



The Abdus Salam
International Centre for Theoretical Physics


United Nations
Educational, Scientific
and Cultural Organization


International Atomic
Energy Agency



Conference on
From Physical Understanding to
Novel Architectures of Fuel Cells
May 21 - 25, 2007

Miramare-Trieste, Italy

This activity will focus on the properties of complex media in fuel cells and the relevant physical processes, as well as on nonlinear science of operation of the cell as a whole. Its interdisciplinary scope will bring together scientists from the cutting edge of fuel cell research as well as experts from related disciplines in order to stimulate further advances in rational design of fuel cells.

In recent years, the search for new energy solutions has become the foremost global concern. In this realm, fuel cells play a key role as an enabling technology of the widely anticipated hydrogen economy or in various sustainable multi-energy-source scenarios. Grand competition and propriety issues often obscure the true picture of the cell structure-performance relationship and the nature of achievements and failures. Further progress in fuel cell technology will have to rest on detailed physical understanding of processes in all components of the cell and their synergetic functioning.

The topics to be addressed at this conference encompass:

- * **energy conversion for a hydrogen economy:** demands, targets, markets, and application niches
- * **frontiers in fuel-cell-relevant materials research:** from assembly to structural characterization
- * **physical processes in fuel cell components (theory and experiment):**
 - structure formation in ionomers
 - transport in proton-, ion-, and mixed electronic/ionic conductors
 - charge transfer and electronic-to-ionic current conversion at electro-catalytic interfaces (from single crystal surfaces to clusters; mesoscopic effects in composite aggregates and nano-structured catalysts; reactions at three and two phase boundaries)
 - percolation properties and transport of charged particles, gases and liquids in random composite catalyst layers and nano-template electrodes
- * **in-situ diagnostics vs. performance modelling of fuel cells and stacks:** voltage efficiency, water balance, catalyst utilization; heterogeneous distribution of performance, nonlinear pattern formation, autocatalytic effects and dissipative structures, thermal balance and feed-back, operation under extreme temperature regimes, physical phenomena leading to cell degradation
- * **from novel materials and architectures to competitive fuel cells:** what physics can offer in terms of optimized performance, durability, stability and cost effectiveness; examples of success and failure, performance bottlenecks

Invited lectures will be followed by discussions and poster sessions, providing ample opportunities for a vibrant, informal exchange of ideas. The participants are selected typically from young applicants – Graduate, PhD students and Postdocs – on a competitive basis, but applications from senior scientists are also considered. The main purpose of the Centre is to help researchers from developing countries within a framework of international cooperation although scientists from developed countries are also welcome to apply. As a rule, travel and subsistence expenses of the participants should be covered by the home institutions. Only very limited funds will be available for some scientists from and working in developing countries as well as several awards, supported by co-sponsors of the Conference, for young scientists from EU and associated states. Applications can be submitted by scientists from all member states of the United Nations, UNESCO and IAEA. Since the activity will be conducted in English, participants should have good working knowledge of that language. **There is no registration fee for attending the Conference.**

Candidates should complete and submit the [Online Application Form](http://agenda.ictp.it/smr.php?1841) that can be found at: <http://agenda.ictp.it/smr.php?1841> with requested attachments. Kindly send all file attachments in Word or Acrobat format.

Conference on From Physical Understanding to Novel Architectures of Fuel Cells

Secretariat: Ms. Rosa del Rio (smr 1841)
the Abdus Salam ICTP - Strada Costiera 11, 34014 Trieste, Italy.
phone: +39-040-2240396 Telefax: +39-040-224163
E-mail: smr1841@ictp.it ICTP Home Page: <http://www.ictp.it/>



Co-sponsored by:

International Society of Electrochemistry

DIRECTORS

M. EIKERLING

(Simon Fraser University and NRC Institute
for Fuel Cell Innovation, Vancouver, BC)

A.A. KORNYSHEV

(Imperial College London)

LOCAL ORGANIZER

E. TOSATTI (ICTP and SISSA Trieste)

TENTATIVE LIST OF SPEAKERS:

V. Antonucci (CNR-TAE Messina)
B. Benicewicz (Rensselaer)
F. Büchi (PSI-Villigen)
S. Burlatsky (UTC)
W. Capehart (General Motors)
M. Debe (3M Company)
H. A. Gasteiger (General Motors)
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S. Holdcroft (SFU, NRC-IFCI)
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A. Khokhlov (Moscow State University)
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K. Krischer (TU München)
A. Kulikovskiy (FZ Jülich)
A. Kucernak (Imperial College London)
A. Kuznetsov (Frumkin Institute)
N. Markovic (Argonne Nat'l Lab)
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A. Warshel (USC, LA)
R.E. White (South Carolina)
T. Zawodzinski (CWRU)

DEADLINE

for requesting participation

15 January 2007