



Fully automated assembly of individual components into high-temperature electrolyzers (SOC) and high-temperature fuel cells

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## SOEC Technology at a Glance

- **What does SOEC stand for?**  
SOEC is the abbreviation for Solid Oxide Electrolysis Cell. SOEC technology refers to high-temperature electrolysis with solid oxide cells.
- **What is high-temperature electrolysis used for?**  
High-temperature electrolysis is a process for producing hydrogen from water vapor. If electricity from renewable energies is used for this, it is green hydrogen.
- **What happens during high-temperature electrolysis?**  
In high-temperature electrolysis, water vapor is split into hydrogen and oxygen by applying a voltage. The conversion process takes place at temperatures of over 600 °C. The central

components are the solid oxide electrolysis cells mentioned above, which are stacked to form a SOEC stack.

- **What is special about the SOEC stack technology from Fraunhofer IKTS?**

The SOEC stack technology is based on the oxygen-conducting ceramic electrolyte substrate with two electrodes, paired with chromium-based CFY interconnectors. The electrolyte-supported concept therefore guarantees high long-term stability with regard to high-temperature corrosion and thermal cycling. The stack technology is based on a small number of components and occupies a leading position compared to currently available designs on the global market.

- **How many cells are installed in a SOEC electrolysis stack?**

Depending on the required output, up to 40 electrolysis cells are installed in a SOEC electrolysis stack.

- **What electrolysis outputs are possible with SOEC technology?**

The output of high-temperature electrolyzers ranges from the kW to the high MW range.

- **What are the advantages of high-temperature electrolysis?**

High-temperature electrolysis ensures high efficiency, as operating at high temperatures means that less electrical energy is required to split the water vapor. If high-temperature electrolysis is implemented in processes where large amounts of waste heat are available – such as in the steel industry – the consumption of electrical energy can be reduced by around 20 % compared to other technologies.

- **Are there other advantages in addition to the high efficiency?**

The SOEC electrolyzers can also run in co-electrolysis mode. To do this, water and CO<sub>2</sub> are split into oxygen, hydrogen and carbon monoxide. This produces a synthesis gas from the electrical energy, which can be used for the sustainable production of chemical products and e-fuels via Fischer-Tropsch synthesis.

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