The Role of Catalysis for the Energy-Transition
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High-throughput Technology in Electrochemistry

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Abstract

In order to reach a 55% reduction in greenhouse gas by 2030 and achieve net zero by 2050 hydrogen technologies play a vital role in the next decades. In particular, water electrolysis will become a key technology for producing green hydrogen. The first generation of electrolyzers is currently installed in large-scale industrial applications such as refineries or steel factories. The operational experience gathered there will be the basis for further optimization. In addition, large-scale production and material use are in a continuous improvement and quality control process. All these efforts need strong R&D support with enhanced experimentation and testing technology. At present, classical single fold test technology or short stacks are mostly used for electrochemical R&D on electrolysis or fuel cell applications.

Due to the obvious similarity between electrocatalysis and heterogeneous catalysis, combinatorial methods developed for the latter can also be applied in electrocatalysis. Our company specialized in parallel catalyst testing builds on this experience and introduces a new system for combinatorial electrocatalysis testing addressing both electrochemical synthesis of, e.g., renewable feeds or conversion of these feeds to release the stored energy. Most obviously, online analysis, as already applied in heterogeneous catalysis, is supplemented by voltammetry and impedance spectroscopy. Thus, electrocatalysis requires more advanced digitalization tools as the parameter space expands by numerous new electric parameters. It seems likely that current tools will not suffice anymore and must be upgraded for example by applying feedback loops or machine learning or both.

In this presentation, we will introduce the high throughput platform for enhanced electrochemical testing to support the ongoing effort of optimizing electrochemical conversion technology. A case study will illustrate the key features of high throughput experimentation in the electrochemical space.