Press release

Evonik and LIKAT discover new type of hydroformylation

- Contrary to accepted doctrine, the reaction also works at low pressures with a stable catalyst
- Discovery opens way to cost-effective and environmentally friendly production of aldehydes and alcohols
- Special recognition through publication in renowned journal Science

September 13, 2022

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Marl (Germany). A research team involving Evonik and the Leibniz Institute for Catalysis (LIKAT) has made another breakthrough in the field of hydroformylation. Hydroformylation is one of the most important reactions in industrial organic chemistry. Unsaturated compounds are converted into aldehydes and alcohols using synthesis gas.

Until recently, the scientific consensus was that this reaction, if catalyzed with cobalt, could only be carried out under high pressure conditions without the catalyst decomposing. This was disproved by Professor Dr. Robert Franke, head of hydroformylation research at Evonik, together with research partners from LIKAT, Dr. Baoxin Zhang and Dr. Christoph Kubis. "With this discovery, we have identified new process options for hydroformylation," says Franke, who is also a professor of chemistry at Ruhr University in Bochum. "In the future, it may be possible to make this large-scale reaction much more economical and environmentally friendly. Developing these processes will be our task for the next few years."

The researchers succeeded in demonstrating, for the first time, that cobalt carbonyls – very inexpensive compounds for the catalysis of hydroformylation – are active and stable even at low pressures. The key to this discovery was the development of special spectroscopic measurement methods and associated mathematical tools for data evaluation.

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High-pressure processes that use cobalt carbonyls as catalysts could be replaced in the future by new processes with lower pressures. These new processes would then be more cost-effective, energy-efficient and thus more sustainable. At Evonik, this would have an impact on the production of long-chain alcohols such as the oxo alcohol isononanol (INA), which is used, among other things, to manufacture plasticizers.

Due to the particular importance of this discovery, the renowned journal *Science* published the results of the project. This is Professor Dr. Robert Franke's second appearance in *Science* on carbonylation reactions. In 2020, Franke succeeded in a so-called 'dream reaction': the direct carbonylation of 1,3-butadiene. This discovery was also worthy of publication in the journal.

Link to the article:
https://www.science.org/doi/10.1126/science.abm4465

Company information
Evonik is one of the world leaders in specialty chemicals. The company is active in more than 100 countries around the world and generated sales of €15 billion and an operating profit (adjusted EBITDA) of €2.38 billion in 2021. Evonik goes far beyond chemistry to create innovative, profitable and sustainable solutions for customers. About 33,000 employees work together for a common purpose: We want to improve life today and tomorrow.

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