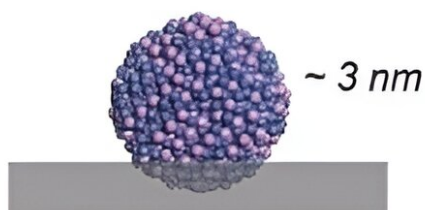
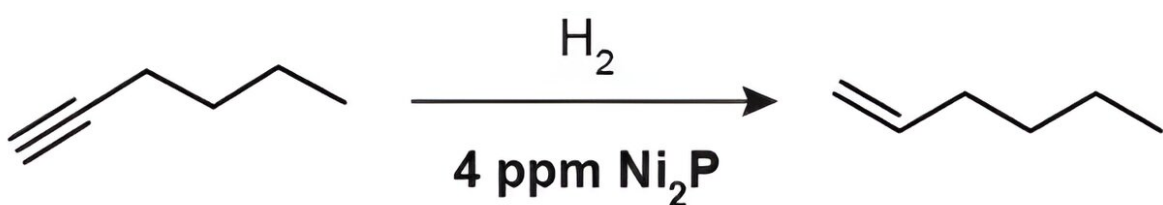


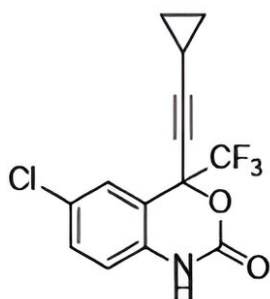
# Single-step procedure synthesizes air-stable, nickel-containing catalyst with safe, cheap materials

July 10 2024, by Sarah-Lena Gombert

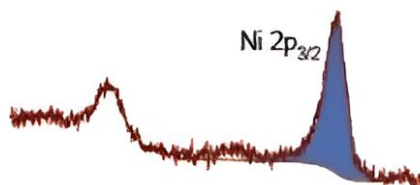


✓ safe & fast synthesis

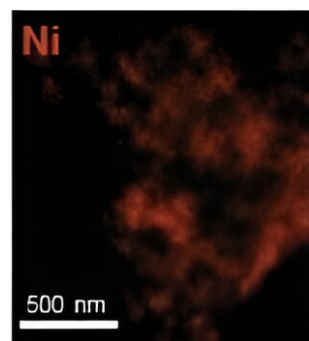
✓ complex substrates



✓ oxidative stability



✓ dispersion



Graphical abstract. Credit: *Angewandte Chemie International Edition* (2024).  
 DOI: 10.1002/anie.202404292

Transition metal phosphides have been dreamed of as a potential replacement for noble metal catalysts for a while now. They are cheaper and available in sufficient quantities.

"But there have always been challenges with the surface oxidation and synthesis," says Dr. Constanze Neumann, Lise-Meitner group leader at the Max-Planck-Institut für Kohlenforschung in Mülheim. For example, their production required very high temperatures or reactive starting material that might be costly, highly toxic—or both.

Together with her team, the young chemist has found an elegant method to provide a single-step procedure that relies on both safe and cheap materials to synthesize an air-stable, nickel-containing catalyst. [The group has published](#) their results in *Angewandte Chemie International Edition*.

"In our paper we show that it is possible to reach a high dispersion of the catalyst," says Dr. Leila Karam, Postdoc in Neumann's group and first author of the paper.

With the help of the right surface ligand, the scientists are able to apply their catalyst to a carrier surface with the broadest possible distribution—and in such a way that it is available for the desired reaction without clumping or oxidizing beforehand.

The ligands are able to protect the catalyst from undesired oxidation but do not hinder it in promoting the desired reaction. This fine distribution ensures that the catalyst can be used in just as small quantities as conventional alternatives containing palladium.

"We are very pleased that our catalyst can keep up with commercial

palladium catalysts," says Neumann. This might be interesting for [chemical companies](#), where heterogeneous palladium catalysts are widely used for selective hydrogenation, including in the synthesis of pharmaceuticals.

And there is another special feature: "We were able to show that our catalyst still works well even if it was stored under air for more than a year. The material is not rendered unusable by oxidation," says Neumann.

This makes both the storage and handling of the catalyst much easier: while other phosphides often have to be worked with in the glovebox, the Mülheim catalyst can be handled in a normal fume hood.

Happy as they are with their findings, the group does not want to stop there. "We want to improve the reusability of our catalyst," states Neumann. Furthermore, the researchers would like to get rid of any solvents that are needed to produce their [catalyst](#). "We would like to keep the production as green as possible."

**More information:** Leila Karam et al, Expedited Synthesis of Metal Phosphides Maximizes Dispersion, Air Stability, and Catalytic Performance in Selective Hydrogenation, *Angewandte Chemie International Edition* (2024). [DOI: 10.1002/anie.202404292](https://doi.org/10.1002/anie.202404292)

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