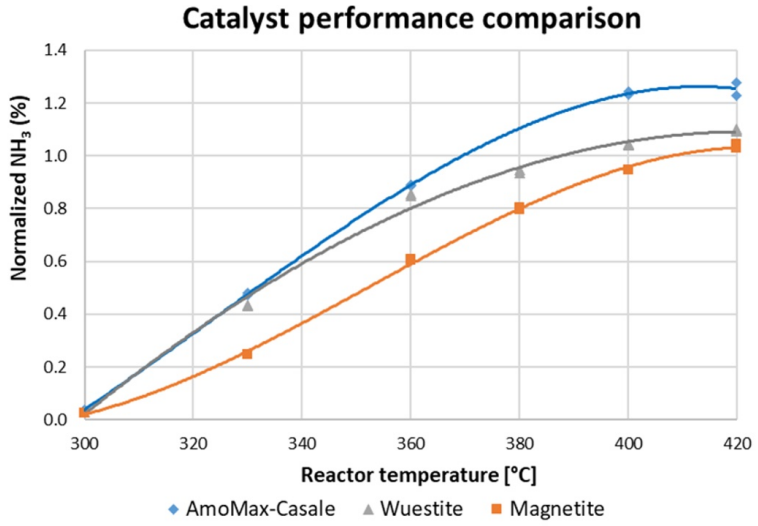

Figure 1. Comparison between state-of-the art magnetite-based catalyst, wuestite based catalyst and AmoMax®-Casale

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[2] Martyn V. Twigg, Catalyst Handbook, Second Edition. Wolf Publishing Ltd. (1989).
[3] Robert Jennings, Catalytic Ammonia Synthesis Fundamentals and Practice. Springer (1991).
[4] https://eu.eventscloud.com/ehome/innovationawards/Home/ consulted on the 19.01.2021
[5] https://scg.ch/index.php?option=com_content&view=category&layout=blog&id=91&Itemid=590&lang=en consulted on the 19.01.2021

A battle for new antibiotics

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The availability of effective antibiotics is a key factor of today's medicine. Without antibiotics many of the modern achievements in neonatal and geriatric care, surgery and cancer therapy would be at risk. With the emergence and continuous spread of resistance among pathogens of different origin, this risk is growing rapidly. At the same time the development of novel agents with new modes of action lacking cross resistance does not follow the medical need. The reasons for this discrepancy are numerous, ranging from scientific challenges, regulatory requirements to economic and societal issues. Only very few pharmaceutical companies remain active in the field.

The complexity of antibacterial drug discovery in the 21st century will be illustrated with a journey through the chemical space of Actelion/Idorsias bacterial topoisomerase inhibitor program.

Mechanistic insights into the formation of Cu nanocrystals pave the way towards better catalysts to reduce CO_2

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The chemistry of non-noble metal nanocrystals (NCs) is far less advanced compared to noble metals. Yet, tuning their composition, size and shape is important for various applications, spanning from plasmonics to catalysis.

In this talk, I will present our recent group efforts towards the synthesis via colloidal chemistry of Cu NCs and Cu-based NCs.

First of all, I will focus on our studies on nucleation and growth. A fundamental understanding of the formation mechanisms is indeed crucial to rationally approach the design of new or underexplored classes of materials. Here, in-situ investigations by X-Ray spectroscopies and scattering allowed us to identify the key reaction intermediates and to direct the growth towards shaped-controlled Cu NCs.

I will then illustrate how these NCs can help to identify selectivity rules at the branching nodes which lead to C_1 and C_{2+}reduction products in the challenging electrochemical CO2 reduction reaction. I will conclude by sharing our latest results which illustrate that the above discussed catalysts are not only model systems but can be implemented in a gas-fed electrolyzer and sustain the same selectivity at technologically relevant conditions with currents up to 300 mA/cm^2.

Some Highlights from an Agro Career

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After more than three three decades working for Syngenta and its legacy companies (Sandoz Agro and Novartis Agro), there have been many exciting personal highlights. In this talk, two of such will be discussed, namely the discovery of the corn herbicide bicyclopyrone, and the isolation, structure elucidation, synthesis, and use in crop protection of the host marking pheromone of the Mexican fruit fly *Anastrepha ludens.*