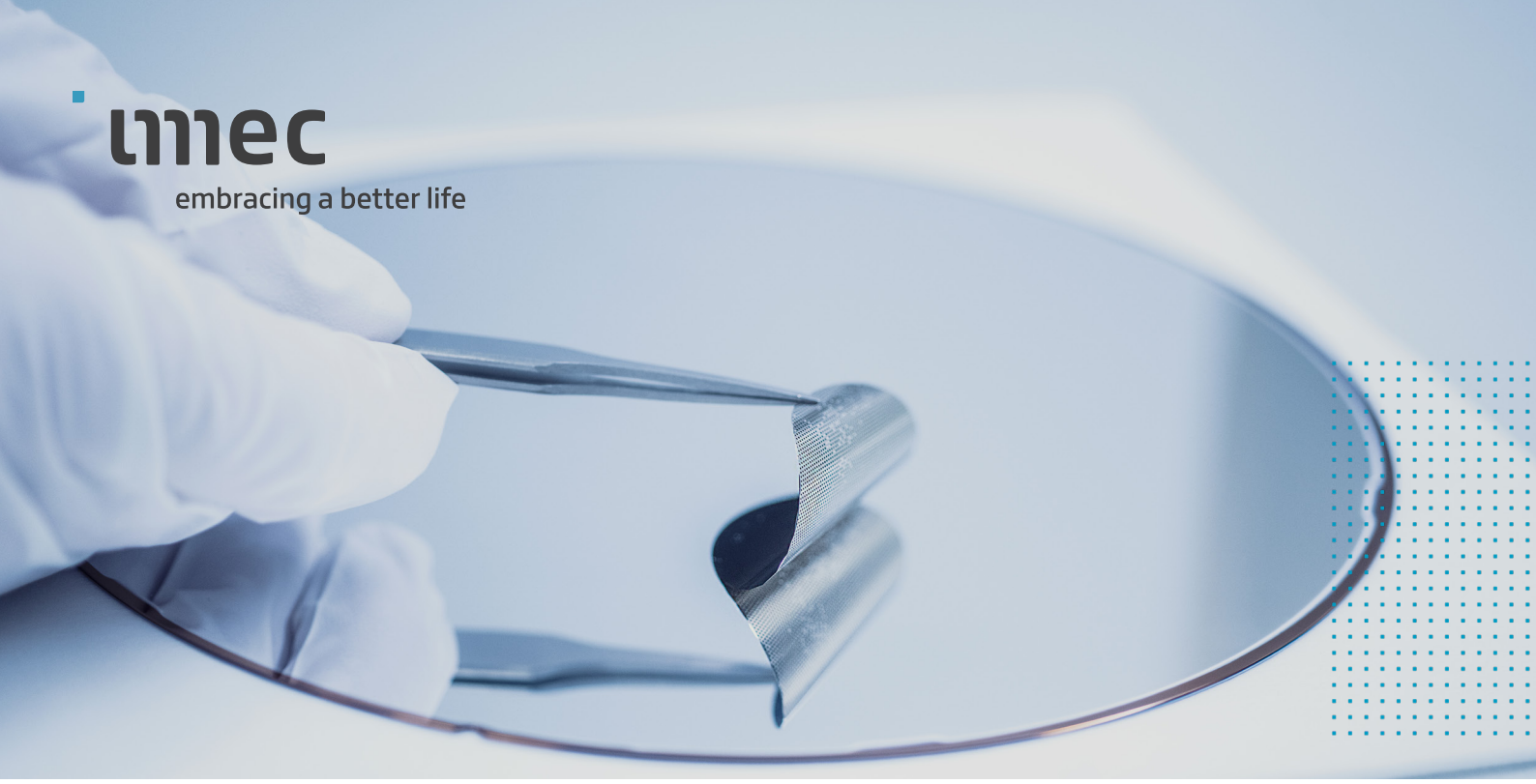
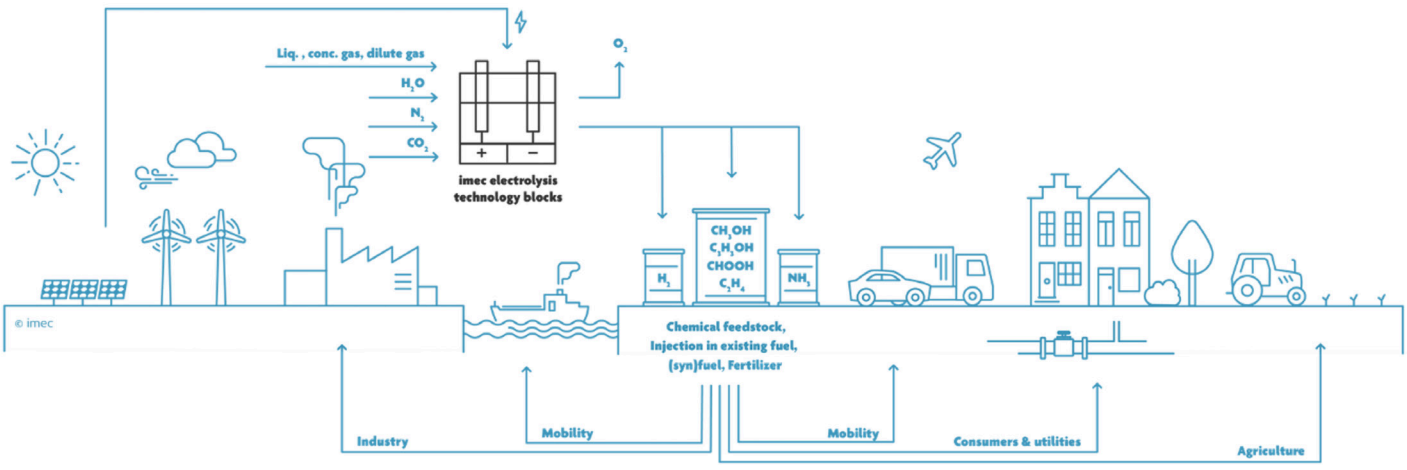


‘Power-to-molecules’: converting and storing renewable energy in useful molecules

With new nanomesh, membrane and coating technologies, it is possible to make more efficient industrial electrolyzers, enabling the chemical and steel industries to move from current ‘grey’ hydrogen to ‘green’ hydrogen production. Moreover, this process could be used to store excess energy from wind farms and solar parks and to capture CO2 from factory chimneys and – in the longer term – directly from the air.

If we want to limit global warming to 2 degrees Celsius, the net global CO2 emissions must drop to zero by 2050. With the help of solar panels and e-cars, carbon emissions can fall rapidly in the transportation and building sectors. For other industrial sectors – like the steel or cement industry – other solutions are needed.

In its Power-to-Molecules research program, imec develops solutions for green hydrogen and green syngas production. Today, the chemical and steel industries produce hydrogen through steam reforming, generating an immense amount of CO2 as a side product. Low temperature electrolysis is a more environmentally-friendly option but is more expensive and requires larger equipment. A new generation of electrolyzers could transform these industries radically.



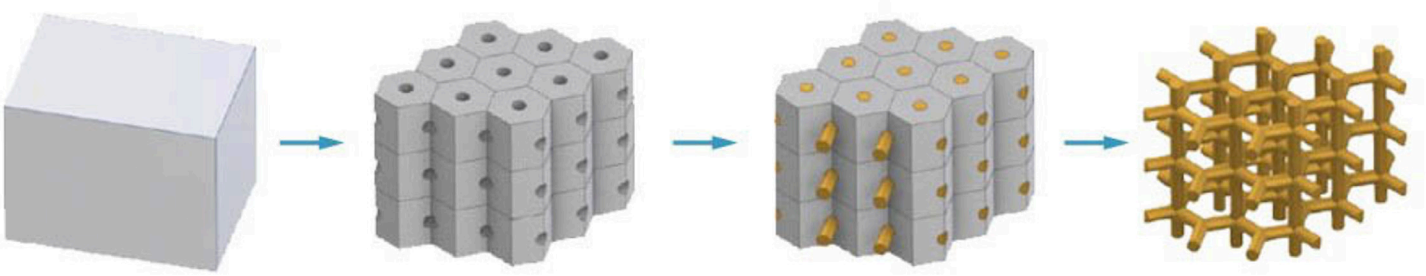
The idea behind Power-to-Molecules: water, carbon dioxide or nitrogen are converted through renewable energy into chemical compounds that can be useful for e.g. the chemical industry.

Innovations for next-gen electrolysis

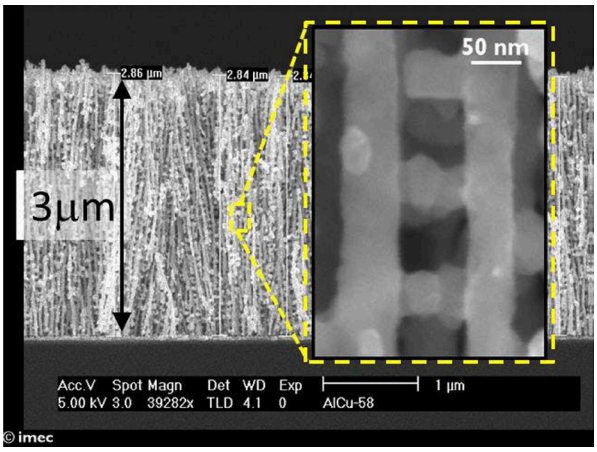
- Porous, high-surface electrodes bandwidth for drive voltage
- Thinner membranes
- Better electrode coatings

'Nanomesh' electrode material

- Millions of nanowires, horizontally interconnected on multiple levels
- High surface-to-volume ratio
- High porosity
- Tuning of internal and external dimensions depending on the application



Fabrication of the nanomesh material



SEM image illustrating the highly regular structure of the nanomesh material consisting of millions of upright nanowires that are horizontally interconnected on multiple levels, resulting in unprecedented mechanical stability.

Applications of high-efficiency electrolysis

- Reduce carbon emissions in various industries
- Convert and re-use CO_2 from factory chimneys and from the air
- Convert nitrogen from the air into substances for agriculture
- Store excess green energy in summer

CONTACT US

WWW.CONTACTIMEC.COM