

7th International Solid Oxide Fuel Cell Summer School

Introduction to Solid Oxide Fuel Cell Science and Technology



29th August – 2nd September 2010

Sun Beach Hotel
Thessaloniki, Greece



Introduction

The 7th international summer school on solid oxide fuel cells will be held in Thessaloniki, Greece, 29.8-02.9.2010.

Following the successful pattern of the previous summer schools carried out under the EU Integrated Project Real-SOFC and LargeSOFC, this year's school is targeted at newcomers to the field and is suitable for students of graduate and PhD levels. It is also helpful for young professionals, technicians and more experienced researchers wishing to review the basics of solid oxide fuel cell technology and expand their knowledge. It aims to provide a comprehensive introduction to SOFC science and technology from fundamental science, through the manufacture and test of cells and components to considering the economics and energy politics of the world today and the place of emerging energy technologies in that world.

The school draws on the knowledge and expertise of a group of teachers currently working at the leading edge of solid oxide fuel cell research and development in Europe from universities, national research centres and industry.

Topics

- General Introduction to SOFC and the energy context
- Fundamental electrochemistry and kinetics
- The science and technology of cell component materials, steels and interconnect materials, stack sealing materials
- Materials preparation & characterization, and Electrochemical measurements (both device performance and investigative)
- Stack and system design, non-stack components and system modelling
- Degradation (device lifetime)
- Market requirements and competing technologies
- Student work session, ECTS exam (optional), and open discussion session

Set in Greece and held in early September, when the weather is expected to be very pleasant, these schools have come to be known for a work-hard play-hard ethic. Previous attendees have spoken highly of those earlier schools and some students who attended the first introductory schools even returned to the later ones - using this as general revision in preparation for writing their PhD theses. The school timetable will follow that of Mediterranean Greece, work in the morning, relax in the hot afternoon and return to work as it cools in the late afternoon. This pattern allows some beach time and time for the morning's learning to sink in!

Informal networking is an important element of science and work in general - also of this school, encouraging this becomes possible with the week long format. Students will be given a mini-project to work on in small teams and also be asked to give a short introduction to themselves and the work they are doing (or expect to be doing).

The schedule takes in ca. six hours of formal teaching per day. An optional exam will be available for students who are required to obtain ECTS points relevant to their PhD studies. The school will be validated and academic points awarded by the University of Birmingham.

This year lecturing team will include : Alan Atkinson (Imperial College, UK), Jesús Canales Vázquez (U. de la Mancha/PCYTA, Spain), Michael Stelter (IKTS, Germany), Phil Ennis (UK, [now retired but formerly FZJ]), Loredana Magistri (U. Genoa, Italy), Oliver Posdziech (EBZ, Germany), Mogens Mogensen (DTU-Risø, Denmark), Mohsine Zahid (ElFER, Germany), Thomas Graule (EMPA, Switzerland), Bert de Haart (FZJ Germany), Dimitry Bronin (IHTE, Russia), Robert Steinberger-Wilckens (FZJ, Germany), Thomas Rostrup-Nielsen (Topsøe Fuel Cell, Denmark).

Thessaloniki

Thessaloniki is the second-largest city in Greece and the capital of the Greek region of Macedonia. Its honorific title is "co-capital", a reference to its historical status as the "co-reigning" city of the Byzantine Empire, alongside Constantinople. It is Greece's second major economic, industrial, commercial and political centre; its commercial port is of great importance for Greece and its southeast European hinterland. Thessaloniki is home to numerous notable Byzantine monuments, including the Paleochristian and Byzantine monuments of Thessalonika, a UNESCO World Heritage Site.

The hotel hosting the school is modern, has an outdoor pool with jacuzzi, fitness facilities. Individual rooms are of a good standard and offer all the facilities you would expect including air-conditioning. More details at www.sunbeach.gr. In early September we can expect temperatures in the mid to high 20°C range. Participants wishing to arrive early or stay longer should make their own arrangements with our contact and cooperating partner: Panhellas Tourism & Congress (Mrs. Manuela Drape Stathoglou, Mail: manuela@panhellas.gr, Tel: 0030 2810 300847, Fax: 0030 2810 30848).

Organization

The series of SOFC Summer Schools was begun in the EU projects Real-SOFC (2004-2007) and LargeSOFC (2008/2009). Due to the success and public demand it is now being continued by FZJ on a 'private' basis. All costs of the school have to be carried through the participant fees and the industrial sponsors' contributions. It is planned to integrate the SOFC Summer School into a larger context of fuel cell and hydrogen education from 2011.

Summer School Chairman

Dr. Robert Steinberger-Wilckens (FZJ, Germany)

Organizing Team

Dr. Robert Steinberger-Wilckens	(FZ Jülich, Germany)
Mr. Josef Mertens	(FZ Jülich, Germany)
Mrs. Chantal Hake	(FZ Jülich, Germany)

Correspondence

Student registration and financial –
ch.hake@fz-juelich.de, Phone +49 24 61 61-2244
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Lecturers/other information –
jo.mertens@fz-juelich.de, Phone +49 24 61 61-6706

Student Fee and Registration

Registration cost per student is 680 €, this includes accommodation (5 nights - Saturday to Thursday – double occupancy, single +150 €), all food (full board), tuition, school banquet and the half-day excursion. The registration form can be found at the end of this document.

All registrations should be made by **15th July 2010** at the very latest. Note that previous summer schools in this series have been “sell-outs”, places are strictly limited and early registration is strongly advised to avoid disappointment.

SUMMER SCHOOL PROGRAMME

Arrive Saturday 28th August – 19:00hrs; welcome – Steinberger

Sunday 29 th August	Monday 30 th August	Tuesday 31 st August
<p>Morning</p> <p>Welcome; Introduction to fuel cells, status, applications, types and designs; competing technologies and the energy market place</p> <p>(Steinberger)</p>	<p>Morning</p> <p>SOFC anode materials; SOFC electrolyte materials; SOFC cathode materials; SOFC contact and protective layers</p> <p>(Atkinson / Canales - Vázquez / Zahid)</p>	<p>Morning</p> <p>High temperature steels and interconnect materials; sealing materials; stack design; modelling</p> <p>(Ennis / Stelter / Magistri)</p>
Lunch and early afternoon break	Lunch and early afternoon break	Lunch and early afternoon break
<p>Afternoon</p> <p><i>Newbies&Experienced</i> Introduction to fuel cells: Fundamentals</p> <p>(de Haart / Mogensen)</p>	<p>Afternoon</p> <p><i>Start of the student project:</i> Economic viability of SOFCS (Stelter / Steinberger)</p> <p>Characterization methods (Vázquez-Canales)</p>	<p>Half-day excursion</p>

Actual lecture times vary to suit content, 30 minute coffee breaks at ca. 2 hour intervals.



2009 group



Later that very week, fearless SOFC summer school students and teachers take on the competition and were spotted in a wine cellar

Wednesday 1st September	Thursday 2nd September	Friday 3rd September
<p>Morning</p> <p>SOFC ceramic materials processing; SOFC fuels, production & issues & reforming; Electro-chemical characterization and performance evaluation</p> <p>(Graule/Rostrup-Nielsen/Mogensen,)</p>	<p>Morning</p> <p>SOFC Systems – Concepts & balance of plant components; Degradation issues and accelerated testing</p> <p>(Posdziech / Bronin)</p>	<p><i>Departure</i></p>
<p>Lunch and early afternoon break</p>	<p>Lunch and early afternoon break</p>	
<p>Afternoon</p> <p>ECTS exam (optional); Student session (participants' contributions)</p>	<p>Afternoon</p> <p>Student group project work (case study); Exam results; thanks and formal end of summer school (Steinberger)</p> <p>End of programme: 17:30 h</p>	

Getting to Thessaloniki

As we meet around the end of the main European holiday season, there will very probably be suitable low cost charter flights to Thessaloniki airport (www.thessalonikiairport.gr) available from a wide range of major and regional European airports.

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Sun Beach Hotel
29th August - 2nd September 2010, Thessaloniki, Greece

Deadline for registration: **15th July 2010**

Title :	
Family Name :	
First name :	
University/Institution/Company Name	
Street / P.O. Box :	
Postal Code :	
Town/City :	
Country :	
Phone :	
Fax :	
E-mail :	
Saloniki arrival date and time:	
Saloniki departure date and time:	
Room category:	Double room (680,00 €) <input type="radio"/> Single room (830,00 €) <input type="radio"/>
Please note any special dietary requirements, disabilities etc. that we may need to know about	

PLEASE RETURN BY E-MAIL OR FAX TO

Mrs. Chantal Hake at ch.hake@fz-juelich.de or +49 2461 61 4155

You will then receive a confirmation and an invoice for the meeting fee