

## Fuel cells and electrolysis

Hydrogen conversion in fuel cells allows high energy densities and local zero-emission operation of electric vehicles. Surplus photovoltaic and wind energy can be used to generate hydrogen using electrolyzers in the "power-to-gas" process. We use computer simulations to optimize lifetime and increase efficiency of fuel cells and electrolyzers.

### Ageing mechanisms of PEM fuel cells

In the project *PUMA MIND* we investigate ageing mechanisms in polymer electrolyte membrane fuel cells (PEMFC) for automotive applications. CFD simulations on the cell level are coupled with microscopic degradation models in a multi-scale approach.

### Elektrochemie und Transport in Festoxid-Brennstoffzellen

The high-temperature ceramic fuel cell (solid oxide fuel cell, SOFC) offers high fuel flexibility and therefore a good integration into the existing energy framework. The electrochemistry is based on complex multi-step surface reaction mechanisms, which we elucidate using elementary kinetic models.