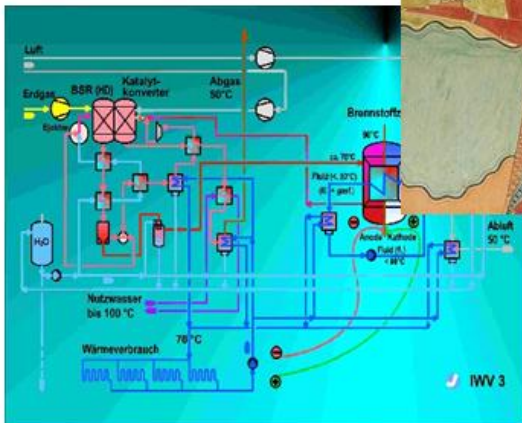


5th International Solid Oxide Fuel Cell Summer School

Introduction to Solid Oxide Fuel Cell Science and Technology Chania, Crete 2008



31st August – 5th September 2008

Almyrida Beach Hotel,
Almyrida nr. Chania, Crete, Greece

Introduction

The 5th international summer school on solid oxide fuel cells will be held on the Greek island of Crete in September 2008.

Following the successful pattern of the previous summer schools carried out under the EU Integrated Project Real-SOFC, this year's school will be organised as a part of the EU Integrated Project LargeSOFC's training and educational programme. This summer school is targeted at newcomers to the field and is suitable for students of graduate and PhD level. 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 & characterisation 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, exam (optional) and open discussion session.

Set on a Greek island 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 school even returned to the second running two years later - using it 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). If past years are anything to go by, the student sessions and open discussion elements at the end of the week can be expected to stimulate controversial and lively debate.

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 Genoa.

This year's lecturing team will include : Prof. Alan Atkinson (Imperial College, UK), Prof. Symeon Bebelis (U. Patras, Greece), Dr. Frank Tietz (FZJ, Germany), Dr. Jesús Vasquez-Canales (U. de la Mancha/PCYTA, Spain), Mr. Phil Ennis (UK, [now retired but formerly FZJ]), Dr. Andreas Gubner (Enerday, Germany), Mr. Andreas Pönicke (IKTS, Germany), Dr. Ico Vinke (FZJ Germany), Dr. Matti Halinen (VTT, Finland), Dr. Robert Steinberger-Wilckens (FZJ, Germany), Dr. Rolf Rosenberg (VTT, Finland) – with some others still to confirm at the time of writing.

Almyrida

Almyrida is a small village close to Chania - the provincial capital city of Western Crete. About 20 minutes drive from Chania airport, the village has a tiny fishing port and various historical points of interest including a 6th century Palaeo-Christian Basilica. The village has a range of shops, regular transport connections to Chania itself, speciality local cuisine for the culinary brave who manages escapes the hotel compound and a range of outdoor activities are available locally.

The hotel hosting the school is modern, is beach-front, has 2 swimming pools of its own, jacuzzi, fitness facilities and even boasts its own scuba diving school for the more adventurous fuel cell applications enthusiast. Individual rooms are of a good standard and offer all the facilities you would expect including air-conditioning. More details at www.almyridabeach.com. 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 on Crete: Panhellas Tourism & Congress (Mrs. Manuela Drape Stathoglou), Mail: manuela@panhellas.gr, Tel: 0030 2810 300847, Fax: 0030 2810 30848 for a special rate of 86,50€ per night.

Organization

This school is organised and is sponsored as part of the education and training element of LargeSOFC. LargeSOFC is an Integrated Project of the 6th RTD Framework Programme of the European Union which focuses research on large scale SOFC power plant, more details can be found at:

<http://www.vtt.fi/proj/largesofc/>

Summer School Chairpersons

Dr. Rolf Rosenberg (VTT, Finland), Coordinator of LargeSOFC
Dr. Robert Steinberger-Wilckens (FZJ, Germany)

Organizing Team

Dr. Robert Steinberger-Wilckens	(FZ Jülich, Germany)
Dr. Rolf Rosenberg	(VTT, Finland)
Dr. M.J. Smith	(FZ Jülich, Germany)
Ms. M. Hackbarth	(FZ Jülich, Germany)

Correspondence

Student Registration and Financial –
m.hackbarth@fz-juelich.de, Phone +49 24 6161 5124
Fax +49 24 6161 4155

Lecturers/other information –
m.j.smith@fz-juelich.de, Phone +49 24 6161 6706

Student Fee and Registration

Registration cost per student is 450 €, this includes accommodation (5 or 6 nights - Sunday to Friday/Saturday), 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 August 2008** 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 Sunday 31st August – 19:00hrs; welcome – Steinberger/Rosenberg

Monday 1st September	Tuesday 2nd September	Wednesday 3rd September
<p><i>Morning</i></p> <p>Welcome; General introduction and LargeSOFC background; Introduction to fuel cells, status, applications, competing technologies and the energy market place (Rosenberg & Steinberger)</p>	<p><i>Morning</i></p> <p>Cell Materials – Chemistry and Physics of : Solid Electrolytes</p> <p>Cell Materials – Chemistry and Physics of : Anodes (Tietz & Atkinson)</p>	<p><i>Morning</i></p> <p>Materials Characterisation techniques; Steels and Interconnect materials; Sealing materials; stack design. (Vasquez-Canales, Ennis, Pönicke, Gubner)</p>
Lunch and early afternoon break	Lunch and early afternoon break	Lunch and early afternoon break
<p><i>Afternoon</i></p> <p>Electrochemical kinetics and thermodynamics of fuel cells. (S. Bebelis)</p>	<p><i>Afternoon</i></p> <p>Cell Materials – Chemistry and Physics of : Cathodes (Tietz)</p>	<p>Half Day excursion: Village tour province of Apokoronas and traditional Cretan dinner</p>

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



At work in 2005



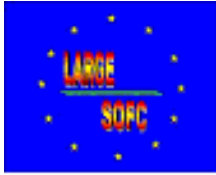
Later that very week, fearless SOFC summer school students and teachers take on the competition and were spotted infiltrating a Swiss hydroelectric plant.

Thursday 4 th September	Friday 5 th September	Saturday 6 th September
<p>Morning</p> <p>Modelling of cells and systems; Electrochemical characterisation and device performance measurement</p> <p>(Gubner & Vinke)</p>	<p>Morning</p> <p>SOFC Systems – balance of plant components; Device performance/lifespan (degradation issues, includes consideration of accelerated. testing)</p> <p>(Halinen & Vinke)</p>	<p><i>Participants depart or opt to stay longer on Crete at their own expense.</i></p>
<p>Lunch and early afternoon break</p> <p>Afternoon</p> <p>Student Session (participant contributions) and ECTS exam (optional)</p> <p>(Steinberger/Rosenberg)</p>	<p>Lunch and early afternoon break</p> <p>Afternoon</p> <p>Student group project work (case study); Exam results; thanks and formal end of summer school</p> <p>(Steinberger/Rosenberg)</p> <p>End of programme: 17:30 h</p>	

Getting to Almyrida

Scheduled Olympic and Aegean flights to Chania airport are available connecting in Athens and Thessaloniki with other major European carriers, but as we meet around the end of the main European holiday season there will very probably be suitable low cost charter flights available from a wide range of major and regional European airports.

The bus service between Chania airport and Almyrida is not particularly regular/useful and using a taxi is advised. This will cost around €50, the journey taking ca. 20 minutes. If possible, note your expected arrival time in Chania on your registration form – will help us when considering a pick-up bus rental option and in arranging for any lone travellers to meet to share taxis. Please do not fly to Heraklion and take a taxi – it will cost you €100+. If experienced with Greek transport, though, you might also take the bus from Heraklion to Chania. More information will follow on registration.



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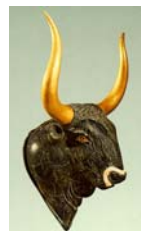
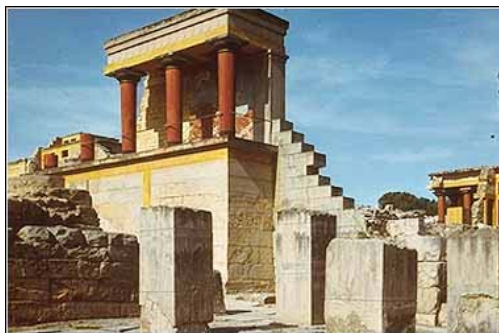
Deadline for registration: **15th August 2008**

Title :	
Family Name :	
First name :	
University/Institution/Company Name	
Street / P.O. Box :	
Postal Code :	
Town/City :	
Country :	
Phone :	
Fax :	
E-mail :	
Chania arrival date and time:	
Chania departure date and time:	
Please note any special dietary requirements, disabilities etc. that we may need to know about	

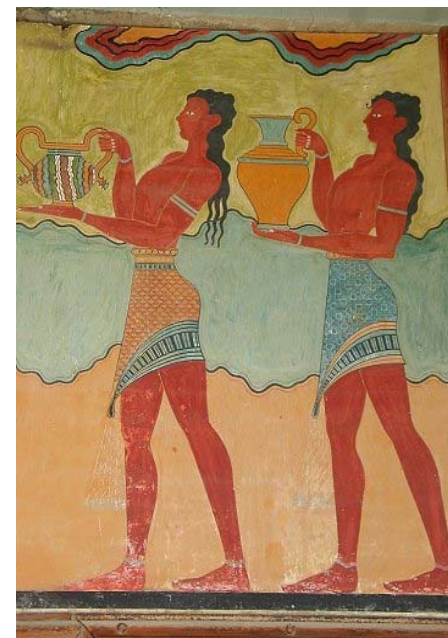
PLEASE RETURN BY E-MAIL OR FAX TO

Mrs. Manuela Hackbarth at m.hackbarth@fz-juelich.de or Fax +49 2461 61 4155

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



SUMMER SCHOOL
Introduction of SOFC
(Solid Oxide Fuel Cells)
Chania/Crete/Greece
August 31st-Septemeber 5th, 2008



General Information about Crete

Crete is situated in the south of Greece. It is the largest island of the country and covers 12,500 km. It consists of four prefectures: Chania, Rethymnon, Heraklion and Lasithi.

Climate

The climate is typical Mediterranean with mild winters and warm summers - pleasant and healthy due to its distinctive dryness, with ample sunshine reaching the 3.000 hours yearly –

Climate in September: The temperatures in September have dropped to a pleasant value, are around 28 degrees Celsius and the seawater has still the same temperature as in the summer time. There might be a few days with low rainfall.

IMPORTANT: The summer school will take place at the area of Chania (Chania Port/Airport)!!!!





General Information about Chania

Chania is the westernmost prefecture of Crete. It has an area of 2,376 km and approximately 134,000 residents, the second largest population in Crete, after Heraklion. The town of Chania, which is also the prefecture's capital, has obtained a great reputation throughout history. Walking on narrow streets of the Old Town you taste the historical atmosphere, meeting the ornaments of Chania, the Venetian harbour and castle. The old town is also the centre of night life. While visiting Chania, you have the chance to visit many archaeological sites which still bring memories of the foreign occupation. Arabs, Venetians and Turks left their marks in the town of Chania. You will be really enchanted by its picturesque houses, churches and its special architecture. Furthermore, the prefecture of Chania has the greatest beaches in Crete! Sandy beaches getting wet by the crystal light-blue waters of Libyan Sea creating an unforgettable landscape. The islets and the mountainous villages give an exotic image to this part of Crete!



General Information about Almyrida Village

Almyrida is a small beautiful village by the sea, with 133 permanent residents.

Apart from the scenic beach with the tiny port, it is worth seeing the Palaeo-Christian basilica (6 th century), decorated with mosaic.

4 kilometers at the east there is the ("Red Village")- Kokkino Horio, a small inland village, where you can see the very interesting "galeries" (tunnels), constructed by the Germans, during the occupation of the island (1941-45), in order to protect the military port of Souda. The village has a manufacture of hand made glass, using the traditional technique of blowing.



How to reach Crete



By Air:



Chania Airport - K. Daskalogiannis – Airport Code – CHQ- <http://www.hcaa-eleng.gr/hania.htm>

Chania airport access: At Chania airport there are only a few infrequent buses - a taxi is the best option if you are not renting a car. A **taxi** to the area of Almyrida takes around 20 minutes and costs approximate Euro 40,00-45,00

Airport facilities: Cash/ATM machine for cash advances and withdrawal. Coffee and snacks are available. "Duty-free" shop and giftshops.

The airlines which fly regularly to Chania are:

- Olympic Airlines: www.olympicairlines.com
- Aegean Airlines: www.aegeanair.com

Connected Flights: Frankfurt, Munich, Brussels, Amsterdam, London, Moscow, Madrid, Rome, Barcelona, Budapest, Vienna, Istanbul, Prague, Miami, New York, Toronto, Montreal, Bangkok, Paris





How to reach Crete



By Ferry Boat from Athens:

There is a daily ferry boat from Piraeus to Chania, leaving Athens at 21:00 and arriving at Chania port at 05:30 in the morning.

The boat company is: www.anek.gr



Venue

Hotel Almyrida Beach – www.almiridabeach.com



General: Almyrida Beach is located at Chania area in the village of Almyrida, approximate 20 minutes driving distance from the airport of Chania. The Hotel is situated on the beach and has 2 swimming pools, a fitness center, a Diving center and Jacuzzi.

Accommodation: All the rooms have direct dial phone, TV, mini bar, fridge, hairdryer and balcony with sea view



Crete

The combination of business and pleasure

