The background of the slide is a light gray gradient, decorated with numerous realistic water droplets of various sizes. Some droplets are large and prominent, while others are small and scattered. They are rendered with soft shadows and highlights, giving them a three-dimensional appearance.

# **THE ROLE OF FUEL CELL AND HYDROGEN TECHNOLOGY IN DELIVERING ENERGY SECURITY FOR EUROPE**

ESTONIAN ACADEMY OF SCIENCES

SEPTEMBER 13. 2017

# AGENDA

- 08:30-9:15 Registration and coffee
- 09:15-09:30 Opening words / Enn Õunpuu
- 09:30-10:00 Keynote: The Status Of The European Fuel Cell And Hydrogen Joint Undertaking Programme And The Expected Impact On Europe's Energy Security
  - ***Bart Biebuyck***, Executive Director – European Fuel Cell And Hydrogen Joint Undertaking
- 10:00-10:30 Hydrogen And Fuel Cells As A Part Of Future Energy System
  - ***Prof. Robert Steinberger-Wilckens***, University Of Birmingham
- 10:30-11:00 Energy Conversion Efficiency – Key To Energy Security
  - ***Enn Õunpuu***, CEO – Elcogen AS

# AGENDA

- 11:00-11:45 Lunch And Networking
- 12:15-12:45 The Role Of Fuel Cell And Hydrogen Technology In Delivering Energy Security For Europe
  - *Prof. Robert Steinberger-Wilckens, University Of Birmingham*
- 11:45-12:15 Fuel Cell Based High Efficiency CHP Plant In Operation
  - *Tuomas Hakala, Co-founder – Convion*
- 12:45-13:15 Hydrogen Refueling Station In The City Of Pärnu, Estonia
  - *Raigo Pert, CEO – NT Bene*
- 13:15-14:00 Panel Discussion, Networking And Snacks

# FRIEDRICH WILHELM OSTWALD

1853 - 1932

Graduated from the University of  
Tartu, Estonia, in 1875,

Received his Ph.D. there in 1878  
Under the guidance of Carl Schmidt,

Academic lecturer from 1875 to 1881

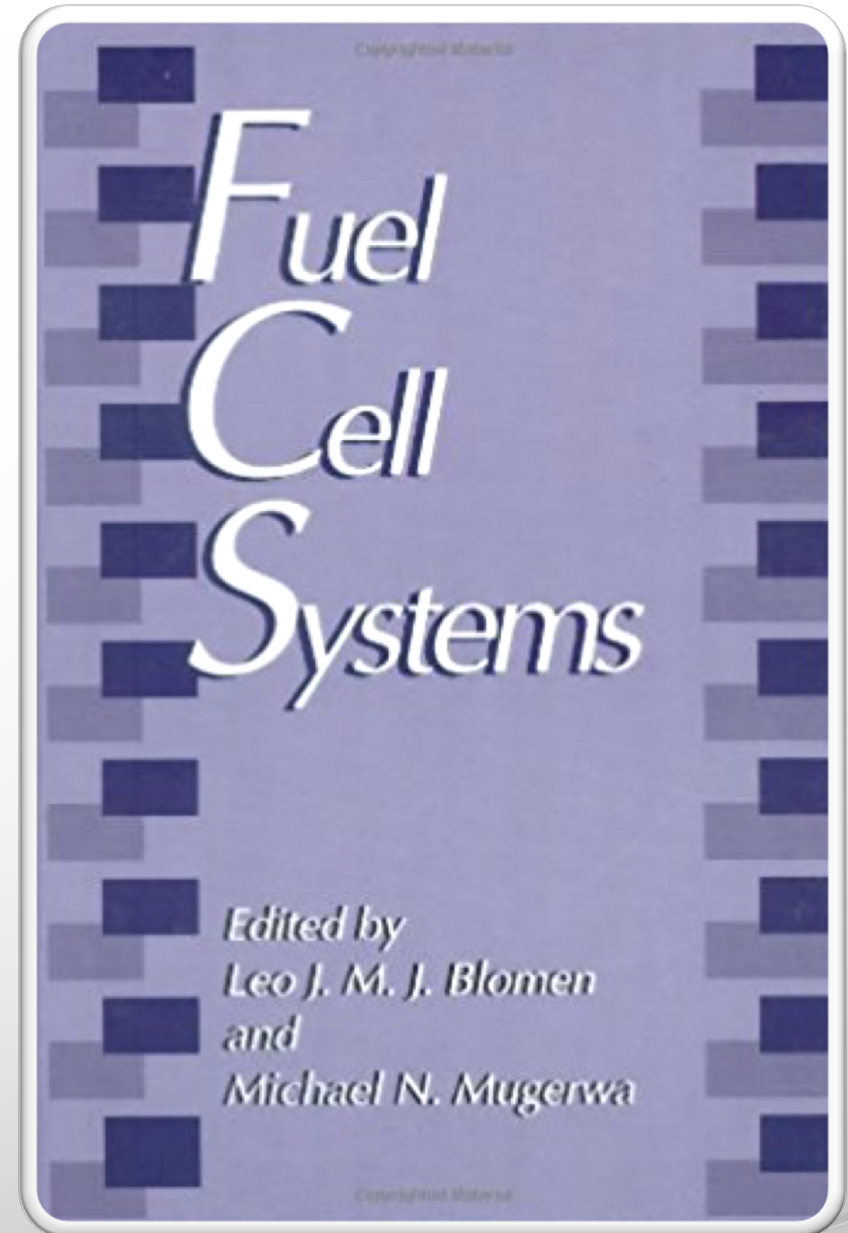
**NOBEL PRIZE FOR CHEMISTRY 1909**

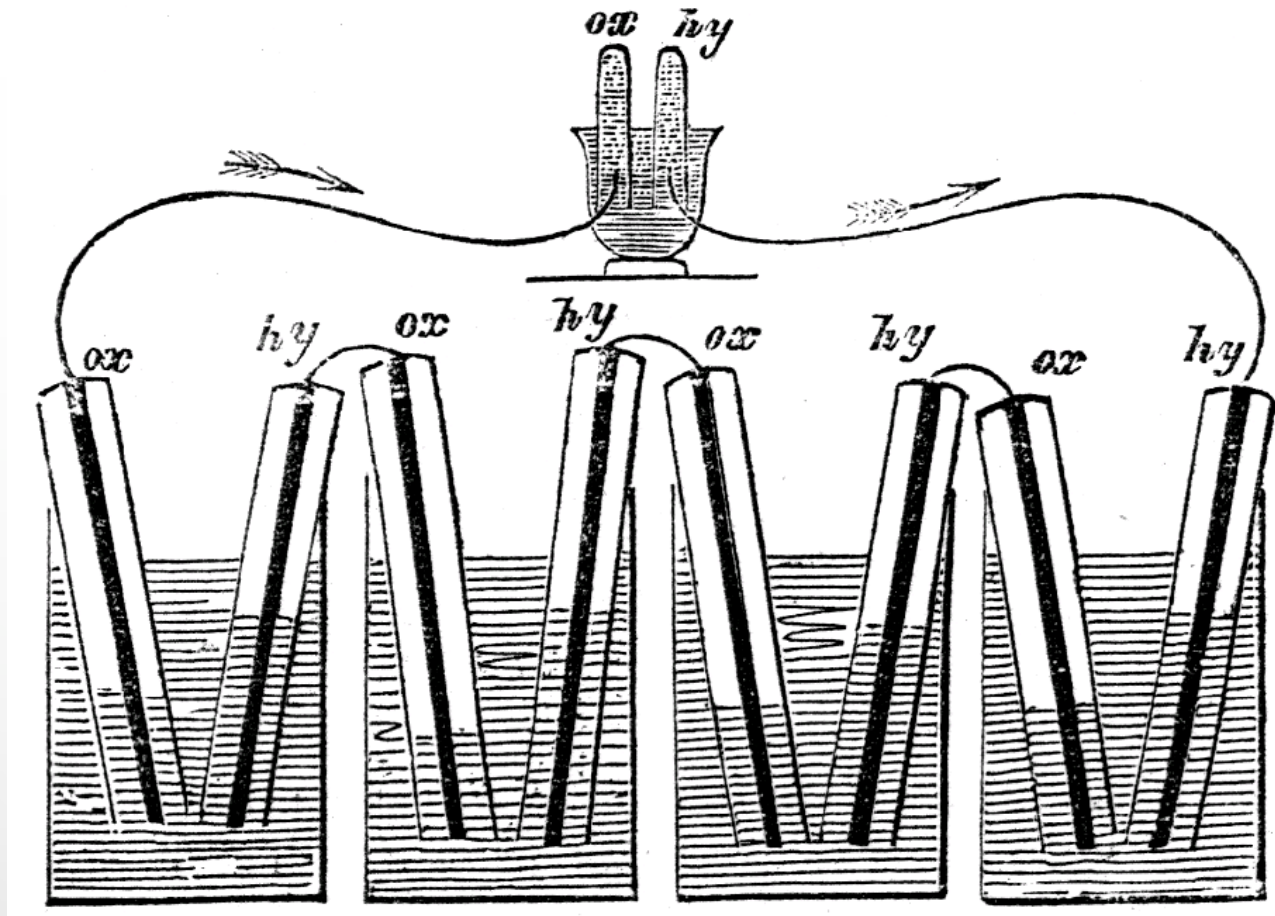




The fuel cell concept obtained a boost from Ostwald, one of the godfathers of physical chemistry. He clearly stated the advantages of producing electricity from the direct conversion of the energy of the fuel reaction in galvanic cell over the usual way via steam engine and dynamo.

Ostwald also mentioned the possible environmental advantages: "No smoke, no soot, no fire ".

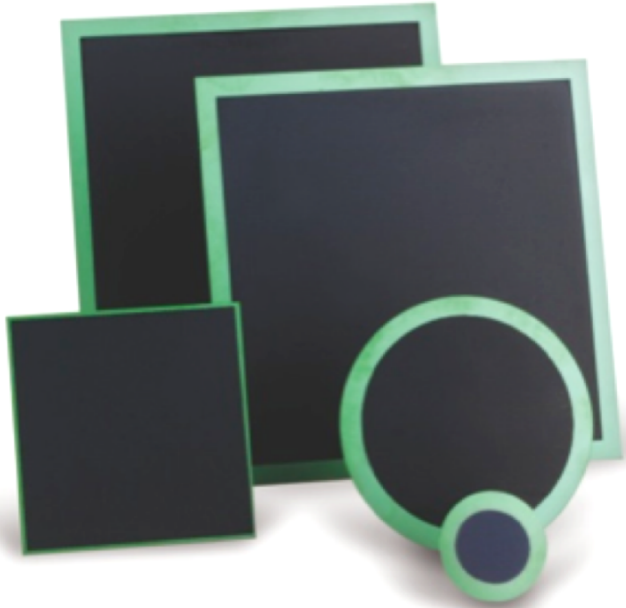




1838 Christian Friedrich Schönbein discovered fuel cell reaction.

1839 William Robert Grove understood the potential in the reaction and built the first fuel cell

# Electrochemical conversion is inevitable future of energetics



Single unit cells



Fuel cell stacks



Fuel cell systems



# FRIEDRICH WILHELM OSTWALD

1853 - 1932

*" The fuel cell is a greater achievement of civilization than the steam engine and will soon banish the Siemens generator into the museum."*

At the 2nd annual meeting of the Association of German Electrical Engineers in 1884 (Verband Deutscher Elektrotechniker)

NOBEL PRIZE FOR CHEMISTRY 1909

