

11th International Conference on Microwave & RF Heating

Oradea, Romania 3rd September, 2007

Short Course: Fundamentals of dielectric heating and applicator design

FINAL PROGRAMME

Short Course – Monday 3rd September, 08.30 – 09.30 Room: Termalo A

Session Title	Short Course	
Session Chairs	Dr. J.M. Catalá-Civera, Spain and Dr. P. Veronesi, Italy	
Timings	Title/authors	
08.30 - 08.40	Opening by Short Course Chairmen	
08.40 - 09.40	Dielectric heating basis. Prof. I.F. Hantila , University of Oradea, Romania <i>The basics of microwave and RF heating will be reviewed in this introductory lecture.</i>	
09.40 - 10.40	Dielectric properties measurement, J.M. Catalá-Civera , Politechnical University-Valencia – Spain <i>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, designed to cover the 2.45 GHz band. The contents include an introduction to dielectric property measurement, classification of methods (reflection methods, the open-ended coaxial probe, transmission methods and resonator methods), hands-on lesson and conclusions.</i>	
10.40 - 11.00	Coffee break	
11.00 - 12.00	Microwave applicators choice and design criteria, P. Veronesi , University of Modena, Italy <i>Which kind of applicator for my process?. Full or partial microwave heating?. How to estimate the overall microwave power requirements for a certain application?. How many magnetrons?. And where?. Continuous or batch systems?. What if dielectric properties vary abruptly during the process?. Which kind of materials can be safely used inside the applicator?. What about the control system?. Efficiency?. Installation costs?. Maintenance costs?. How often?. We will try to answer these and other questions during the session dedicated to microwave applicators choice and design criteria. A lecture for the application engineer, the end-user and who wants to know more.</i>	
12.00 - 13.15	Modeling as a tool to design and optimise applicators, V. Yakovlev , Worcester Polytechnic Institute – USA <i>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. The emphasis is made on the Finite-Difference Time-Domain (FDTD) method and the related computational strategies for simulation of purely electromagnetic and coupled (electromagnetic plus thermal) phenomena. Formulations and solutions of related optimization problems are also considered. Finally, the lecture discusses the capabilities and limitations of a recently developed technique of modeling-based design of microwave applicators providing uniform temperature fields inside the processed materials.</i>	
13.15 - 15.00	Lunch at Termal Restaurant	
15.00 - 16.30	Industrial RF and Microwave Application: a brief review, A.C. Metaxas , Metaxas Associates <i>This lecture will review the industrial applications of RF and microwave energy, ranging from rubber curing to food tempering with microwaves and from moisture levelling of biscuits to textile drying with RF. Examples of good and bad practice will be highlighted as well as the use of computer modelling for studying specific aspects of such energy use in industry. Contents include an introduction to Electroheat and Energy Utilization, Advantages of RF and Microwave Heating, Examples of Processing with RF, Modelling of RF arcing, Examples of Processing with Microwaves, Modelling of microwaveable food packages which contain thin metallic films and conclusions.</i>	

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About the Speakers

Dr. José M. Catalá-Civera

Jose M. Catalá-Civera was born in Valencia (Spain) in February 1969. He received the Dipl. Ing. and Ph.D. degrees from the Universidad Politécnica de Valencia, Spain, in 1993 and 2000, respectively. Since 1996, he has been with the Communications Department, Universidad Politécnica de Valencia, where he received the Readership in 2000. Currently he is head of the Microwave Applications Research Division of the Institute ITACA at the Universidad Politécnica de Valencia. His research interests encompass the design and application of microwave theory and applications, the use of microwaves for electromagnetic heating, microwave cavities and resonators, measurement of dielectric and magnetic properties of materials and development of microwave sensors for non-destructive testing. He has co-authored about 100 papers in referred journals and conference proceedings, more than 50 engineering reports for companies and he holds 14 patents. Dr. Catalá-Civera is IEEE Member, IMPI Member, he is reviewer of several international Journals and is currently Board Member of the Association of Microwave Power in Europe for Research and Education (AMPERE), a European-based organization devoted to the promotion of RF and microwave energy.

Dr. Eng. Paolo Veronesi

1998 - Bachelor degree in Materials Engineering at the University of Modena and Reggio Emilia – Italy.
2001 - PhD degree in Materials Engineering; thesis title: " Study, design and development of new applicators and processes for the microwave assisted heat treatment of materials".
2001 - Post-doctoral position at the University of Modena and Reggio Emilia, Dept. of Materials and Environmental Engineering; topic: "Microwave assisted surface and thermal treatments of silicatic glasses and glass-matrix composites".
Since 2003 - Member of the Italian technical committee CEI-CT27 – Electroheat. Researcher in Metallurgy - Dept of Materials and Environmental Engineering, University of Modena. Working areas: thermal applications of microwaves, dielectric heating modeling, design of applicators, coatings (CVD/PVD), SHS, tribology and metals.

Dr. Vadim V. Yakovlev

Vadim V. Yakovlev received his Ph.D. in Radio Physics in 1991 from the Institute of Radio Engineering and Electronics of the Russian Academy of Sciences where he worked as Senior Research Scientist until 1996. In 1993, Dr. Yakovlev was with Electricité de France, Centre "Les Renardières", and in 1996 joined the Department of Mathematical Sciences of Worcester Polytechnic Institute (WPI), Worcester, MA, USA, his current affiliation. In 1999 he established the Industrial Microwave Modeling Group (www.wpi.edu/+CIMS/IMMG) as a Division of the WPI's Center for Industrial Mathematics and Statistics, focusing on microwave modeling and optimization. The IMMIG organizes annual international seminars on computer modeling for microwave power industry. Dr. Yakovlev has authored more than 80 papers. He is a member of AMPERE, IMPI and IEEE. His current research interests are in neural-network-based techniques for microwave inverse problems and optimization.

Dr. AC (Ricky) Metaxas

Dr AC (Ricky) Metaxas is a Fellow and Tutor at St John's College Cambridge, UK. He received his doctorate at Imperial College London in 1968 in the field of gas discharges. In addition to his extensive teaching experience at the University of Cambridge (1982-2002) where he was seconded from Eastern Electricity plc, he has also worked for the UK's fusion programme at the Atomic Energy Authority (1968-1972) and the Electricity Council Research Centre (1972-1982-now C-Tech Innovation) where he promoted and researched the use of electricity in industry. He co-authored Industrial Microwave Heating (IEE, 1983) and has written Foundations of Electroheat: A Unified Approach (Wiley, 1996). He is a Fellow of IEE and President of AMPERE. He is the author of over two hundred publications and is founder and Managing Director of AC Metaxas and Associates, an energy consultancy.