Annex 31
Collaborative Research on Polymer Electrolyte Fuel Cells

Spring 2017 Workshop
Graz University of Technology - Austria
Graz, Austria
May 15 – May 16, 2017

Willkommen!
International Energy Agency (IEA) Technology Collaboration Programme on Advanced Fuel Cells (AFC TCP)

- **Established in 1990 as part of an international energy technology collaboration, duration of each implementing agreement is 3-5 years**
- **Current implementing agreement: Duration 2014 – 2019**
- **Signatories:** Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Israel, Italy, Japan, Korea, Mexico, Netherlands, Norway, Sweden, Switzerland, Turkey, United States
  - The program continues to actively encourage new participants
- **Aim of IEA–AFC**
  - Advance the state of understanding of Contracting Parties in the field of advanced fuel cells through
    - Coordinated program of research, technology development and system analysis on SOFC, and PEFC systems
    - Information exchange through Task meetings, workshops, and reports
    - Task-sharing with participating countries providing an agreed level of effort over the period of the Task
Current Annexes or Tasks

Annex 30  Electrolysis (New)
Annex 31  Polymer Electrolyte Fuel Cells
Annex 32  Solid Oxide Fuel Cells
Annex 33  Fuel Cells for Stationary Application
Annex 34  Fuel Cells for Transportation
Annex 35  Fuel Cells for Portable Application
Annex 37  System Analysis
Task/Annex 31 (formerly 22): Collaborative Research on Polymer Electrolyte Fuel Cells

- **Objective:** To contribute to the identification and development of techniques to reduce the cost and improve the performance and durability of PEFCs and PEFC systems

- **Predecessor tasks:** VIII, XI, XI Phase II and XVI

- **Operating Agent:**
  
  U. S. Department of Energy
  Argonne National Laboratory
Participants in Current Annex 31

- Austria
- China
- Denmark
- Finland
- France
- Germany
- Israel
- Italy
- Japan
- Korea
- Mexico
- Sweden
- United States
Task Structure for Annex 31: Subtask 1 Topics

- **Subtask 1: Stack Materials**
  - **Membrane materials** (new functional groups, cheaper membranes, composite membranes, high-temperature membranes, low-humidity proton conductors)
  - **Electrode catalysts** (lower Pt loadings, CO tolerance, lower-cost higher-performance structures, PGM-free materials)
  - **Bipolar plates** (new materials, improved manufacturability, lower costs)
  - **Cells and stack assemblies** (higher power density, low degradation, light-weight, lower cost, continuous fabrication techniques, >100ºC operating temp.)
Task Structure for Annex 31: Subtask 2 Topics

• **Subtask 2: System, Component, and Balance-of-Plant Issues**

  – **End-user aspects** (contaminants, humidification and thermal management, operating environments and duty cycles, rapid-start, durability, freeze-thaw cycling, and characterization of materials and components)

  – **System-level issues** (systems analysis, stack/system hardware designs, fuel processing, and prototypes)
Task Structure for Annex 31: Subtask 3 Topics

• **Subtask 3: Direct Fuel Polymer Electrolyte Fuel Cells**
  (e.g., Direct Methanol, Direct Ethanol, Direct Borohydride FC)

  – **Cell materials** (anode and cathode catalysts, reduced precious metal loadings, MEA designs and processes for reduced fuel crossover, fuel impermeable membranes, anion-conducting membranes)

  – **Operating conditions** (pressure, temperature, vapor versus liquid feed, fuel concentration, etc.)

  – **Stack and system designs and analyses** (modeling, high-temperature operation, high power densities, high efficiencies, performance over duty cycles, etc.)
Recent Meeting, Annex 31

15th workshop of the Annex 31 Working Group was held on Nov. 9 – Nov. 10, 2016 at Renaissance Beijing Capital Hotel, Beijing, China

18 representatives, delegates and observers from the local institutes attended and presented at the meeting, representing fifteen institutes and eleven countries.
Recent Meeting, Annex 31

14th workshop of the Annex 31 Working Group was held on March 31 – April 1, 2016 at Institute for Advanced Energy Technologies (ITAE), Messina, Italy

Thirteen representatives and delegates representing eight institutes participated and presented at the meeting,
Recent Meeting, Annex 31

- 13th workshop of the Annex 31 Working Group was held on July 5 -6, 2015 at Fraunhofer Institut for Chemical Technology ICT, Pfinztal, Germany

A total of 17 participants include 9 representatives from nine countries attended this Annex meeting.
Recent Meeting, Annex 31

- 12th workshop of the Annex 22(31) Working Group was held on Oct 2-3, 2015 at Krystal Palace, Cancun, Mexico, cosponsored by IIE, Mexico and Mexican Hydrogen Society.

A total of 11 representatives from nine countries attended the IEA meeting, in addition to the observers from IIE, ITC, and Brazil.
Recent Meeting, Annex 31

- 11th workshop of the Annex 22 Working Group was held on June 13-14, 2014 at Korean Institute of Science & Technology, Seoul Korea.

12 participants from 8 countries
Agenda for This Workshop / May 15, 2017

HIGHLIGHTS OF INTERNATIONAL FUEL CELL RESEARCH 2017

AFC TCP ANNEX 31 & 35 Meetings / Student Poster Session
Agenda for This Workshop / May 16, 2017

• **Meeting 0900 – 13:00**
  – Presentations by Mr. Hideo Inoue, Ishifuku Metal Industry, Japan
  – Annex 35 presentations continues
  – Presentation by Dr. Werner Lehnert, Jülich, Germany “Fuel Cell Database Generation & Sharing”
  – Annex business discussion
    • Research network and collaboration opportunities
    • Annex 31 booklet and other publications
    • Next Annex meeting venues (dates & sites)
  – Lab tour.

• **Lunch 13:00 – 14:00**

• **Adjourn**
Acknowledgements

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