THE WAVE

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IMPI 52 Call for Papers Nets Largest Number of Abstract Submissions in Recent Years; Plans for Symposium Underway

The Call for Papers for the 52nd Annual Microwave Power Symposium (IMPI 52) netted the largest number of abstracts the Institute has received in recent years. Over 60 abstracts underwent review by the Technical Program and Food Science & Technology Program Committees. IMPI 52 will be held at the Hilton Hotel in Long Beach, California, USA from June 26-28, 2018. IMPI 52 will feature 2 keynotes addresses, a short course on Modeling, a Spotlight Session on Industrial Microwave Applications, invited, oral and poster presentations, panel discussions, many networking opportunities and a full exhibition hall. Registration is now open.

Abstracts were received from researchers, students and professionals in Australia, Canada, China, France, Germany, Japan, Italy, The Netherlands, Sweden, Taiwan, the UK and the USA.

The full program will be released in early March but sessions will include: Microwave Assisted Chemistry, Solid State Applications, Microwavable Packaging, Food & Agriculture, Material Handling & Scale up, Dielectric & Material Processing, Industrial Processing, Microwave Plasma, Microwave Oven: Design, Safety & Standards, Applications in the Mining Industry, Modeling, CAD & Optimization, Product Validation, Processing of Food, Process Intensification with Mw and RF, Microwave Equipment, and New (Non-communication) Microwave Technologies.

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PRESIDENT'S MESSAGE

Sometimes the press gets it so completely wrong that it's almost laughable, except that the ordinary reader may come away with a totally false impression of reality. Such is the case surrounding some work that was done by the University of Manchester in the UK. Here, for example, are excerpts from an article is that appeared in the publication "Clean Malaysia": "According to a groundbreaking study by researchers at the University of Manchester, the millions and millions of microwaves in use around the European Union emit as much CO2 as 7 million cars each year .... What they have found is that the microwaves in use across the EU emit an estimated 7.7 million tons of CO2 each year, which is the equivalent to the annual emissions of 6.8 million cars." A recent article in The Daily Mail (UK) Entitled "Is Your Microwave KILLING the environment?", then claimed that by emitting this much carbon dioxide, microwave ovens could be as bad for the environment as cars.

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IMPI 52 SYMPOSIUM CONTINUED

A Short Course on Modeling will be offered from 8am-12pm on Tuesday June 26th. The Short Course will be taught by Dr. Vadim Yakovlev of Worcester Polytechnic Institute and cover the major issues in the development of efficient processes and systems of microwave power engineering and shows how some of these difficulties could be addressed (as well as what problems could be resolved) with the use of computer modeling.

This year's Spotlight Session, **"There's a Novel Microwave Process in your Future"** will kick off at 1:30pm on Tuesday, June 26th. The Spotlight Session will feature a series of invited papers and a panel discussion. The Welcome Reception in the Exhibit Hall and adjacent patio area will follow. The Symposium will run all day Wednesday through 3:45pm Thursday. IMPI 52 will offer a myriad of networking opportunities including networking luncheons, a Group Dinner at a local restaurant and a full Spouse/Guest Program.

Lora Spizzirri, VP of Research & Development for 915 Labs will present a keynote address on Wednesday, June 27th, **"Microwave Food Processing - Reinventing Packaged Food."** The keynote address on Thursday, June 28th will be presented by Dr. Brad Hoff, a Senior Research Physicist, with the United States Airforce Research Laboratory. Dr. Hoff's keynote entitled, **"Millimeter wave interactions with high temperature materials and their application to power beaming."**

Muegge GmbH will serve as the Gold Sponsor, Ampleon and Richardson Electronics have come on board as Silver Sponsors and Ferrite Microwave Technologies has signed on as a Bronze Sponsor. Additionally, Ampleon has agreed to sponsor 2 student's registrations and travel for the conference. A few sponsorships remain and interested parties should contact the IMPI Office.

We have a record number of Exhibitors confirmed for IMPI 52 as well: Ampleon, Ferrite, Graphic Packaging International, L3 Electron Devices, MKS, Muegge GmbH, NXP, PSC, SAIREM, Richardson Electronics, Wattsine. Exhibit Packages are selling out very quickly – contact molly.poisant@impiorg to secure your booth today!

Regular updates on the IMPI 52 Symposium, hotel, registration and travel information can be found at http://impi.org/symposium-short-courses/

IMPI Welcomes our two newest Corporate Members:

SAIREM & NXP Semiconductors

PRESIDENTS MESSAGE CONTINUED

Now that's not at all what the University of Manchester's study says. (Interestingly, the actual purpose of the study is to use microwave ovens as an example for assessing the impact of EU environmental legislation due to take full effect in 2020.) We all know that microwave ovens do not emit CO2, so that part is absolute nonsense. What the University of Manchester study claimed was that microwave ovens in the EU consume an estimated 9.4 terawatt- hours (TWh) of electricity per year, which is equivalent to the annual power generated by three large gas-fired powered plants (hence the source of CO2). Also, individual microwave ovens use approximately 573 kWh over a lifetime of eight years.

You can imagine the hysteria that this sort of incorrect press can generate in an unknowing public. Fortunately, our colleagues at the Microwave Technology Association of the UK (MTA-UK) responded with an excellent news release titled, "is your microwave SAVING the environment?", prepared by Greg Hooper, microwave and thermal process specialist and Honorary Member of MTA-UK; a copy of that news release appears in this newsletter. Greg makes the point, in great detail, that all cooking uses energy, but microwave ovens do it more efficiently, and generally use much less energy. I urge you to read the MTA's and Greg's report carefully – it does a good job of setting the record straight.

Throughout my day I keep getting emails from Quora, an Internet site to which individuals send questions of all sorts, and I frequently respond to those relating to microwave ovens and microwave energy. What disturbs me is that many of the same questions keep appearing over and over again, e.g. are microwave ovens dangerous?; can eating microwaved foods cause cancer?; do microwaves kill the nutrients in foods?; is the radiation from microwave ovens dangerous?; etc.. What all this indicates is the great ignorance of much of the public as relates to microwave ovens. There is a small minority that don't use microwave ovens and won't have them in their homes, but we know that saturation in the United States is about 93 to 95%, so there are approximately 150 million homes in which microwave ovens are being used, and many of these are used many times a day. And yet, there is much misunderstanding about the microwave ovens – to the consumers they just peculiar black boxes that heat their coffee or foods despite the air still being cold – weird! We need to do a better job of communicating with consumers to assure them that their microwave ovens are not dangerous, don't damage of foods, cook many foods, such as fish and vegetables, better than any other way (something my wife and I do regularly). I admire the excellent job that Jennipher Marshall-Jenkinson and the MTA – UK is doing, communicating with consumers through their website. Also, Jennipher conducts many microwave oven cooking demonstrations, both on television and at meetings throughout the UK (many of you enjoyed Jennipher's cooking demonstration when you attended IMPI 51). This is something that use to happen a great deal in the United States, as manifested by the very large number of home economists that were members of IMPI in the late 1970s and into the 90s, producing microwave cookbooks, and running microwave cooking schools. A quick search on Google didn't turn up any in the USA, although there are quite a few microwave-cooking videos on YouTube. Currently, IMPI is not organized to deal directly with consumers, but I wonder if there is a way that we can? Please send Molly and me any suggestions you may have.

Let me finish with another piece of research that shows just how crazy this whole area is becoming. In the journal Sustainable Production and Consumption(Volume 15, July 2018, Pages 1-15), an article "Understanding the impact on climate change of convenience food: Carbon footprint of sandwiches", gives the carbon footprint of 40 different homemade or commercially made sandwiches, concluding that the carbon footprint is lower for homemade sandwiches. I guess that if you're environmentally conscious, you'll want to be making your own sandwiches.

Best wishes,

Bob

CALENDAR OF EVENTS

Klystrons, Traveling Wave Tubes, Magnetrons, Crossed-Field Amplifiers and Gyrotrons, February 27 – March 1, 2018, Stetson University Center, Celebration, Florida. Registration and more details at: www.asgilmourjr.com and click on the **orange Eventbrite button**.

52nd Annual Microwave Power Symposium (IMPI 52) The Hilton Hotel, Long Beach, California, USA, June 26-28, 2018. http://www.impi.org/

IMPI's Fall Short Course 2018 will be held October 24-26 at Campbell's Soup Company Headquarters in Camden, New Jersey, USA. Our Welcome Reception, Group Dinner and hotel block will take place in downtown Philadelphia, PA. Transportation to and from Camden will be included in your registration. Save the date and look for more details on this flagship event next month.

Do you have an event you want us to publish? Contact molly.poisant@impi.org to have your event highlighted.

News from Around the Web

Microwave catalyst in recycling PET

Radar adds technological twist to age-old cranberry counting process

Statement from Jeffrey Shuren, M.D., J.D., director of the FDA's Center for Devices and Radiological Health on the recent National Toxicology Program draft report on radiofrequency energy exposure

Cancer Risk from Cellphone is Still Small, Study Says

Is your microwave SAVING the environment?

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There was a recent article in the Express newspaper entitled "Is your microwave KILLING the environment? Study claims they emit THIS much carbon dioxide. MICROWAVE ovens could be as bad for the environment as cars, new research suggested". The article can be found here: https://www.express.co.uk/news/uk/906018/microwave-global-warming-climate-change-University-of-Manchester-research-emissions-cars

This is a response to the article which takes the electricity used and the carbon dioxide associated with the production, use and disposal of microwave ovens completely out of context, preferring to report the results from a scientific study as negative rather than positive.

For a start, the title is misleading – microwave ovens don't actually emit any carbon dioxide! The energy used in making, running and disposing of the microwave oven has an energy footprint associated with it. I presume it is this to what they are referring.

Almost all foods need cooking (heating), traditionally this has involved using gas, electric or fan-assisted hot ovens to heat air. The heat energy in the hot air is then passed to the food product. In theory, this involves several steps; a heating element (or gas flame) heats the air inside the oven, this then heats the oven itself and the outside of the food, finally this heat energy is then conducted to the centre of the food. Compared to microwave heating hot air heating is a relatively inefficient process, since in microwave ovens electricity is converted to microwave energy and this then directly penetrates and heats the food itself, meaning much less energy is wasted heating the oven itself or the air inside or the packaging. So although the article draws attention to the energy and emissions associated with microwave ovens, this is far less than the energy used and associated emissions from using conventional hot air ovens.

To investigate the potential energy saving of using a microwave oven compared to a conventional hot air oven trials were performed using an energy meter to measure the electrical energy consumed during the heating of a frozen ready meal product. The heating times developed to safely cook a c.400g chicken and vegetable ready meal were used for both a 900W microwave oven and a fan-assisted electric oven set at 180°C. Note that a fan-assisted oven was used for the trials, rather than a standard electric oven. Fan ovens are more energy efficient as they have much better heat transfer from the hot air to the product caused by the rapidly moving (fanned) air inside the oven.

The results were interesting and summarised below:

- The fan-assisted electric oven used 0.43 kilowatt hours (KWh) in a 15 minute pre-heat.
- In cooking the product for the recommended 51 minutes the oven used an additional 0.67 KWh, giving a total of 1.10 KWh.
- In microwaving for 12 minutes on full power the microwave used just 0.25 KWh. What was surprising was that the fan-assisted electric oven used almost twice as much energy as the microwave oven in just the pre-heat! Over the whole cooking process the microwave oven used over four times less electrical energy compared to the fan-assisted oven and also cooked the meal over four times faster. Granted, there were a limited range of tests performed and a much more in-depth research project could also compare other products, with longer and shorter cook times, different sized and type of products and different oven types and perhaps other cooking methods etc. But the results from these limited tests indicate the energy (and time!) saving convenience of microwave cooking compared to using a fan-assisted oven. Furthermore (using the figures above) a shorter heating time e.g. for a product requiring 20 minutes in a fan-assisted oven at 180°C compared with say 4 minutes in the microwave on full power could result in the microwave using 8 times less energy than the fan-assisted oven!

Continued... **Is your microwave SAVING the environment?**

Some of the points of interest in the article in the Express newspaper were:

- The use of microwave across the European Union (EU) emits as much carbon dioxide as almost 7 million cars – 7.7 million tonnes of CO_2.

- Microwaves across the EU consume an estimated 9.4 terawatt hours (TWh) of electricity per year (this is incorrectly stated as 9.4 terawatts per hour in the article!). This is equivalent to annual power generated by three large gas power plants.

- An individual microwave uses 573 kilowatt hours (KWh) over a lifetime of 8 years. Using a bit of 'bucket science' and applying the relative efficiency figures measured for the microwave oven versus fan-assisted electric oven, we arrive at the following conclusions (note that the manufacturing and disposal of the ovens was not taken into account– but since microwave ovens are far smaller than fan-assisted ovens, it might be presumed that the energy required to make and dispose of microwave ovens is less anyway). Since the microwave versus fan-assisted oven trials indicated a four times greater energy efficiency for the microwave, then applying this to the figures in the article the conclusions (based on limited trials) would be:

- Using microwave ovens rather than a conventional fan-assisted electric oven would SAVE 23 million tonnes of carbon dioxide, equivalent to almost 21 million cars!

- Using microwave ovens rather than a conventional fan-assisted electric oven would SAVE 28 terawatt hours (TWh) of electricity per year! This is equivalent to the annual power generated by nine large gas power stations!

- Using microwave ovens rather than a conventional fan-assisted electric oven would SAVE 1719 kilowatt hours (KWh) over a lifetime of 8 years! So, if you want to help the environment (and your pocket) with a reduction in energy use and reduction in carbon dioxide emissions then use your microwave instead of conventional fan-assisted hot air ovens (or gas and electric ovens for that matter)! If you want to help reduce the energy and emission lifetime footprint of your microwave oven, then make it last longer! Much of the energy use of appliances actually comes from manufacturing and disposing of them when their useful life is over. Making your microwave last longer is relatively simple:

1. Keep it clean inside – especially the mica window where the microwave energy passes into the cavity. A dirty mica window (coated in grease, oil, burnt food deposits etc) stops some of the microwave energy passing into the cavity; this puts stress on the microwave generating components.

2. Allow it to dry inside after use. Rust is also a killer of microwave ovens. Drying the inside of the oven after use will reduce the risk of rust formation. Keeping it clean will also help this!

3. Ensure the oven is well ventilated. This allows moving air to cool the oven's components. Overheating the oven components is a microwave killer! Don't allow the oven to operate empty. This is sure way to shorten the life of your microwave oven.

THE JOURNAL OF MICROWAVE POWER & ELECTROMAGNETIC ENERGY (JMPEE)

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Helpful Hints: Cleaning Microwave Ovens

Cleaning the inside of a microwave is not a job you're likely to want to prioritise. It can be difficult to get into all those hard-to-reach corners, and feel like you've actually done what you need to.

But a natural remedy can come to the rescue. Mix one tablespoon of baking soda into a cup of warm water and soak a cloth in it before wiping away inside. The baking soda works to break up stubborn odours inside. Then, for a fresher smell, simply mix some lemon juice into a large bowl of water and heat for a few minutes. After removing the bowl, wipe it down and the citrus smell should be faintly there still.

Experts say you should wipe down your microwave once a week and then perform a deep clean once a month. They suggest a homemade mixture of half a cup of water and half a cup of white vinegar, which you pop in a microwaveable dish and heat on high until the windows steam up.

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