



12th International Conference on Microwave and High Frequency Heating

Forschungszentrum Karlsruhe, Germany
September 7-10, 2009

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Featuring

An intensive Short Course on the Basics of Microwave and HF-Heating and Industrial Microwave Applications for Composites

September 7, 2009

Course Directors:

Dr. José M. Catalá-Civera, ITACA Research Institute, Technical University of Valencia, Spain.

Dr. Lambert Feher, Forschungszentrum Karlsruhe, Institute for Pulsed Power and Microwave Technology, Germany

Overview

As part of the 12th International Conference on Microwave and High Frequency Heating on behalf of the Ampere Association, a special short course on microwave processing technologies will be offered on Monday September 7th.

The course is structured in two parallel sessions. Short course 1 covers the basics of microwave and high frequency heating, with special focus on the fundamentals of microwave heating operation, dielectric properties, design and modelling of microwave devices and an overview of industrial microwave applications. Short course 2 is more specific and focused on microwave technology applied to composite materials. Topics as microwave treatment of carbon-fibre composites, monitoring technique for composites and nanocomposites and polymer applications are covered by this course.

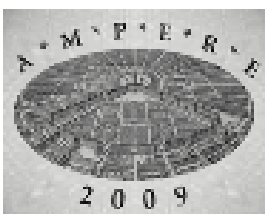
The lectures will be provided by a group of international experts from the academia and the industry in the fields of industrial microwave processing, antennas, polymers, materials and composites, microwave devices, modelling and computational methods.

Who Should Attend?

The courses are designed for engineers and scientists from industry and research, as well as technicians and graduate students with interest in applied microwave technologies and applications. For both newcomers and practitioners who want to brush up on microwave and RF technology.

More specifically, the short course about microwave applications for composites is targeted to chemists, engineers, physicists, material scientists involved in research and development, quality control, automotive, avionics, construction, and polymer related technologies.

The short course presents a unique opportunity to learn from leading, international microwave processing experts.



Forschungszentrum Karlsruhe
in der Helmholtz-Gemeinschaft





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Short Course Schedule

Short Course 1: "Basics of Microwave and HF-Heating" (Monday, September 7th)

- 08.30 - 08.40 [Opening by Course Directors](#)
- 08.40 - 09.40 [Dielectric heating basis](#) (L. Feher, FZK, Germany)
The basics of microwave and RF heating will be reviewed in this introductory lecture. Theoretical basis of electromagnetic propagation, sources and microwave frequencies, wave material interactions and quantum effects are also described in this lecture.
- 09.40 - 10.40 [Dielectric properties measurement](#) (J.M. Catala-Civera, UPV, Spain)
This lecture will review the different dielectric property measurement techniques at microwave frequencies, ranging from the simply open-ended coaxial probes to more sophisticated microwave resonators. The lecture will also include a hands-on lesson with a portable Dielectric Measurement Kit.
- 10.40 - 11.00 [Coffee break](#)
- 11.00 - 12.00 [Microwave applicators design criteria](#) (P. Veronesi, UM, Italy)
This lecture will try to answer questions as: Which kind of applicator for my process? How to estimate the overall microwave power requirements for a certain application? How many magnetrons? And where? Continuous or batch systems? What about the control system? Efficiency? etc.
- 12.00 - 13.15 [Modeling of Microwave applicators](#) (V. Yakovlev, WPI, USA)
The lecture briefly outlines fundamental and practical issues in computer modeling of systems and processes in microwave power engineering and shows how modern advanced simulation can help engineers in designing microwave heating applicators.
- 13.15 - 15.00 [Lunch](#)
- 15.00 - 16.30 [Industrial RF and Microwave Application: a brief review](#) (A.C. Metaxas, CU, UK)
This lecture will review the industrial applications of RF and microwave energy, ranging from rubber curing to food tempering with microwaves and from moisture leveling of biscuits to textile drying with RF. Examples of good and bad practice will be highlighted as well as the use of computer modeling for studying specific aspects of such energy use in industry.
- 16.30 [Questions and debate](#)

Short Course 2: "Composites and Industrial Microwave Applications" (Monday, September 7th)

- 08.30 - 08.40 [Opening by Course Directors](#)
- 08.40 - 09.40 [Basics of Microwave treatment of Composites](#). (Seb. Vaucher, EMPA, Switzerland)
This lecture will present the main basis of the microwave treatment of Composites and Nanocomposites and applications. New monitoring methods for better understanding the effect of microwaves on composites are also outlined.
- 09.40 - 10.40 [Microwave Processing of Carbon-Fiber Reinforced Composite \(CFRP\) Materials](#), (L. Feher, FZK, Germany)
This lecture will briefly present the characteristics of microwave processing of CFRP materials. Applications on avionic and automotive technologies based on the industrialized HEPHAISTOS-systems are described.
- 10.40 - 11.00 [Coffee break](#)
- 11.00 - 12.00 [Dielectric Properties and Microwave sensors for Composites](#) (JM Catala-Civera, UPV, Spain)
This lecture will describe the main techniques for the measurement of dielectric properties of composites at microwave frequencies and the application of new microwave sensors for the non-invasive monitoring of the curing of thermosets.
- 12.00 - 13.15 [Microwave Polymer Applications](#) (R. Emmerich, FI, Germany)
This lecture will present microwave systems for polymer applications and a curing technology for thermosets with radiated microwaves for naval applications.
- 13.15 - 15.00 [Lunch](#)
- 15.00 - 16.30 [Industrial Microwave Plants for Composites](#), (JP Bernard, SAIREM, France)
This lecture overviews the main microwave components and equipment required for a microwave heating application on composites. The lecture also reviews some examples of microwave industrial installations for this type of materials.
- 16.30 [Questions and debate](#)



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Short Course Instructors

Dr. Lambert Feher, Forschungszentrum Karlsruhe (FZK), Institute for Pulsed Power and Microwave Technology, Germany. Dr. Feher is head of the Industrial Microwave Group and expert on avionic applications, HEPHAISTOS- Technology, Microwave Quantum Materials interaction and industrial processing.

Dr. José Manuel Catalá Civera, Technical University of Valencia (UPV), Spain. Dr. Catalá Civera is expert on dielectric measurements, system design and simulation and teaches as a Professor for Electrical Engineering and Communication Systems.

Dr. Rudolf Emmerich, Fraunhofer Institute (FI) for Chemical Technology, Pfingsttal, Germany. Dr. Emmerich is expert for Microwave Plasma Technology, Microwave Antennas, Polymers and Composite Curing for naval and automotive applications.

Dr. Paolo Veronesi, Dept. of Materials and Environmental Engineering, University of Modena and Reggio Emilia (UM), Italy. Dr. Veronesi is expert in thermal applications of microwaves, dielectric heating modeling, and design of applicators, coatings (CVD/PVD), SHS, tribology and metals.

Dr. Vadim V. Yakovlev, Department of Mathematical Sciences of Worcester Polytechnic Institute (WPI), Worcester, MA, USA. Dr. Yakovlev is leader of the Industrial Microwave Modeling Group a Division of the WPI's Center for Industrial Mathematics and Statistics, focusing on microwave modeling and optimization. He is expert in neural-network-based techniques for microwave inverse problems and optimization.

Dr. AC (Ricky) Metaxas, Managing Director of AC Metaxas and Associates, an energy consultancy. Dr AC (Ricky) Metaxas is a Fellow and Tutor at St John's College Cambridge, UK. Dr. Metaxas has an extensive teaching experience at the University of Cambridge (UC) (1982-2002). He co-authored Industrial Microwave Heating (IEE, 1983, considered as the "yellow bible" in the microwave heating field) and has written Foundations of Electroheat: A Unified Approach (Wiley, 1996). He is a Fellow of IEE and President of AMPERE for many years.

Dr. Sebastien Vaucher, EMPA - Swiss Federal Laboratories for Materials Testing and Research, Thun, Switzerland. Dr. Vaucher is the leader of the Nanocomposites Processing Group with a large expertise in electromagnetic processing of materials. He is pioneer in the use of the synchrotron radiation at the Swiss Light Source for in situ monitoring microwave heating experiments (real-time X-ray diffraction, microtomography).

Dr. Jean Paul Bernard, General Manager of SAIREM, a Frech Company leader in Microwave and RF heating industrial equipment. Dr. Bernard has become during last 30 years a major actor in the world of microwave and radio-frequency applications.

Location

The conference will be held in the Fortbildungszentrum für Technik und Umwelt (FTU) at the Forschungszentrum Karlsruhe, Germany, situated 12 km north of the city center.

Karlsruhe in the State of Baden-Württemberg is beautifully located in the valley of the Upper Rhine River between the wooded mountains of the Black Forest, the vineyards of the Palatinate (Pfalz), and the Vosges in France with a mild climate.

Karlsruhe is an inviting place to linger. The city with its radial layout features an interesting and unique connection of technology, art, education and culture. Enjoy the large cultural and gastronomic offer in the warmest region of Germany. Please, check the conference website for details about travelling and accommodation.

<http://www.ampere2009.org/html/accommodation.html>

A bus shuttle transfer from Karlsruhe to Forschungszentrum Karlsruhe will be organized. The Local Organizing Committee has reserved a sufficient number of rooms at a reduced rate in several hotels located in Karlsruhe for AMPERE 2009 participants. Please refer to the group name of "AMPERE 2009".

Registration

The cost of the course is 400€, and there is a reduced fee of 200€ for students. Please, check our website for the payment details (<http://www.ampere2009.org/html/registration.html>).

Contact:

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