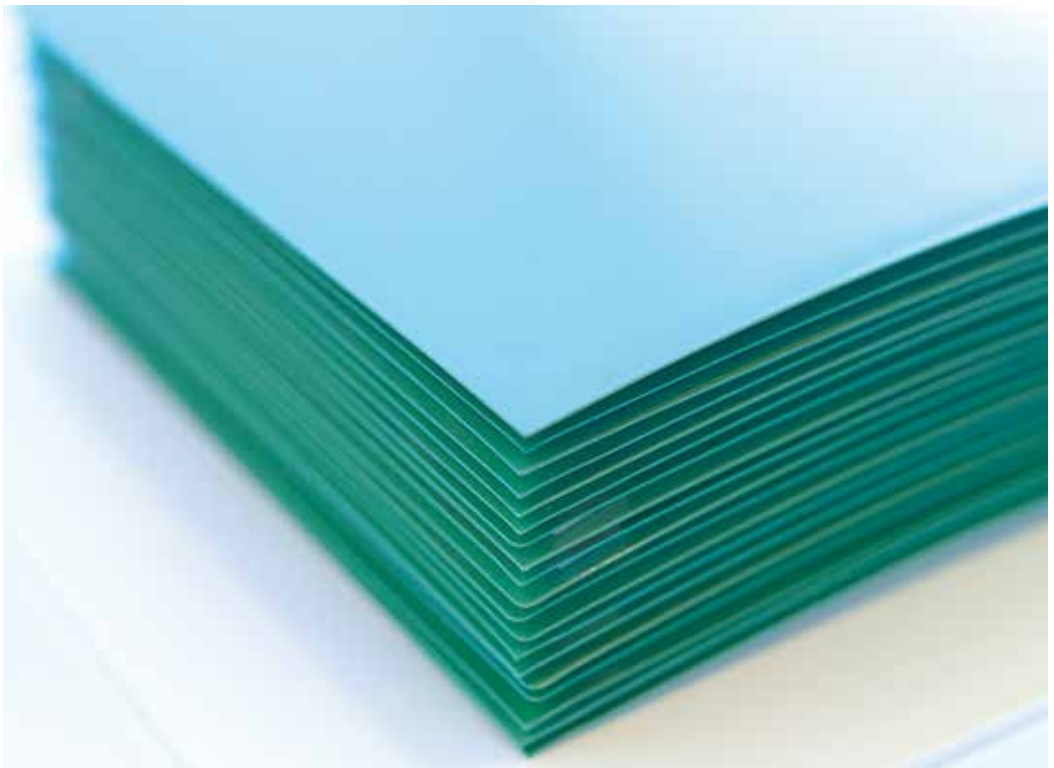


SOLID OXIDE ELECTROLYSIS CELLS

- STORAGE OF SURPLUS ELECTRICITY AND PRODUCTION
OF SYNTHETIC FUELS



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An electrolysis cell uses electricity to split, e.g., water molecules (H_2O) into hydrogen (H_2) and oxygen (O_2). In this way, electrical energy is transformed into chemically bound energy in the hydrogen molecules. This is the reverse of the process that occurs in a fuel cell.

A Solid Oxide Electrolysis Cell (SOEC) is basically the corresponding fuel cell (Solid Oxide Fuel Cell - SOFC) run in 'reverse'. Such a cell operates at relatively high temperatures (700-1000 °C), which makes the efficiency very high. The two electrolysis products, hydrogen and oxygen, are formed on each side of the cell. [SOECs may be used for the production of hydrogen from surplus electricity, e.g., generated by wind turbines. The hydrogen can be stored and -](#)

using a fuel cell - reconverted into electricity again when the demand arises. This allows the storage of electricity when production exceeds demand.

An SOEC can also electrolyze carbon dioxide (CO_2) to carbon monoxide (CO). If water is electrolyzed at the same time, a mixture of hydrogen and CO is produced. This mixture, called syngas, is the starting point of a large number of syntheses of hydrocarbons in the chemical industry. In this way, liquid transport fuels can be produced synthetically. If the electricity is generated by wind turbines or solar cells, the use of the fuel is CO_2 neutral.

The Department of Energy Conversion and Storage is using its extensive experience in the field of fuel cells for electrolysis research. In collaboration with industrial partners, we are developing the electrolysis technology for various applications. Our sponsors include the Danish transmission system operator [energinet.dk](#), Innovation Fund Denmark and the EU. Our research stretches from fundamental investigations of the electrochemical properties of candidate materials to the manufacture of complete cells using industrially relevant processes and finally testing of stacks and modules.

ABOUT THE DEPARTEMENT

We focus on functional materials and their applications for sustainable energy technologies

FURTHER INFORMATION

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