New cobalt catalyst for synthesizing Methanol from CO₂

- Catalyst consists of abundantly available materials
- Broad scope of substrates can be converted with this catalyst
- Also possible to dehydrogenate Methanol

Background
Many companies are continuously working on the development of processes that develop less waste and are safer. By making the chemical reactions less hazardous and more sustainable, companies will not only become friendlier for the earth, the businesses will turn out to be more efficient and profitable as well.

Korstanje et al., part of the UvA Research Priority Area Sustainable Chemistry, have found a catalyst that can reduce carboxylic acids and esters to alcohols. These compounds are mostly found in chemicals derived from biomass. This new catalyst can make businesses more efficient and sustainable. It is cheaper and does not use any undesirable materials or metals. It can drastically reduce waste output.

The Technology
This homogeneous catalyst is made of cobalt and is paired with a tridentate phosphine ligand. Contrary to current technologies this catalyst operates under mild conditions (100°C, 80 bar H₂) and reaches high turnover rates. Other similar homogeneous catalysts require a ruthenium or iridium core, which are scarce and more expensive metals. This cobalt catalyst is thus more efficient and sustainable in comparison with these other catalysts. Also great selectivity and high turnover rates have been achieved.

Applications
A broad scope of substrates can be converted into alcohols with this catalyst. In the table below you can find some examples that can be hydrogenated with this catalyst, but more substrates can be reduced to alcohols.

For example methanol could be synthesized entirely sustainable. By taking CO₂ from the industry and producing H₂ from H₂O while taking your energy...
from a renewable energy source, methanol will be produced sustainable. Methanol can be used to make several products or store hydrogen. By dehydrogenating the methanol it will be possible to recover the $\text{H}_2$. The methanol is then used as an easily transportable carrier for $\text{H}_2$.

**Partnership opportunity**
We envisage a partnership with companies who want to make their process more sustainable. We already collaborate with many research groups across the globe to improve their performance while reducing their carbon footprint. Do you also want to benefit from this innovative knowledge? Join us and contact us at the Amsterdam Science Park.

**Key publications**

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*Mitsui Methanol Process Illustration*