AMPERE Newsletter

Trends in RF and Microwave Heating

http://www.ampere-newsletter.org

Issue 123 **July 9, 2025**

In this Issue:

ISSN 1361-8598

In memoriam: Professor Serge Lefeuvre (1935-2025) – A visionary in microwaves

Junwu Tao, Tan-Hoa Vuong

Département Electronique, Energie Electrique & Automatique, ENSEEIHT, Toulouse Institut National Polytechnique
Toulouse, France

Contact E-mail: jun-wu.tao@enseeiht.fr

Serge Lefeuvre (1935–2025)

"I have a little idea, and it has to work perfectly," he would declare, hands animating an imaginary basketball toss, his eyes dancing with a familiar, joyous sparkle. This iconic phrase belonged to **Serge Lefeuvre**, a distinguished professor whose life was a testament to intellectual curiosity, groundbreaking research, and unwavering dedication. It is with immense sorrow that we announce his passing on April 20, 2025, just before what would have been his ninetieth birthday.

Born in 1935 in the serene town of Langrolay-sur-Rance, Brittany, Serge's early promise was evident as he pursued his preparatory classes at the Lycée Chateaubriand in Rennes. His path led him to the **ENSEEIHT**, where he graduated as an engineer in 1959. His exceptional aptitude for research quickly became apparent when he joined the CNRS, culminating in his doctoral thesis in 1961. After a period serving his country as a naval officer, imparting his electronics expertise at the École Navale near Brest, Serge returned to his alma mater, ENSEEIHT, in 1967, embarking on a transformative career as a professor of electronics.

Professor Lefeuvre was a true luminary in the field of **high power microwaves**. His leadership was pivotal; he served as Director of the Electronics Department at ENSEEIHT, spearheaded the pioneering work of the Microwave Laboratory, and later directed the Microwave Hyperthermia Laboratory. Beyond the confines of academia, his influence extended deeply into the professional landscape. A profound admiration for Michel HUG, a key architect of France's nuclear power infrastructure and former President of the ENSEEIHT School Council, inspired Serge to collaborate in the creation of the Midival association, an organization he later proudly led as President. His entrepreneurial spirit also saw him found Creawave, a consulting firm that further bridged the gap between cutting-edge research and industrial application.

Serge Lefeuvre's contributions resonated far beyond national borders. He was a highly respected member of the scientific committee of the French Electrothermal Committee (1974-1986) and a towering figure within prestigious international bodies like the International Microwave Power Institute (IMPI) and the Association of Power Microwaves in Europe for Research and Education

(AMPERE). His profound impact was recognized globally, leading to extensive collaborations with scientists across Russia, Poland, the United Kingdom, Italy, Spain, Sweden, Turkey, Morocco, and the United States. This international esteem was formally acknowledged through his membership as a foreign member of the Russian Academy of Engineering Sciences and his appointment as an honorary professor at the Krasnoyarsk National Technical University.

As a dedicated research professor, Serge Lefeuvre's legacy is also etched in the minds and careers of some twenty doctoral students he meticulously supervised, each of whom benefited from his profound knowledge and mentorship. His intellectual output was prodigious, marked by the authorship or co-authorship of some twenty patents that translated theoretical knowledge into practical innovation. His published works, from the fundamental "Hyperfrequency: Mastery of Electronics, Electrical Engineering, and Automation" (1969) to the more recent "One Model of Microwave Heating of Water Drops" (2022), stand as enduring testaments to his scholarly rigor and unwavering commitment to advancing his field.

Beyond his impressive professional achievements, Serge Lefeuvre was a devoted family man. He shared his life with Marie-Claude Lefeuvre, née Magrin, an accomplished English teacher, and together they raised four children. He leaves behind not only a rich tapestry of scientific and technical achievements but also the cherished memory of a brilliant mind, an inspiring mentor, and a warm, committed individual who brightened the lives of those around him with his wit and vision.

Our heartfelt condolences are extended to his beloved wife, Marie-Claude, his children, and all his family, friends, former colleagues, and students. Serge Lefeuvre's impact will be felt for generations to come.

This Obituary can also be read in French at the link:
https://www.ampereeurope.org/wp-content/uploads/2025/07/about_serge_french.pdf

---

Microwave research at the Department of Biotechnology and Physical Chemistry at Cracow University of Technology, Krakow, Poland

Dariusz Bogdal

Head of Department of Biotechnology and Physical Chemistry at Cracow University of Technology

Contact E-mail: pcbogdal@cyf-kr.edu.pl

The Department of Biotechnology and Physical Chemistry was established almost 15 years ago; however, the first work related to the use of microwave irradiation in chemistry was undertaken in the late 90s. The research was concerned with reactions under phase-transfer catalytic (PTC) conditions, which were carried out mostly under solvent-free conditions and yielded much better results. A little later the principles of Green Chemistry were formulated, and it was found that the reactions carried out under such conditions with the use of microwave irradiation were perfectly suited to the area of interest.

Nowadays, we are the interdisciplinary Team with a number of highly motivated young and practised researchers, experienced in platform chemicals, nanomaterials, and physical chemistry (**Figures 1-2**). We have over 25 years of research

experience in organic and polymer chemistry. In the last few years we have also focused on intensification of chemical processes (ICP), which is commonly mentioned as one of the most promising development paths for the chemical industry and one of the most important progress areas for chemical engineering research.

Fig. 1: Microwave research group at Cracow University of Technology.

Fig. 2: Selfie of microwave research group at Cracow University of Techology.

The use of alternative energy forms, e.g. plasma, UV, microwave or ultrasound waves, is one of the key approaches of ICP. We use these techniques to synthesise organic compounds, polymers, and nanomaterials. Our research was published in high- and medium-impact factor journals. We have experience in the realisation of a number of national and internationally funded projects during the last years as partner and leader, respectively. We have the basic infrastructure facilities necessary for the correct execution of the projects on research and we are divided into teams:

Chemical Processes Intensification Team

Recently, the group has been responsible for organic synthesis under microwave irradiation, investigating the structure and physicochemical properties of new compounds with potential applications in various industries:

- Application of phase-transfer catalysis (PTC) for synthesis of polymers and organic compounds.
- Polymer synthesis and modification of novel polyester elastomers, elastic polyurethane, epoxy resins, and chitosan derivatives.
- Polymer modification with renewable materials and recycling.
- Preparation and investigation of polymers for optoelectronic devices
- Rare earth metal complexes and rare earth metal complexes as polymer pendant groups

More recently, the group is interested in the development of new synthesis pathways according to the 6R principles, the preparation and characterisation of cellular and tissue scaffolds, implants, GBR/GTR systems, controlled drug delivery and release systems, hemostatic agents, bioactive coatings, the synthesis and testing of nanomaterials, and extensive in vitro biological research. Current topics include 4D bioprinting, preparation, and characterisation of biodegradable Mg-based implants and 2D nanomaterials from the MXenes and CQDs groups, as well as the application of AI in the prediction of medical device properties and in vitro diagnostics and the intelligent design of biomaterials with controlled, time-varying parameters.

Applied Photochemistry Team

The research focus of the Applied Photochemistry Team is on photopolymerization, and the synthesis and characterisation of innovative photoinitiator systems, photosensitisers, accelerators, coinitiators, and photoinitiators for 3D printing applications in LCD, DLP, SLA, CLIP, and volumetric resin 3D printing technologies.

Research also includes applications of spectroscopic and calorimetric methods for monitoring photochemical processes, as well as the development and synthesis of new fluorescent sensors for use in the photochemistry of polymers and polymer coating materials. The Group is also working on innovative solutions in the field of aerodynamic research using photochemical sensors, as well as the design of theranostic luminescent sensors that enable precise tracking of cellular processes in studies of cytotoxicity, genotoxicity and antibacterial properties of materials with a view to their application in biomedicine.

Green Technologies and Bionanomaterials Team
The research topics of the group include obtaining and analyzing the properties of chitosan biomaterials; obtaining and analyzing the properties of bionanocomposites; thermal analysis (DSC) of materials; study of biodegradation of materials; processing of waste biomass; microwave-assisted extraction (MAE); ultrasound-assisted extraction (UAE); microwave-assisted organic synthesis; analysis of chemical and microbial contamination of the environment and intensification of aerobic and anaerobic fermentation processes.

Current research focuses on the synthesis and study of the properties of innovative chitosan biomaterials for biomedical applications, microwave synthesis of chitosan hydrogels and aerogels, preparation of fermented basil extracts for cosmetic applications, and ultrasound-assisted extraction (UAE) of plant material.

Polymer Synthesis and Biosynthesis Team
Research topics range from the preparation of synthetic polymers (mainly based on itaconic acid, natural oils and their derivatives) to the biosynthesis of biopolymers, primarily polysaccharides produced by fungi, algae and cyanobacteria. Current research topics include vitrimers based on itacone polyesters (international project Weave-UNISONO UMO-2024/06/Y/ST5/00062), fungi, algae and cyanobacteria as sources of polysaccharides (FutureLab project of Krakow University of Technology), synthesis and characterization of properties of aliphatic copolymers based on itaconic acid esters, screening for fungal strains producing unsaturated carboxylic acids, application of biocatalysis for monomer synthesis, synthesis of polymers by controlled radical polymerization methods (m. ATRP, RAFT, among others) and the study of radical polymerization kinetics (experiment and modeling).

Fluorescent Biomaterials and Molecular Electrochemistry Team
Current research includes the synthesis of new molecular fluorophores in carbon dots along with their structural characterization, determination of photophysical properties and reaction mechanisms. Biodegradable polymeric materials for tissue engineering obtained by conventional methods and 3D printing are also being developed.

Research is also being conducted on the synthesis of bioactive compounds using precursors of natural origin and determining their affinity for potential molecular targets, as well as the biosynthesis of small-molecule organic compounds of industrial and environmental importance.

The research also includes the development of fluorescent methods for the determination of psychoactive substances and their metabolites, as well as studies on the mechanism and thermodynamics of catalytic and non-catalytic reductive dehalogenation of polyhalogenated organic compounds of biological and environmental importance, as well as computational electrochemistry and molecular spectroscopy of organic and coordination compounds and the study of the effects of non-covalent interactions on their redox and optical properties.

In 2015, we organized *AMPERE – 15th International Conference on Microwave and High Frequency Heating, Kraków, 14-17 September 2015* as well as 3th *Summer School in High Energy Processing Ultrasound & Microwave Technologies*, 2015; under patronage of *European Society of Sonochemistry (ESS)* and *Association for Microwave Power in Europe for Research and Education (AMPERE)*. Similarly, *5th Summer School in High Energy Processing Ultrasound & Microwave Technologies* was organized in 2019. **Figure 3** shows a nice view of Krakow centre.

Fig. 3: Krakow, Matejko Square located in the city centre.

Recent international cooperation-projects

- COST D32 "Chemistry in High Energy Microenvironments" WG10: Diversity oriented synthesis under (highly efficient) microwave conditions. (2004-2008)
- COST D40 "Innovative Catalysis: New Processes and Selectivities" WG1: Innovative Catalysis in Oxidation Reactions (2006-2011).
- COST CM0903 "Utilisation of Biomass for Sustainable Fuels & Chemicals (UBIOCHEM)" WG3: Biomass to materials (2009-2013)
- COST TD1203" Food waste valorisation for sustainable chemicals, materials & fuels (EUBis)" WG3: Chemical processing (2013-2017)
- COST CA15106 C-H Activation in Organic Synthesis (CHAOS) (1016-2020).
- Erasmus+ "Improvement of innovative teaching methods in the fields of Technology and Chemical Engineering according to the best standards of the Bologna Process"(no. 2014-1-PL01-KA203-003415)
- STARS EU - STrategic Alliance for the Regional TranSition - ERASMUS-EDU-2023-EUR-UNIV-1 -European Universities – Development of new deep institutional transnational cooperation: Project No 101124529 (2023-2027)

For further reading

1. D. Bogdal and M. Galica, Introduction to Microwave Chemistry. In: Microwave Engineering of Nanomaterials: From Mesoscale to Nanoscale. E. Guenin (Ed.) Pan Stanford, 2016, ISBN 9789814669429.
2. D. Bogdal, S. Bednarz, K. Matras-Postolek, Microwave-Assisted Synthesis of Hybrid Polymer Materials and Composites (2015) Advances in Polymer Science, DOI: 10.1007/12_2014_29.
3. D. Bogdal, U. Pisarek, Polymer chemistry under action of microwaves. In: *Microwaves in Organic Synthesis*, A. de la Hoz, A. Loupy (Eds), III ed., Wiley-VCH, 2012.
4. D. Bogdal, Microwave-assisted polymerization. *Comprehensive Polymer Science*, K.Matyjaszewski, M.Moller (Eds), II ed., Elsevier, 2011.

About the author

Professor Dariusz Bogdal has 40 years of research experience in organic and polymer chemistry. He works extensively on the application of phase-transfer catalysis (PTC) and microwave irradiation to organic and polymer synthesis as well as polymer modification and recycling. He is also involved in the application of microwave-assisted reactions to organic and polymer chemistry.

Professor D. Bogdal is the author and co-author of books published in Elsevier and Blackwell-Wiley i.e., "Microwave-assisted organic synthesis: One hundred reaction procedures" (2005) and "Microwave-Enhanced Polymer Chemistry and Technology" (2007), six book chapters and over 200 papers and review articles; (https://dariuszbogdal.pl). His teaching includes organic and polymer chemistry as well as physical organic chemistry. Professor Dariusz Bogdał was the vice-rector for science at Cracow University of Technology in charge of overall strategy, development and scientific cooperation of the university, which includes European projects during 2020-2024. He was the Dean of the Faculty of Chemical Engineering and Technology during 2016-2020. In the past, Professor Bogdal was the chairman of Erasmus+ Strategic Partnership Program: Improvement of innovative teaching methods in the fields of Technology and Chemical Engineering according to the best standards of the Bologna Process (2014-2017). Now, STARS EU - STrategic Alliance for the Regional TranSition - ERASMUS-EDU-2023-EUR-UNIV-1 - European Universities – Development of new deep institutional transnational cooperation: Project No 101124529 (2023-2027). Between 2008 and 2016, he was responsible for the coordination of international cooperation and Erasmus Programs at Cracow University of Technology as the vice-rector for education and international cooperation.

Contact details:

Professor Dariusz Bogdal
Department of Biotechnology and Physical Chemistry
Faculty of Chemical Engineering and Technology
Cracow University of Technology
ul. Warszawska 24

31-155 Cracow, Poland
phone: +48 126282700
email: pcbogdal@cyf-kr.edu.pl

http://dariuszbogdal.pl
http://www.cyf-kr.edu.pl/~pcbogdal

Ricky's Afterthought:

Miscellaneous items

A.C. (Ricky) Metaxas

Life Fellow St John's College Cambridge UK
Contact E-mail: acm33@cam.ac.uk

Rummaging through my bookcases in my office at St John's I came across some interesting books which I would like to bring to the attention of the readership. These are not new but members who joined our community recently may not be aware of their existence.

- Introduction to Plasma Technology: Science, Engineering and Applications, by John Harry, Wiley 2010
- Radio Frequency Plasmas by Pascal Chabert and Nicholas Braithwaite CUP 2011
- Dielectric Properties of Agricultural materials and Their Applications by S Nelson Academic Press 2015

All the books are still available to purchase, however, to my amazement I was able to download the whole of Stuart Nelson's book within a few minutes and for free. One does not get that kind of service with many books!

AI and all that

I also came across the Proceedings of the ***MRS Symposium held in San Fransisco in 1994*** on Microwave Processing of Materials IV edited by M. Iskander, R. Lauf and W. Sutton, where I presented an Overview of the activities within my group, the EUG at Cambridge University Engineering Dept.

Browsing through the paper it starts by describing all the usual activities such as teaching, research, publications, books, seminars, etc., but to my extreme surprise the last activity read as follows:

"AI and electroheat
Finally the Unit is looking ahead in linking aspects of artificial intelligence, already an important activity within the Engineering Department in its own right, with electroheat and this will form another important area in the near future. The result, years later, was the development of an expert system which guided the user, having fed the type of material, its size/properties and the heating/drying requirements, to the most appropriate eletroheat system for treating this particular material.".

Wow, this is some 30 years before AI has become the topic of conversation in all aspects of everyday life with researchers talking of downloading an AI roadmap to stay ahead of developments. Of course, the first notion of AI came about in the 1950's when it was hinted that in the future one could build machines that were more intelligent than humans.

The latest news regarding developments in AI, emanates from the founders of Anthropic, the $60billion rival to OpenAI, who claim that within a year there will be dramatic changes to the workforce making many unemployed and hoping that their

start-up will become one of the super-corporations of tomorrow. The industrial revolution had a similar effect when machines replaced many in the workforce forcing a huge swathe of redundancies, so likewise AI will have a similar effect and re-orientate society to a new order which many cannot thus far fully envisage. Incidentally many that are now with Anthropic were previously employed by OpenAI but they felt disillusioned by the way this company was run and joined the rival start-up. Anthropic's Chatbox, Claude, is highly regarded with some claiming that it is superior to ChatGPT across a number of industrial criteria. It is claimed that despite massive losses thus far they still bring funds in aiming next year at a staggering $4billion.

The speed with which rival start-ups are developing is astonishing. Which of Anthropic, OpenAI, Google and Deepseek in the end will come on top is hard to say at this stage, the crucial factor being the kind of data one feeds in to these schemes for training will influence how well they develop.

Ethan Mollick from Pennsylvania University and author of Co-Intelligence, said recently, that "adoption of this technology is historically huge and more is coming. Every controlled study we do shows large scale effects on performance from using AI systems at the individual level. It is good at medicine and education." What is undeniable is the speed with which AI enters all walks of life and one hopes that people involved in this emerging technology have built in their systems safeguards so that when something is obviously going the wrong way, however one defines that, alarm bells sound and catastrophic consequences are averted.

Such sentiments are echoed in Cambridge's Conservation Institute, which recently it asked:

"Have you ever persisted in following your SatNav even when you knew you were going in the wrong direction? If so you will know that placing all your trust in a machine powered by AI without also engaging your own intelligence does not always get you where you want to go. This is a message that a group of conservation scientists at Cambridge is pushing hard. Efforts to protect the natural world need all the help they can get but before embracing AI as a solution we need discussions about its risks and wider implications."

What is frightening is the pace at which AI is invading many areas and we seem to be incapable of slowing it down or arresting its relentless expansion.

Incidentally, the In Memoriam about Serge Lefeuvre that heads this Issue was prepared by our colleagues at ENSEEIHT, Jun-wu and Tan-Hoa and was enhanced using AI's ChatGPT!

AMPERE 2025 Conference: last updates

Endorsed by AMPERE EUROPE and supported by three national associations (SCI, SIEm and INSTM), as well as two universities (Polytechnic University of Bari, Bari, Italy, and University of Modena and Reggio Emilia, Modena, Italy), the 20th International Conference on Microwave and High Frequency Applications is well underway! There will be two short courses, six plenary lectures, eight keynote speakers, four parallel sessions and much more for around 180 registered participants. Moreover, this edition of the AMPERE conference will feature a brand new addition: a day dedicated entirely to the oral presentation of industrial applications (Industry Day, 17 September). On the first day, there will be an extensive 'medical applications' session dedicated to Nevio Tosoratti for delegates interested in this emerging topic, with more than 15 presentations.

The Platinum sponsor (Muegge Group), the Golden sponsor (MKS) and the Silver sponsor (S-TEAM) have confirmed their attendance, alongside a vibrant exhibition area.

The event will take place from 15 to 19 September 2025 at the romantic Hotel Villa Romanazzi-Carducci in Bari, Italy. Book your flights and accommodation early, as another national event will be taking place in Bari the same week. Don't miss this opportunity!

About AMPERE Newsletter

AMPERE Newsletter is published by AMPERE, a European non-profit association devoted to the promotion of microwave and RF heating techniques for research and industrial applications (http://www.ampereeurope.org).

New structure of the AMPERE Newsletter

At a management meeting during AMPERE23 it was decided that in view of the introduction of the new scientific Journal entitled "European Journal of Microwave Energy" supported by CUP, no technical papers will be published in future Issues of the Newsletter. Instead, AMPERE welcomes submissions for short bios on individuals, articles, research proposals, projects, briefs as well as news.

AMPERE Disclaimer

The information contained in this Newsletter is given for the benefit of AMPERE members. All contributions are believed to be correct at the time of printing and AMPERE accepts no responsibility for any damage or liability that may result from information contained in this publication. Readers are therefore advised to consult experts before acting on any information contained in this Newsletter.

AMPERE Newsletter

ISSN 1361-8598

https://www.ampereeurope.org/newsletter/