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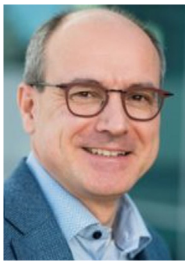
Using Biomass Gasification Mineral Residue as Catalyst to Produce Light Olefins from CO, CO_2, and H_2 Mixtures







Iris C. ten Have | Robin Y. van den Brink | Dr. Stéphane C. Marie-Rose | Dr. Florian Meirer | Prof. Dr. Bert M. Weckhuysen

Invited for this month's cover is the group of Bert Weckhuysen at Utrecht University. The image shows how iron nanoparticles in a biomass gasification residue can convert CO, CO_2, and H_2 mixtures into light olefins.
The Research Article itself is available at 10.1002/cssc.202200436.

How would you describe to the layperson the most significant result of this study?

Biomass gasification is in principle a renewable process that allows the transformation of various biomass feedstocks, such as agricultural waste, to a more convenient gaseous fuel. The gaseous fuel, consisting of CO, CO_2, and H_2, can then be used to generate heat and electricity. After biomass gasification, a mineral residue remains, which is typically discarded as a waste product. In this study, we have repurposed this mineral residue as a solid catalyst to create light olefins from CO, CO_2, and H_2 mixtures. Light olefins, such as ethylene and propylene, are essential chemical building blocks to create, for example, plastics, but also are the starting point for a wide range of other important bulk chemicals (e.g., propylene oxide) and end products (e.g., coatings).

What was the biggest surprise?

When we received the mineral residue from the industrial plant of Enerkem, we first did an elemental analysis of the material. The outcome of this analysis was overwhelming: while our research group typically investigates heterogeneous catalysts with typically 2–4 chemical elements, the mineral residue contained about 15 different chemical elements. Therefore, the biggest surprise was that the mineral residue was actually capable of transforming CO, CO_2, and H_2 mixtures into light olefins in good yields.

What future opportunities do you see?

The fact that an industrial waste product could successfully be repurposed as a solid catalyst to create valuable light olefins offers promising perspectives for creating a more sustainable future. We envision a future where all (industrial) chemical processes will become circular instead of linear and where consumer products are continuously recycled. We also believe that fruitful scientific interactions between academia and industry, such as this collaboration between Utrecht University and Enerkem, are essential in the transition towards a more renewable society as scale matters and the latter is difficult to realize in full at universities.

Acknowledgements

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