Movers & Shakers

Dr. Hendrik Spod

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Dr. Hendrik Spod received his Dr.-Ing. degree in Chemistry from the Technische Universitaet Darmstadt in 2016, where his research focused on the selective hydrogenation of benzene. He has more than 15 years of experience in catalytic processes and catalyst manufacturing.

In his current role, he oversees all innovation activities for the chemicals business of Heraeus Precious Metals worldwide. Before being appointed Global Head of Innovation Chemicals at Heraeus Precious Metals, he worked in different roles within the company's catalyst businesses.

Hendrik and his team have extensive expertise in the design, scale-up, and manufacturing of precious metal-based catalysts leading to the development of high-quality catalyst products that can be fine-tuned to customers' demands and applications. Together with his team, he has authored many articles for industry journals and speaks at numerous global conferences. His primary areas of interest include refinery and petrochemical catalysts, automotive catalysts, and catalysts for biomass conversion, including other sustainable feedstocks. He can be reached at hendrik.spod@heraeus.com.

The Catalyst Review asked Dr. Spod to share his thoughts on using catalysts in existing and future chemical processes.

Most energy sources and industrially produced chemicals are derived from fossil fuel-based resources. The initial investment costs associated with these processes are very high. So are the chances that they will continue to be used for decades using these existing processes. Nevertheless, these processes can and will be optimized continuously with respect to their sustainability and atom economy.

Such improvements are also necessary to bridge the gap between existing technologies and future relevant, more environmentally friendly technologies based on renewables. However, considerable effort will be required to improve existing catalytic processes as well as to develop catalysts for new, unique processes. Therefore, the focus for both processes should be on efficiency and environmental friendliness. Here, the twelve basic principles of green chemistry come into play, of which three principles are most important: using optimized catalysts, improving the selectivity, i.e., reducing unwanted side products - and lastly, avoiding the formation of greenhouse gases.

As a catalyst manufacturer, we can make a positive contribution to all three aspects for a broad range of industries. Approximately 75% of all existing industrial chemical transformations and about 90% of newly developed processes involve the use of homogeneous or heterogeneous catalysts.

As far as addressing the most significant challenges for using current and new catalyst technologies for existing and future processes, I believe it will be necessary to improve catalyst lifetime and efficiency for current large-scale industrial processes. The development of these improvements often takes place in close cooperation with the process operators. Thanks to the large amount of data combined with our expertise, we can initiate measures for improvements, such as introducing stabilizing agents, regeneration cycles, shapes, and distributions of the active component.

Regarding how best to deal with these different requirements with process operators, it will be essential to build up a broad portfolio of possible catalyst solutions and understand their key characteristics. Digital transformation, especially AI, can facilitate the process by identifying the connection between the most relevant catalyst characteristics and the desired output based on the historically available data.

New process development typically starts with a proof-of-concept phase followed by minor improvements to the catalyst system in a batch process. Once a suitable catalyst is found, it is necessary to collect data on the reaction kinetics, the robustness of the catalyst through aging or long-term stability tests, and the process conditions themselves. All these parameters influence the design of the process and may lead to a change in the catalyst again.

After all these initial hurdles are overcome, the first installed catalyst must be further optimized while the process is running. All these steps are very time-intensive, meaning it can take a long time until a final catalyst for new processes is found.

Finally, I believe that the production of green hydrogen, such as green ammonia or green methanol, are new and important future processes. Currently, most hydrogen is produced using the steam-reforming process of fossil fuels (mainly natural gas). Green hydrogen, produced through renewable sources like wind and solar power, offers a clean and sustainable alternative to conventional hydrogen production methods. Green ammonia and methanol, derived from green hydrogen, present additional opportunities as versatile energy carriers and raw materials for various applications. All these processes are catalyst dependent and will require innovative development of both systems and materials.

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- Polyolefin Supports
- Process Technology Markets
- Advanced Electrolysis Chemicals