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Synthetic membranes and their applications

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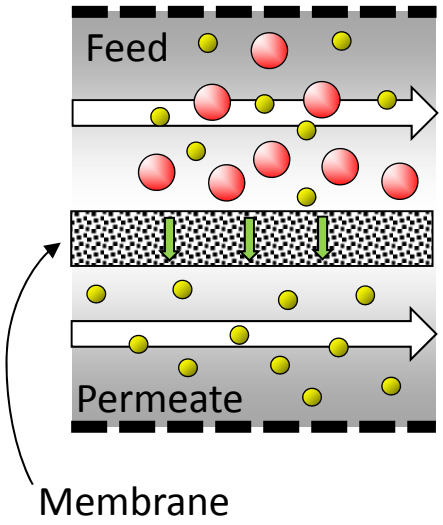
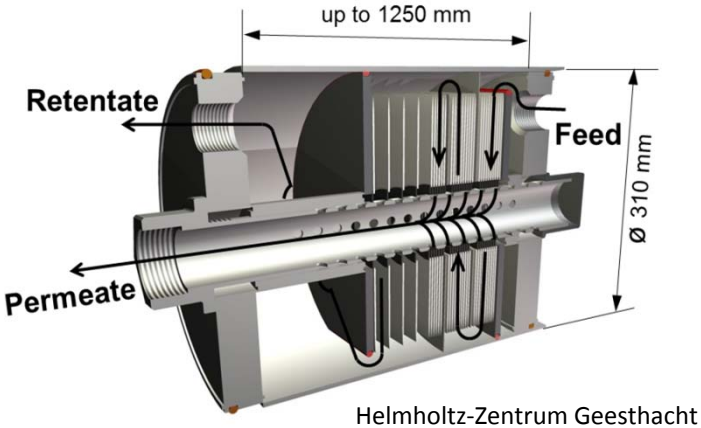
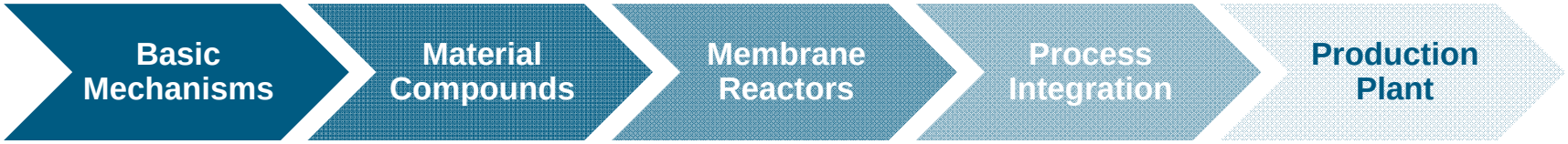
Successfully navigating the path from promising lab findings to large scale development:





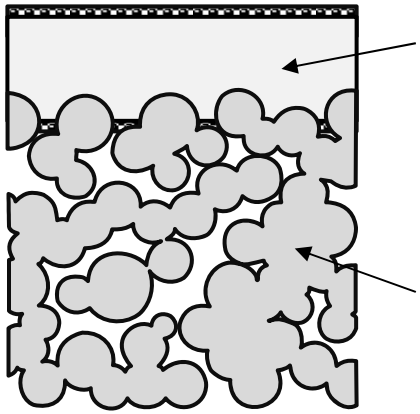
Helmholtz-Zentrum Geesthacht

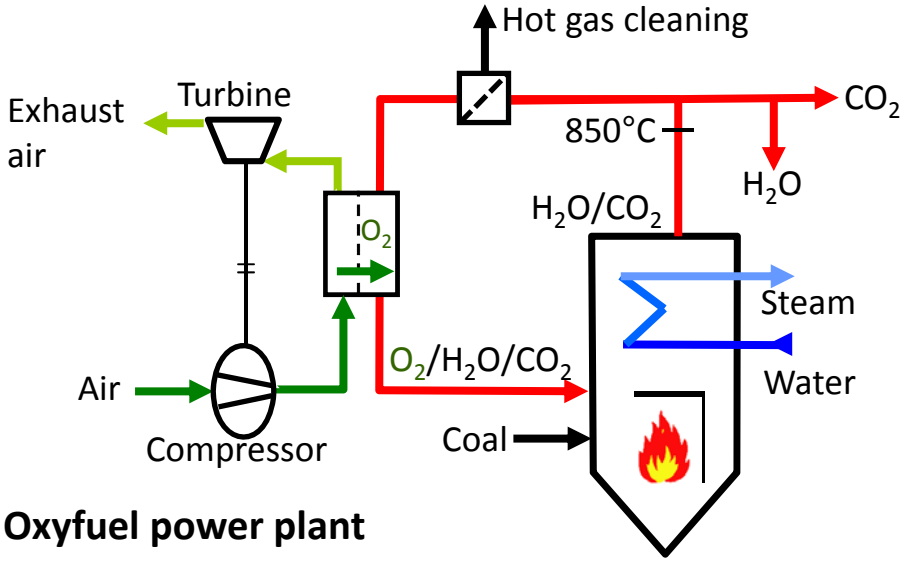


Challenges of membrane technology

- High permeation/diffusion rates
- Low activation energy of transport mechanisms
- High resolution separation
- Design of membrane reactors
- Up-scaling of technology
- Process integration
- Low membrane degradation

$$J_{O_2} = \frac{RT}{(4 \cdot F)^2} \cdot \frac{1}{d} \cdot \frac{\overline{\sigma_i \cdot \sigma_e}}{\sigma_i + \sigma_e} \cdot \ln \frac{p'_{O_2}}{p''_{O_2}}$$





Oxyfuel power plant

Continously working tape casting device

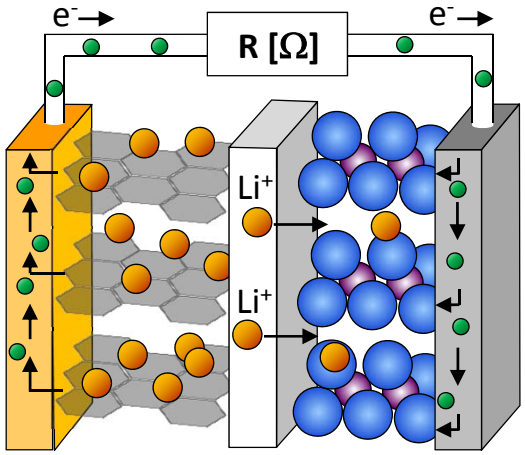
Applications of membranes

Polymeric membranes

- Filtration and purification
- Desalination
- Medical applications
  - Artificial organs (kidney, lung)
  - Drug delivery
- Bio processing
  - Food, dairy and beverages
  - Pharmacy
- Gas separation
  - CO_2 capture
  - Recovery of vapors
- Electrochemical devices
  - Electrolytes of polymer electrolyte fuel cells and electrolyzers

Inorganic membranes

- Filtration and purification
- Pervaporation
- Gas separation
  - Mixed ionic conducting membranes
  - Molecular sieves
- Electrochemical devices
  - Electrolytes of all solid state batteries
  - Electrolytes of solid oxide fuel cells



All solid state battery

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Inorganic membranes

- Filtration and purification
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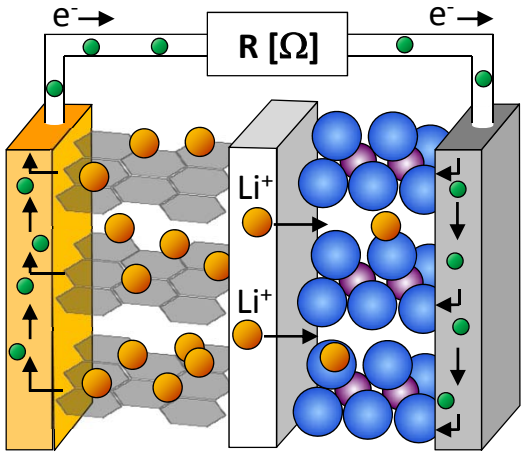
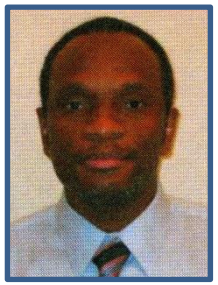


All solid state battery

Speakers of the session

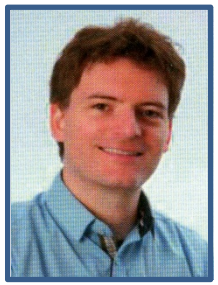


Chinedum Osuji
Yale University, New Haven, USA

Synthetic Membranes: Basic Principles and Challenges of Large Scale Production

Stefan F. Wagner
Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany

Efficient Gas Separation with Inorganic Membranes



Philipp Adelhelm
Friedrich Schiller University, Jena, Germany

The Role of Liquid Electrolytes and Solid Membranes in New Battery Systems

Abhishek Roy
The Dow Chemical Company, Edina, USA

How Membrane Technology Contributes to Sustainability and Life Sciences