CARD smart dryer/oven at WPI; project supported by the US Department of Energy
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The 22nd International Drying Symposium (IDS) was scheduled to take place in June 2020 at Worcester Polytechnic Institute (WPI), located at Worcester, Massachusetts, USA. Unfortunately, the IDS2020 had to be postponed twice due to the global pandemic (COVID-19). However, I am very pleased that the IDS2022 will finally take place in a hybrid mode (a first for the IDS!) at WPI from June 26 through June 29, 2022. The IDS2022 is sponsored by the Center for Advanced Research in Drying (CARD), a USA National Science Foundation Industry University Cooperative Research Center, located at WPI and the University of Illinois at Urbana-Champaign (co-site).

Despite the ongoing challenges associated with the pandemic, the IDS2022 will be a successful event with expected 200+ participants (120+ in-person and 80+ online). The Symposium will include six keynote presentations by experts from government agencies, industry, and academia. There will be 200+ high quality technical paper presentations from around the globe, in-person as well as virtually.

In the USA, industrial drying consumes approximately 12% of the total end-use energy used in manufacturing, corresponding to about 1.2% of the total energy consumed in the country. It is estimated that about 40% of this energy can be saved with novel drying technologies. The impact of this will be significant on reducing the carbon footprint associated with industrial drying processes. IDS provides a platform for the researchers from across the globe to gather to explore novel energy-efficient drying technologies pertinent to energy intensive manufacturing industry sectors.

I would like to take this opportunity to utterly thank all the authors, presenters, and participants in advance for making the IDS2022 a success. I am sure this 22nd IDS will be remembered as the Symposium that was successfully held despite the global pandemic challenges.

Jamal S. Yagoobi
Worcester Polytechnic Institute
USA
IDS Honorary Chair

It is a distinct pleasure and privilege for me to welcome to IDS2022 participants from around the globe. Indeed, this Symposium is unique in many ways; it is the first one since the series was established in 1978 that is being held in a now-normal hybrid format of in person and virtual participation. It is also being held after four years since the last meeting in the biennial IDS series as a direct result of the Covid19 pandemic. I want to compliment and heartily congratulate Professor Jamal Yagoobi, his highly diligent Organization Committee as well as the Center for Advanced Research in Drying for their perseverance and truly outstanding effort to make IDS2022 a remarkable success and a truly memorable event.

I am very happy and satisfied to see that the series is continuing to attract attention and proactive participation of international researchers and practitioners in drying science and technology. It is a pity that Covid19-induced travel limitations in many parts of the world have severely limited potential for personal interaction between participants but I believe we can still provide an excellent forum for transfer and exchange of latest R and D in drying and potentially develop successful networking on a global scale. There is continuing strong potential for challenging and innovative research in the inter- and multi-disciplinary field of drying driven by the needs of sustainability and circular economy. As a highly energy-intensive operation, there is need to ensure that the emerging industrial drying technologies in diverse industrial sectors continue to be enhanced to lower their impact on climate change.

Finally, I am sure IDS2022 will be a major success and lead to a professionally rewarding and pleasant experience for in-person as well as virtual participants.

Arun S. Mujumdar
McGill University
Canada
Organizing Committee

Chairs

Arun S. Mujumdar
Honorary Chairperson

Jamal S. Yagoobi
Chairperson
Worcester Polytechnic Institute, CARD

Sakamon Devahastin
Secretariat
King Mongkut’s University of Technology

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Worcester Polytechnic Institute
Edward Burnham
Patricia Howe
Mengqiao Yang
Mark Lippi
Yuxiang (Shawn) Liu
Mehrnoush Dardashti
Tessa Lytle

University of Illinois Urbana-Champaign
Hao Feng
Youngsoo Lee
Irfan Ahmad
## 2022 IDS Program at a Glance

### SUNDAY, JUNE 26TH
- 14:00-20:00 – REGISTRATION (Rubin Campus Center, 1st Floor)
- 18:00-20:00 – RECEPTION (Rubin Campus Center, 2nd Floor)

### MONDAY, JUNE 27TH
- 7:00-18:00 – REGISTRATION (Rubin Campus Center, 1st Floor)
- 7:45-8:30 – SYMPOSIUM OPENING CEREMONY (Rubin Campus Center, 2nd Floor – Odeum)
- 8:30-9:30 – KEYNOTE PRESENTATIONS 1 (Rubin Campus Center, 2nd Floor – Odeum)
- 9:30-10:00 – COFFEE BREAK (Innovation Studio)
- 10:00-12:15 – TECHNICAL ORAL SESSIONS (Innovation Studio)
  - Session 1: Drying of Food and Agricultural Products (Room 203)
  - Session 2: Spray Drying Technologies (Room 205)
  - Session 3: Fundamentals, Modelling, Simulation and Product Quality (Room 105)
- 12:15-13:30 – LUNCH (Higgins House Garden)
- 13:30-16:30 – TECHNICAL ORAL SESSIONS (Innovation Studio)
  - Session 4: Drying of Food and Agricultural Products (Room 203)
  - Session 5: Drying of Gasses and Liquid, and Process Intensification (Room 205)
  - Session 6: Fundamentals, Modelling, and Simulation (Room 105)
- 14:45-15:15 – COFFEE BREAK (Innovation Studio)
- 16:45-21:00 – BOSTON HARBOR CRUISE (bus departs at 16:45 from Quad)
## TUESDAY, JUNE 28TH

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<td>8:00-9:00</td>
<td>KEYNOTE PRESENTATIONS 2 (Rubin Campus Center, 2nd Floor, Odeum)</td>
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<td>9:00-9:30</td>
<td>COFFEE BREAK (Innovation Studio)</td>
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<td>9:30-11:45</td>
<td>TECHNICAL ORAL SESSIONS (Innovation Studio)</td>
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<td>Session 8: Industrial Process and Equipment &amp; Environmental Issues</td>
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<td>Session 9: Drying of Chemicals, Polymers, and Forest Products (Room 105)</td>
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<td>COFFEE BREAK (Innovation Studio)</td>
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<td>16:30-17:30</td>
<td>CARD LABS TOUR (gathering at Quad)</td>
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<td>18:00-21:00</td>
<td>BANQUET AND AWARDS CEREMONY (Worcester Art Museum)</td>
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WEDNESDAY, JUNE 29TH

7:00-12:00 – REGISTRATION (Rubin Campus Center, 1st Floor)

8:00-9:00 – KEYNOTE PRESENTATIONS 3 (Rubin Campus Center, 2nd Floor, Odeum)

9:00-9:30 – COFFEE BREAK (Innovation Studio)

9:30-12:00 – TECHNICAL ORAL SESSIONS (Innovation Studio)

  - Session 13
    Drying of Food and Agricultural Products
    (Room 203)
  - Session 14
    Drying of Biomass Materials
    (Room 205)
  - Session 15
    Process Intensification
    (Room 105)

12:00 – 12:30 – SYMPOSIUM CLOSING CEREMONY (Rubin Campus Center, 2nd Floor, Odeum)

12:30-13:30 – LUNCH BOXES (Rubin Campus Center, 2nd Floor)

POSTER SESSIONS

POSTER SESSION 1 – Monday June 27th, 9:30-16:30
Poster session 1 will be in-person. The presenters should be available to present their posters during the morning and afternoon coffee breaks on June 27th. In addition, the authors’ recorded poster presentations will be available throughout the symposium and their individual Zoom links will be provided.

POSTER SESSION 2 - Virtual
Poster session 2 will be virtual. The authors’ recorded poster presentations will be available throughout the symposium and their individual Zoom links will be provided.
Sunday, June 26th

14:00-20:00  REGISTRATION
(Rubin Campus Center, 1st Floor)

18:00-20:00  RECEPTION
(Rubin Campus Center, 2nd Floor)
Monday, June 27th

7:00-18:00  REGISTRATION
(Rubin Campus Center, 1st Floor)

7:45-8:30  SYMPOSIUM OPENING CEREMONY
(Rubin Campus Center, 2nd Floor, Odeum)

8:30-9:30  KEYNOTE PRESENTATIONS 1
(Rubin Campus Center, 2nd Floor, Odeum)
Hongda Chen, National Program Leader, Bioprocess Engineering and Nanotechnology, National Institute of Food and Agriculture, U.S. Department of Agriculture, “Advancing Food Manufacturing towards Sustainable Food and Agriculture Systems” (virtual)

9:30-10:00  COFFEE BREAK
(Innovation Studio)

10:00-12:15  TECHNICAL ORAL SESSIONS
(Innovation Studio)

Session 1: Drying of Food and Agricultural Products (Room 203)
Chair: Timothy Langrish, University of Sydney, Australia

#668 Zhou, Zelin; Langrish, Timothy
“Particle residence time distributions in different configurations of a pilot-scale spray dryer”, University of Sydney, Australia (in-person)

#476 Castro, Adriana; Moreno, Fabian Leonardo
“Comparison between convective drying and refractance window drying of feijoa fruit (Acca sellowiana)”, Universidad de La Sabana, Colombia (online)

#426 Rodríguez Ramírez, Juan (1,2); Farzad, Miland (1); Noori O’Connor, Zahra (1); Yagoobi, Jamal (1)
“Radial Jet Reattachment Impingement Drying of Corn Tortillas”, 1: Worcester Polytechnic Institute, USA; 2: Instituto Politécnico Nacional, México (in-person)

#447 Porto, Luanna Carrera; Barletta, Lethicia Gaiara; Kosuji, Erika Yukari; Souza, Luciane Franquelin Gomes de; Nitz, Marcella; Andreola, Kaciane
“Influence of process parameters on protein powder fluidized bed agglomeration and drying using açai pulp as a binder”, Maua Institute of Technology, Brazil (online)
#677 Le Loeuff, Jeanne (1); Boy, Virginie (1); Morançais, Pascal (2); Magueresse, Anthony (3); Bourgougnon, Nathalie (4); Lanoisellé, Jean-Louis (1)


#435 Khan, Md Imran Hossen (1,2); Welsh, Zachary (1); Kumar, Chandan (3); Karim, Azharul (1)

“3D Conjugated Multiphase Porous Media Modelling for Intermittent Microwave Convective Drying of Food Materials”, 1: Science and Engineering Faculty, Queensland University of Technology, Australia; 2: Department of Mechanical Engineering, Dhaka University of Engineering &Technology, Bangladesh; 3: Salisbury Research Facility, Department of Agriculture and Fisheries, Queensland Government (online)

#669 Arefi, Arman (1); Sturm, Barbara (2); Hensel, Oliver (3)

“NIR-monochrome monitoring systems to predict moisture content of apple slices during drying process”, 1: Department of Agricultural and Biosystems Engineering, University of Kassel, Nordbahnhofstr. 1a, D-37213, Witzenhausen, Germany; 2: Department of Agricultural and Biosystems Engineering, University of Kassel, Nordbahnhofstr. 1a, D-37213, Witzenhausen, Germany; 3: Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB), Max-Eyth Allee 100, 14469, Potsdam, Germany, Albrecht Daniel Thaer-Institute of Agricultural and Horticultural Sciences, Humboldt University of Berlin, Hinter der Reinhardtstr. 6–8, 10115, Berlin, Germany (online)

#549 Malvandi, Amir; Kahraman, Ozan; Feng, Hao

“Drying kinetics of sliced strawberries using a novel ultrasonic contact dryer”, Center for Advanced Research in Drying, University of Illinois, Urbana-Champaign, Illinois, 61801, USA (in-person)

#454 Hu, Lina (1,2); Bi, Jinfeng (1); Jin, Xin (1); Van der Sman, Ruud (2)

“Rehydration capacity improvement of mushrooms dried by combined methods”, 1: Institute of Food Science and Technology, Chinese Academy of Agricultural Science (CAAS), Key Laboratory of Agro-Products Processing, Ministry of Agriculture and Rural Affairs, Beijing 100193, China; 2: Laboratory of Food Process Engineering, Wageningen University, P.O. Box 17, 6700 AA Wageningen, the Netherlands (online)
Session 2: Spray Drying Technologies (Room 205)
Chair: Anna Vega, Grain Technik, Pvt. Ltd., India

#520 Vaessen, Evelien; den Besten, Heidy; Schutyser, Maarten
“Pulsed Electric Field Pre-treatment for Spray Drying of Probiotics”, Wageningen University, The Netherlands (in-person)

#378 Alcalde Garcia, Fabiola; Gariepy, Yvan; Raghavan, Vijaya
“Microwave-assisted convective drying of cantaloupe”, McGill University, Canada (online)

#386 Hussain, Farooq (1); Sondej, Franziska (1); Jaskulski, Maciej (2); Peglow, Mirko (3); Tsotsas, Evangelos (1)

#700 Arpagaus, Cordin
“Spray Drying of Vaccines — A Review”, Eastern Switzerland University of Applied Sciences, Switzerland (online)

#687 Mezhericher, Maksim; Stone, Howard A.
“Diameters and Flow Rates of Droplet Aerosols and Sprays in Drying Devices”, Princeton University, United States of America (in-person)

#388 Ruprecht, Nora Alina; Liebig, Luisa Katharina; Hajare, Vidya; Kohlus, Reinhard
“Thermal damages in spray drying — Effect of particle size and residence time ratio”, University of Hohenheim, Germany (in-person)

#461 Başer Gümüş, İrmak; Kahraman, Ebru; Erdöl Aydı̇n, Nalan; Nasün Saygılı, Gülhayat
“Drug loading of tannic acid crosslinked hydroxyapatite/gelatin composites via spray dryer and kinetic studies”, Istanbul Technical University, Turkey (online)

#380 Chaparro, Irene (1); Méndez Lagunas, Lilia (1); Barriada Bernal, Gerardo (2); Rodríguez Ramírez, Juan (1); Aquino González, Laura (1)
“Spray Drying of Jicama Aqueous Extract (Pachyrizus Erosus) for Obtaining Insulin as a Natural Encapsulant”, 1: CIIDIR-OAXACA, INSTITUTO POITÉCNICO NACIONAL, México; 2: CONSEJO NACIONAL DE CIENCIA Y TECNOGIA, México (online)
Session 3: Fundamentals, Modelling, Simulation and Product Quality (Room 105)
Chair: Patrick Perré, CentraleSupélec, Université Paris-Saclay, France

#711 Hashib, SA.(1); Azman, I.(1); Ibrahim, UK.(1); Bakar, NFA.(1); Rahman, NA.(1); Yunus, MAC.(2) Lenggoro, W.(3)
“Physical Properties of Spray Dried Ananas comosus Powder with Addition of Centella asiatica (L.)”, 1: Universiti Teknologi MARA; 2: Universiti Teknologi Malaysia; 3: Tokyo University of Agriculture and Technology (online)

#363 Chia, Andrea (1); Bouchard, Jocelyn (2); Ratti, Cristina (3); Poulin, Éric (1)
“Development and calibration of a lyophilization model for process control applications”, 1: LOOP, Department of Electrical and Computer Engineering, Laval University, Québec City, QC, Canada; 2: LOOP, Department of Chemical Engineering, Laval University, Québec City, QC, Canada; 3: Department of Soil Science and Agri-Food Engineering, Laval University, Québec City, QC, Canada (in-person)

#513 Barrera, Gustavo (1); Reche, Cristina (1); Femenia, Antoni (1); Rosselló, Carmen (1); Bon, José (2)
“Acoustic drying at low temperature of artichoke stems (cynara scolimus)”, 1: University of Balearic Island, Spain; 2: Escuela Técnica Superior de Ingeniería Agronómica y del Medio Natural, Universitat Politècnica de València, València, Spain (online)

#428 Du, Jiajie (1); Abhinandan Kumar, Singh (1); Bück, Andreas (2); Tsotsas, Evangelos (1)

#501 Cogua, Ricardo(1); Ramos, Andrés Felipe (1); Jackson Tovar (2); Sánchez-Sáenz, Carolina María (3)
“Approximation to CFD Simulation of a Spray Drying system using OpenFoam” 1: Department of Chemical and Environmental Engineering - Universidad Nacional de Colombia; 2: Department of Mechanical and Mechatronic Engineering – Universidad Nacional de Colombia; 3: Department of Civil and Agricultural Engineering – Universidad Nacional de Colombia (online)

#670 Singh, Abhinandan Kumar; Tsotsas, Evangelos
“Modeling the agglomeration of spray-dried milk powder in a spray fluidized bed”, Otto von Guericke University Magdeburg, Germany (in-person)

#547 Wang, Yuchuan
“Pilot-Scale Microwave Assisted Pulse-Spouted Bed Freeze Drying of Carrot Cubes-Effect on Product Quality and Energy Consumption”, JIANGNAN UNIVERSITY, People's Republic of China (online)
## Session 4: Drying of Food and Agricultural Products (Room 203)
Chair: Andrew Rosenthal, Reading Thermal, USA

### #471 Linke, Annika; Kohlus, Reinhard
"Factors determining the surface oil concentration of encapsulated lipid particles — impact of the emulsion viscosity and oil load", Food Powders and Process Engineering, University of Hohenheim, Germany (in-person)

### #675 R, Pothi Raj; K, Rajsekar; B, Raja
"Spray drying of Na2Fe0.6Mn0.4P04F/C Electrode material for Na-ion Batteries: An Experimental Study on Heat and Mass Transfer Characteristics", Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram, India (online)

### #533 Masbernat, Laurena (1); Casalinho, Joel (2); Regnier, Matthieu (3); Berland, Sophie (1); Michon, Camille (1); Almeida, Giana (1)
"Additive Manufacturing of food products: Study of the heat transfer inside the nozzle during extrusion", 1: Université Paris-Saclay, INRAE, AgroParisTech, UMR SayFood, 91300, Massy, France; 2: Université Paris-Saclay, CentraleSupélec, Laboratoire de Génie des Procédés et Matériaux, 91190, Gif-sur-Yvette, France; 3: Dagoma, 87 rue du Fontenoy, 59100, Roubaix, France (in-person)
Session 5: Drying of Gasses and Liquid, and Process Intensification
(Room 205)
Chair: Maarten Schutyser, Wageningen University, The Netherlands

#671 Raut, Sharvari (1,2); von Gersdorff, Gardis J. E. (1); Kulig, Boris (2); Mellmann, Jochen (1); Sturm, Barbara (1,3)
“Development of robust statistical algorithms for non-invasive measurement of product quality during drying processes”, 1: Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB), Germany; 2: University of Kassel, Department for Agricultural and Biosystems Engineering, Germany; 3: Albrecht Daniel Thaer-Institute of Agricultural and Horticultural Sciences, Humboldt Universität zu Berlin (online)

#684 Yamamoto, Shundai (1); Kano, Ichiro (1); Oikawa, Akira (2)
“Comparison on primary metabolic components of freeze, low temperature, and high temperature dried Japanese young soybeans (Edamame)”, 1: Yamagata university, Japan; 2: Kyoto university, Japan (online)

#432 Farzad, Milad (1); El Ferouali, Hicham (2); Asar, Munevver Elif (1); Yagoobi, Jamal (1)
“Enhancement of Drying of Food Products with Slot Jet Reattachment Nozzles in a Convective Oven with a Moving Belt”, 1: Worcester Polytechnic Institute (WPI), United States of America; 2: Cadi Ayyad University, Marrakech, Morocco (in-person)

#390 Boparai, Supreet Kaur; Quelvia, Rute; Gariepy, Yvan; Raghavan, Vijaya
“Drying kinetics of wheat seeds in a microwave assisted hot air dryer”, McGill University, Canada (online)

#531 Umaña, Mónica (1); Chamorro, Gloria (1); Vaquiro, Henry (2); Eim, Valeria (1); Simal, Susana (1)
“Use of pectin extracted from lemon peel to stabilize oil-in-water emulsions for spray drying”, 1: Universitat de les Illes Balears; 2: Universidad del Tolima (online)

#475 Garnica Rodríguez, Katherine Johanna; Anzola Rodríguez, Ricardo Andres; Sánchez Saenz, Carolina Maria
“Effect of osmotic dehydration on the convective drying of tomato cherry (Solanum lycopersicum var. cerasiforme)” UNIVERSIDAD NACIONAL DE COLOMBIA, Colombia (online)

#359 Janocha, Manuel; Hussain, Farooq; Tsotsas, Evangelos
“Direct numerical simulation of sessile droplet drying under varying convective conditions”, Otto von Guericke University, Germany (in-person)

#527 Nishikawara, Masahito (1,2); Matsuda, Juriya (2); Yokoyama, Hiroshi (2); Yanada, Hideki (2)
“Visualization study on liquid-vapor phase displacement between wall and porous media in drainage process of two-phase loop”, 1: Worcester polytechnic institute, United States of America; 2: Toyohashi university of technology, Japan (online)
#623 Taboada, Martha Lia; Karbstein, Heike Petra; Gaukel, Volker
“Changes in the oil droplet size of food emulsions during the atomization and the drying step of spray drying”, Karlsruhe Institute of Technology, Germany (in-person)

#705 Llavata, Beatriz (1); Rosselló, Carmen (2); Mas, Francisco (1); Peña, Ramón (1); Carcel, Juan A. (1)
“Ultrasoundically assisted atmospheric freeze-drying of orange peel: comparison between plate and tubular transducer arrangement”, 1: Universitat Politècnica de València, Spain; 2: University of the Balearic Islands, Spain (online)

#522 Piatkowski, Marcin; Wawrzyniak, Paweł; Jaskulski, Maciej; Zbicinski, Ireneusz; Zawadzki, Dawid
“Experimental analysis of the effect of nozzle position on product properties in counter-current pilot plant spray drying tower”, Lodz University of Technology, Poland (in-person)

#484 Hajji, Wafa (1,2); Bellagha, Sihem (1); Allaf, Karim (2)
“Interval Starting Accessibilities Drying (ISAD) as an intensification step in Dehydrofreezing of strawberries”, 1: Research Unit PATIO (UR17AGR01): Promoting Tunisian natural and agri-food heritage through innovation, University of Carthage, National Institute of Agronomy of Tunisia, Tunis; 2: LaSIE-UMR 7356 CNRS University of La Rochelle (online)

#610 Reed, Monty (1); Simone, Elena (1); Munnoch, Alex (2); Bayly, Andrew (1)
“Demonstrating the link between spray drying and single droplet drying for two organic, crystalline aqueous solutions”, 1: University of Leeds, United Kingdom; 2: Johnson Matthey, United Kingdom (in-person)

#714 Deck, Leif-Thore; Košir, Andraž; Mazzotti, Marco
“Characterizing Freezing-Related Heterogeneity Within and Among Vials in Pharmaceutical Freeze-Drying Processes”, ETH Zurich, Switzerland (in-person)

Session 6: Fundamentals, Modelling, and Simulation (Room 105)
Chair: Ian Kemp, Independent Consultant, United Kingdom

#377 Müller, Daniel (1); Briest, Lucas (1); Bück, Andreas (2); Tsotsas, Evangelos (1)
“A two-zone continuum model of heat and mass transfer in Wurster fluidization”, 1: Department of Thermal Process Engineering, Otto von Guericke University, Magdeburg, Germany; 2: Institute of Particle Technology, FAU Erlangen-Nuremberg, Erlangen, Germany (in-person)

#357 Rieck, Christian (1); Bück, Andreas (2); Tsotsas, Evangelos (1)
“Estimation of the dominant size enlargement mechanism in spray fluidized beds”, 1: Thermal Process Engineering, Otto von Guericke University Magdeburg, Germany; 2: Institute of Particle Technology, FAU Erlangen-Nuremberg, Germany (online)
#716 Asar, Munevver Elif; Yang, Mengqiao; Yagoobi, Jamal
“Impact of Reattachment Surface Characteristics on the Slot Jet Reattachment Nozzle’s Performance”, Center for Advanced Research in Drying, Worcester Polytechnic Institute, Worcester, Massachusetts, 01609, USA (in-person)

#710 Roman Roldan, Nicolas Ivan (1); Ituna Yudonago, Jean Fulbert (2); López Ortiz, Anabel (1); Rodríguez, Juan (3); Sandoval Torres, Sadoth (3)
“Improvement of air distribution inside the greenhouse solar dryer using Computational Fluid Dynamics”, 1: Instituto de Energías Renovables IER-UNAM, México; 2: Universidad Politécnica Metropolitana de Hidalgo, México; 3: Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional, Instituto Politécnico Nacional, México (online)

#444 Liu, Rongtang; Xu, Can; Liu, Ming; Yan, Junjie
“Theoretical Evaluation and Case Analysis on a Solar-Driven Lignite Drying System Coupled with Pyrolysis and Gasification”, Xi’an Jiaotong University, China, People’s Republic of (online)

#492 Welsh, Zachary G. (1); Simpson, Matthew J. (2); Karim, M. A. (1)
“A multiscale model to determine homogenized diffusivity for convective drying of food material”, 1: School of Mechanical, Medical and Process Engineering, Queensland University of Technology, Australia; 2: School of Mathematical Sciences, Queensland University of Technology, Australia (in-person)

#411 Sturm, Barbara (1); Martynenko, Alex (2)
“Towards a System View on Intelligent Drying”, 1: University of Kassel, Germany; 2: Dalhousie University, Canada (online)

#352 David Pour, Yehonatan; Fominykh, Andrew; Krasovitov, Boris; Levy, Avi
“Control of Low-Temperature Slurry Droplet Drying Using Soluble Gas Absorption”, Ben-Gurion University of the Negev, Israel (in-person)

#472 Pérez-Santiago, Angel (1); Sandoval-Torre, Sadoth (1); Leonard, Angélique (2); Plougonven, Erwan (2); Díaz-González, M. (3); Hernández-Bautista, E. (3)
“Drying model to predict the deformation of tuberous crop”, 1: Instituto Politécnico Nacional, CIIDIR Oaxaca; 2: ULiege, Belgium; 3: Tecnológico Nacional de México. Instituto Tecnológico de Oaxaca (online)

#712 Iheonye, Anthony Chukwuemeka (1); Ferrie, Frank (2); Orsat, Valérie (1); Raghavan, Vijaya (1)
“Deep learning-based method for real-time monitoring of visual attributes during fluidized bed drying”, 1: Department of Bioresource Engineering, McGill University, 21111 Lakeshore Road, Ste-Anne-de-Bellevue, Quebec H9X 3V9, Canada; 2: Department of Electrical and Computer Engineering, McGill University, McConnell Engineering Building, 3480 University Street, Montreal, QC H3A 2E9, Canada (online)
14:45-15:15  COFFEE BREAK  
(Innovation Studio)

16:45-21:00  BOSTON HARBOR CRUISE  
(bus departs at 16:45 from Quad)
Tuesday, June 28th

7:00-18:00  REGISTRATION
(Rubin Campus Center, 1st Floor)

8:00-9:00  KEYNOTE PRESENTATIONS 2
(Rubin Campus Center, 2nd Floor, Odeum)

Dr. Sheyla Ramsay, R&D Director Baking & Dehydration, PepsiCo Global Process Function, PepsiCo, Inc., “Every Day is Earth Day for PepsiCo” (in-person)


9:00-9:30  COFFEE BREAK
(Innovation Studio)

9:30-11:45  TECHNICAL ORAL SESSIONS
(Innovation Studio)

Session 7: Drying of Food and Agricultural Products (Room 203)
Chair: Juan Rodríguez Ramírez, Comision de Operación y Fomento de Actividades Académicas del Instituto Politécnico Nacional, Mexico

#694 Kohlus, Reinhard (1); Linke, Annika (1); Chávez Montes, Edgar (2)
“Atomization behavior of plant based dairy alternatives”, 1: University of Hohenheim, Germany; 2: Société des Produits Nestlé S.A., Switzerland (in-person)

#597 Kaimal, Admajith M. (1); Thorat, Bhaskar N. (2)
“Economical evaluation and optimization of different process for resistant starch III manufacturing”, 1: Department of Chemical Engineering, Institute of Chemical of Technology Mumbai, ICT-I0C Campus, Bhubaneswar, India — 751013; 2: Institute of Chemical of Technology Mumbai, ICT-I0C Campus, Bhubaneswar, India - 751013. (online)

#383 Schutyser, Maarten
“Powder Morphology Development during Spray Drying”, Wageningen University, Netherlands, The (in-person)

#709 Abril, Blanca (1); Alba, Juan F. (1); Sanchez-Torres, Eduardo A. (1); Mulet, Antonio (1); Bou, Ricard (2); Benedito, Jose (1); Garcia-Perez, Jose V. (1)
“Influence of pork liver drying on the enzyme activity of Ferrochelatase and the formation of Zinc protoporphyrin”, 1: Universitat Politècnica de València, Spain; 2: IRTA, Spain (online)
Session 8: Industrial Processes and Equipment & Environmental Issues (Room 205)
Chair: Ireneusz Zbicinski, Lodz University of Technology, Poland

#509 Bessenyei, Kornel; Kurjak, Zoltan; Beke, Janos
“Additives for a Complex energetic analysis of convective crop drying” Szent Istvan University, Hungary (online)

#667 Marques, Bianca Cristine (1); Almeida, Giana (2); Casalinho, Joel (3); Tadini, Carmen Cecilia (1); Plana-Fattori, Artemio (2); Perré, Patrick (3)“Convective drying of yacón: continuous measurements during drying and modeling of a highly deformable product”, 1: USP, Brazil; 2: Université Paris-Saclay, INRAE, AgroParisTech, UMR SayFood, 91300, Massy, France; 3: Université Paris-Saclay, CentraleSupélec, Laboratoire de Génie des Procédés et Matériaux, 91190, Gif-sur-Yvette, France (online)

#693 Sickert, Till; Gaukel, Volker
“Microwave-Assisted Freeze-Drying of Foodstuffs Using a Novel Frequency-Based Control Concept”, Karlsruhe Institute of Technology, Germany (in-person)

#419 Shirkole, Shivanand Shankarrao; Sutar, Parag Prakash
“Thermal and Solids Melting Characterization of Paprika (Capsicum annuum L.) for Establishment of High-Power Short Time Combined Microwave-Infrared Assisted Finish Drying Process”, Department of Food Process Engineering, National Institute of Technology, Rourkela, India (online)

#499 Pacheco, Itzel Yamilette (1); Lopez-Ortiz, Anabel (1); Guerrero, Laura (2); Padmanabhan Panlakshy, Karunakaran Nair (2); Méndez-Lagunas, Lilia (3)“Edible Coatings for nutrition conservation in solar dried strawberry”, 1: INSTITUTO DE ENERGIAS RENOVABLES, Mexico; 2: Laboratorio de Materiales semiconductores para la energía solar; 3: Instituto Politécnico Nacional, Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional (CIIDIR) Unidad Oaxaca (online)

#599 Sukunza, Xabier; Aguado, Roberto; Olazar, Martin
“Effect of the atomizer in conical spouted beds for drying kaolin suspensions”, University of the Basque Country, UPV/EHU, Spain (in-person)

#367 Nunez Vega, Anna-Maria
“OPTIONS FOR PADDY DRYING AND THE SELECTION OF THE BEST PRACTICE SYSTEM” Grain Technik Pvt. Ltd. (in-person)

#540 Okazaki, Julia Haruka (1); Souza, Amarilis Severino e (1); Souza Pinto, Thiago César de (2); Bettega, Rodrigo (1); de Pádua, Thiago Faggion (1)“Drying of Brazilian Iron Ore in Spherical Pellets.”, 1: Federal University of São Carlos, Brazil; 2: Instituto Tecnológico Vale - ITV, Brazil (online)
#480 Sezer, Serhat; Esin, Berk; Erdol Aydin, Nalan; Nasun Saygili, Gulhayat
“Removal of boron from wastewaters using tannin-based biosorbent produced via spray drying”, Istanbul Technical University, Turkey (in-person)

#504 Wang, Jinshi; Nie, Jiazhuo; Qin, Yuanzhi; Li, Gen; Liu, Jiping; Yan, Junjie
“Experimental Study on Heat Transfer and Water Recovery Characteristics of dryer exhaust across circular finned tube bundles”, Xi’an Jiaotong University, China, People’s Republic of (online)

#708 Tadlan, Lorcelie Bareng; Tadlan, Emson; Umpad, Roy Ephraim Monteseven; Garduque, Darwin Lorenzo; Molina, Regina Herrera; Ratio, Mark John
“Multi Commodity Heat Pump Dryer”, Adventist University of the Philippines, Philippines (in-person)

#681 Brunzell, Lena Kristina
“Drying as a way to introduce a new value chain in retail stores”, Karlstad university, Sweden (online)

#460 Gruber, Sebastian (1); Vorhauer, Nicole (2); Schulz, Michael (3); Xu, Xinjing (4); Hilmer, Mathias (1); Thomik, Maximilian (2); Tsotsas, Evangelos (2); Schuchmann, Harald (5); Foerst, Petra (1)
“Experimental investigations on freeze-drying of particulate matter by using neutron imaging”, 1: Technical University of Munich, Chair of Process Systems Engineering, Germany; 2: Otto-von-Guericke University of Magdeburg, Germany; 3: Heinz Maier Leibnitz Zentrum, Technical University of Munich, Germany; 4: Georgia Institute of Technology, USA; 5: Wilhelm Büchner College of Darmstadt, Germany (in-person)

#548 Patel, Sanjay Kumar; Bade, Mukund

Session 9: Drying of Chemicals, Polymers, and Forest Products (Room 105)
Chair: Amit Gokhale, BASF SE, USA

#479 Schlosser, Celia (1); Mitzkat, Martin (2)

#402 Anselmo, Rodrigo Barbosa; Sartor, Luis Otávio; Rodrigues, Liana Alves; Chaguri, Livia
“Characterization of niobium photocatalyst precursor obtained by spray drying”, EEL USP, Brazil (online)
#621 Noori O'Connor, Zahra; Yagoobi, Jamal; Tilley, Burt
“Experimental study of drying of paper with ultrasound mechanism”, Worcester Polytechnic Institute, United States of America (in-person)

#469 Tysén, Aron; Muhic, Dino; Sedin, Maria
“Dewatering and drying with infrared-equipped steel belt unit”, RISE, Sweden (online)

#152 Schabel, Wilhelm
“Drying of multilayer and multicomponent thin polymeric films”, Karlsruhe Institute of Technology, Germany (in-person)

#690 Kong, Lingbo; Zhao, Jingyi; Xie, Shan
“Drying characteristics and moisture distribution of pulp sheet in the drying process by thermal analysis”, Shaanxi University of Science & Technology, People’s Republic of China (online)

#619 Bouchard, Jacob (1,2); Petkie, Douglas (1,2)
“Using Effective Medium Theory to Develop a Narrow-Band Terahertz Drying Monitor for Paper Manufacturing”, 1: Department of Physics, Worcester Polytechnic Institute; 2: Center for Advanced Research in Drying, Worcester Polytechnic Institute (in-person)

#518 Kutovoy, Volodymyr
“Physical Aspects of Dehydration in Thermal Vacuum System”, Kharkov Institute of Physics and Technology, Ukraine (online)

#615 Voruganti, Sindhuja (1); Ramachandran, Palaghat T A (2); Thorat, Bhaskar Narayan (3)
“Understanding Diffusional Effects in Drying”, 1: Institute of Chemical Technology Mumbai, India; 2: Department of Energy, Environmental & Chemical Engineering, Washington University, St Louis, MO 63130, USA; 3: Institute of Chemical Technology, ICTIOC Campus, Bhubaneshwar, India (online)

11:45-12:15  GROUP PHOTO  
(Quad)

12:15-13:30  LUNCH  
(Higgins House Garden)
**TECHNICAL ORAL SESSIONS**

(Innovation Studio)

**Session 10: Drying of Food and Agricultural Products (Room 203)**
Chair: Milad Farzad, PepsiCo, Inc., USA

#366 Nolasco, Anna Gabryella Gomes Cavalcanti; Carvalho, Carlos Brian Oliveira de; Brandão, Shirley Clyde Rupert; Silva, João Henrique Fernandes da; Azoubel, Patricia Moreira
“Influence of ethanol pretreatment on banana drying kinetics”, UFPE, Brazil (in-person)

#511 Boparai, Supreet Kaur; Quelvia, Rute; Gariepy, Yvan; Raghavan, Vijaya
“Drying kinetics of wheat seeds in a microwave assisted hot air dryer”, McGill University, Canada (online)

#680 Zongo, P. Assana (1,2,3); Khalloufi, Seddik (1,2,4); Mikhaylin, Sergey (1,2,3); Ratti, Cristina (1,2,4)
“Sugar uptake during osmotic dehydration of fresh and frozen/thawed mango slices in agave syrup solutions”, 1: Laval University, Canada; 2: Institute of Nutrition and Functional Foods; 3: Food Science Department; 4: Soils Science and Agri-food Engineering Department (in-person)

#358 Verlhac, Pierre (1); Vessot, Séverine (1); Degobert, Ghania (1); Agusti, Géraldine (1); Cogne, Claudia (1); Andrieu, Julien (1); Beney, Laurent (2); Gervais, Patrick (2); Moundanga, Sylvie (2)
“Study and optimization of freeze-drying cycles of model probiotic: Morphology characterization of Lyophilisates by SEM”, 1: University of Lyon, France; 2: Université de Bourgogne (online)

#466 Carvalho, Gisandro Reis de (1); Silveira, Isabela (1); Rojas, Meliza Lindsay (1,3); Augusto, Pedro Esteves Duarte (1,2)
“Improving drying of vegetables: effect of pre-treatment with ethanol, isopropanol, acetone and acetic acid”, 1: Department of Agri-food Industry, Food and Nutrition (LAN), Luiz de Queiroz College of Agriculture (ESALQ), University of São Paulo (USP), Piracicaba, Brazil.; 2: Food and Nutrition Reseach Center (NAPAN), University of São Paulo (USP), São Paulo, Brazil.; 3: Dirección de Investigación y Desarrollo, Universidad Privada del Norte (UPN), Trujillo, Peru (in-person)

#470 Raut, Sharvari (1); Kirchhofer, Phil (1,2); Hensel, Oliver (1); Sturm, Barbara (1,3)
“Developing Smart Dryers using Adaptive Control System to Improve Food Product Quality’, 1: Department of Agricultural and Biosystems Engineering, University of Kassel, Germany; 2: Technische Hochschule Nuremberg Georg Simon Ohm, Germany; 3: School of Agriculture, Food and Rural Development, Newcastle University, Newcastle upon Tyne, UK (online)
#604 Siccama, Joanne W. (1); Pegiou, Eirini (2); Zhang, Lu (1); Schutyser, Maarten A.I. (1)
“Encapsulation of asparagus aromas by spray drying with different carrier formulations”, 1: Laboratory of Food Process Engineering, Wageningen University, Wageningen, the Netherlands; 2: Laboratory of Plant Physiology, Wageningen University, Wageningen, the Netherlands (in-person)

#640 Barisik Marasli, Damla (1); Colak Gunes, Neslihan (2); Kumcuoglu, Seher (1); Tavman, Sebnem (1)
“Energy analysis of drying of tomatoes in a novel PVT assisted heat pump drying system”, 1: Department of Food Engineering, Ege University, Bornova, Izmir, Turkey; 2: Solar Energy Institute, Ege University, Bornova, Izmir, Turkey (online)

#606 El Moussaoui, Malak (1,2); Pabiou, Hervé (3); Youssef, Ayman (1); Giroux, Stéphanie (2); Bassal, Ali (1)
“Experimental determination of the effective moisture diffusivity during drying of kishk”, 1: Lebanese University / Claude Bernard University Lyon 1, Lebanon (Lebanese Republic); 2: Univ Lyon, INSAM-LYON, CNRS, CETHIL UMR5008, F-69621, LYON, France; 3: Univ Lyon, univ. Lyon1, CETHIL UMR5008, F-69622, LYON, France (in-person)

#372 Zhang, Min (1); Liu, Wenchao (1); Mujumdar, Arun S (2)
“Synergy of Novel Technologies in Food Drying and its Applications”, 1: Jiangnan University, China, People’s Republic of; 2: McGill University, Quebec, Canada (online)

Session 11: Fundamentals, Modelling, and Simulation (Room 205)
Chair: Avi Levy, Ben-Gurion University of the Negev, Israel

#665 Eijkelboom, Nienke M.; Swinkels, Anne C.M.; de Ruiter, Jolet; Schutyser, Maarten A.I.
“Temperature development of drying sessile single droplets”, Wageningen University, Netherlands, The (in-person)

#706 Salamat, Razieh (1); Váquiro-Herrera, H.A. (2); Sturm, Barbara (1); Mellmann, Jochen (1)
“Estimation of the effective diffusion coefficient of digestate during drying using the inverse method”, 1: Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB), Germany; 2: Universidad del Tolima, Ibagué, Colombia (online)

#425 Huelsmann, Ramona (1); Esper, Guenter J. (1); Reinhard, Kohlhus (2)
#406 Janjai, Serm; Aumporn, Orawan; Khunkaeo, Thodsaporn; Mahayothee, Busarakorn
“ARX modeling of a parabolic greenhouse solar dryer for drying of chilli”, Silpakorn University, Thailand (online)

#666 Rachid, Ahmed; Ul Abdin, Zain
“Solar hybrid PV/T panels for drying”, UPJV, France (online)

#611 Cardoso, Patricia (1); Sviech, Fernanda (1); Ubbink, Job (2); Prata, Ana Silvia (1)
“Construction of state diagrams of Brazilian Fruits”, 1: University of Campinas - UNICAMP, Campinas – Brazil, Brazil; 2: Department of Food Science and Nutrition, University of Minnesota, Saint Paul, MN 55108, USA (online)

#674 Kolan, Subash Reddy
“Homo and Hetero agglomerate formation of nanoparticles in a spouted bed”, Otto von Guericke University, Germany (in-person)

#374 Lu, Xiang; Tsotsas, Evangelos; Kharaghani, Abdolreza
“Drying of capillary porous media simulated by coupling of continuum-scale and meso-scale models”, Drying of capillary porous media simulated by coupling of continuum-scale and meso-scale models (in-person)

#505 Ozturk, Oguz; Takhar, Pawan S
“Multiscale modeling of viscoelatic properties, color and selected nutrients in fruits and vegetables”, University of Illinois, United States of America (in-person)

#679 Nguyen, Thanh Tri (1,2); Rosselló, Carmen (4); Ratti, Cristina (2,3)
“Mathematical modelling of air-drying kinetics of potato skin”, 1: Food Science Department, Laval University, Canada; 2: Institute of Nutrition and Functional Foods; 3: Soils Science and Agri-Food Engineering Department, Laval University, Canada; 4: Chemical Engineering Group, Department of Chemistry, Universitat des Illes Balears, Palma, 07122 Mallorca, Spain (online)

Session 12: Novel Drying Technologies (Room 105)
Chair: Shawn (Yuxiang) Liu, Worcester Polytechnic Institute, USA

#537 Gong, Emily Sarah (1); Khakpash, Nasser (2); Hinds, Michael F. (1); Schomber, Lorraine (3); Yusoff, Zak (3); Pikal, Michael (2); Kessler, William J. (1)

#417 Nakagawa, Kyuya (1); Kono, Shinji (2)
“Application of microwave resonance spectroscopy for the monitoring of freeze-drying process”, 1: Kyoto University, Japan; 2: Mayekawa MFG. Co., Ltd., Japan (in-person)
#555 Yang, Mengqiao; Yagoobi, Jamal
“Drying of Paper with Dielectrophoresis Mechanism”, Worcester Polytechnic Institute, United States of America (in-person)

#525 Michal, Krempski-Smejda (1); Wojciech, Kropiwnicki (2); Magdalena, Rzepkowska (2); Monika, Sakosik (2); Justyna, Kowalska (2); Wawrzyniak, Pawel (1)
“Low-temperature drying: experimental viability analysis of bacteriophages (Siphoviridae family) immobilized in alginate substrate”, 1: Lodz University of Technology, Poland; 2: Proteon Pharmaceuticals SA, Poland (in-person)

#409 Martynenko, Alex (1); Defraeye, Thijs (1,2)
“Electrical and Convective Effects in EHD Drying”, 1: Dalhousie University, Canada; 2: EMPA, Swiss Federal Laboratories for Materials Science and Technology (online)

#506 Mezhericher, Maksim (1); Rieck, Christian (2); Razorenov, Nikolay (3); Tsotsas, Evangelos (2)

#423 Martynenko, Alex; Kudra, Tadeusz
“Electrohydrodynamic drying: Challenges and opportunities for innovative process design”, Dalhousie University, Canada (online)

#717 Vazquez, Pedro A (1); Pontiga, Francisco (2); Yanallah, Khelifa (3)
“Application of semi-analytical models of corona discharge to EHD drying systems”, 1: Dpt. of Applied Physics III, ETSI, Universidad de Sevilla, Spain; 2: Dpt. of Applied Physics II, Universidad de Sevilla, Spain; 3: Laboratoire de Génie Electrique et des Plasmas, University of Tiaret, Algeria (in-person)

#468 Jaskulski, Maciej (1); Lewandowski, Artur (1); Krempski-Smejda, Michal (1); Nejman, Mariusz (2); Figiel, Adam (2); Surmacki, Jakub (3); Zbiciński, Ireneusz (1); Abramczyk, Halina (3)
“Methods of encapsulation efficiency determination”, 1: Lodz University of Technology, Department of Environmental Engineering, Wolczarska Street 213, 90-924 Łódz, Poland; 2: Wrocław University of Environmental and Life Sciences, Institute of Agricultural Engineering, Chelmanskiego Street 37a, 51-630 Wrocław, Poland; 3: Lodz University of Technology, Faculty of Chemistry, Wroblewskiego 15, 93-590 Łódz, Poland (in-person)

#462 Faria, Rute Quelvia (1); dos Santos, Amanda Rhitiele (2); Gariepy, Yvan (3); Sartori, Maria Márcia Pereira (2); Raghavan, Vijaya (3)
“Biostimulation in soybean seeds after microwave exposure”, 1: Institute Federal Goiano - Urutai, Brazil; 2: University Professor Julio de Mesquita Filho, (UNESP), Botucatu, São Paulo, 18610-034, BRA; 3: Bioresource Engineering, McGill University, Montreal, Quebec, H9X 3V9, CAN (online)
14:45-15:15  COFFEE BREAK  
(Innovation Studio)

16:30-17:30  CARD LABS TOUR  
(gathering at Quad)

18:00-21:00  BANQUET AND AWARDS CEREMONY  
(Worcester Art Museum)
Wednesday, June 29th

7:00-18:00  REGISTRATION
(Rubin Campus Center, 1st Floor)

8:00-9:00  KEYNOTE PRESENTATIONS 3
(Rubin Campus Center, 2nd Floor, Odeum)

Min Zhang, Distinguished Professor, School of Food Science and Technology, Jiangnan University, Wuxi, China, “Synergy of Novel Technologies in Food Drying and its Research Progress” (virtual)

Azharul Karim, Associate Professor, Leader- Energy and Drying Research Group, Queensland University of Technology, Australia, “CFD integrated modelling framework for designing Advanced Food Drying Process” (in-person)

9:00-9:30  COFFEE BREAK
(Innovation Studio)

9:30-12:00  TECHNICAL ORAL SESSIONS
(Innovation Studio)

Session 13: Drying of Food and Agricultural Products (Room 203)
Chair: Wei Yang, Mondelez International, Inc., USA

#678 Frank, Jennifer (1); Schlitter, Marcus (1); Hinrichs, Jörg (2); Kohlus, Reinhard (1)
“Fluid bed drying of dairy gel granules”, 1: Department of Process Engineering and Food Powders, University of Hohenheim, Germany; 2: Department of Soft Matter Science and Dairy Technology, University of Hohenheim, Germany (in-person)

#703 Llavata, Beatriz (1); Torres, Rita (1); Simal, Susana (2); Bon, José (1); Carcel, Juan A. (1)
“Effect of drying temperature on alcohol insoluble residue and antioxidant properties of ‘magaya’”, 1: Universitat Politècnia de València, Spain; 2: University of the Balearic Islands (online)

#538 Li, Mucheng (1); Rossi, Christian (1,2); Ren, Yundong (1); Jafarishad, Hamed (1); Liu, Yuxiang (1)
“Optical Fiber Strain Sensor for Foods in Drying”, 1: Worcester Polytechnic Institute, United States of America; 2: Mount Wachusett Community College, United States of America (in-person)
#673 Bhatkar, Nikita S. (1); Pai, Kalash R. (2); Thorat, Bhaskar N. (3)
“Application of Mass Transfer Regime Approach Theory to Drying of Carrot”,
1: Department of Food Engineering & Technology, Institute of Chemical of Technology Mumbai, ICT-IOC Campus, Bhubaneswar, India - 751013.; 2: Department of Chemical Engineering, Institute of Chemical of Technology Mumbai, Matunga, India.; 3: Institute of Chemical of Technology Mumbai, ICT-IOC Campus, Bhubaneswar, India - 751013. (online)

#652 Rudolph, Yvette; Linke, Tobias; Kohlus, Reinhard
“Effect of superheated steam spray drying on food powder morphology and wetting” University of Hohenheim, Germany (in-person)

#607 Herrera, Paola Andrea; Moreno, Fabian Leonardo; Mayorga, Edgar Yesid
“Mathematical modeling of refractance window drying of whole milk”, Universidad de La Sabana, Colombia (online)

#529 Ren, Yundong; Li, Mucheng; Rossi, Christian; Rao, Pratap; Liu, Yuxiang
“Measurements of Food Moisture Content During the Drying Process Using an Optical Lossy-mode-resonance Fiber-tip Sensor”, Worcester Polytechnic Institute, United States of America (in-person)

#701 Fu, Nan (1); Lu, Ying (1); Pan, Yuzhe (1); Hardy, Paul (2); Yu, Ming (1,3); Zhao, Lili (1); Bornand, Antonin (2); Jeantet, Romain (3); Chen, Xiao Dong (1)
“Exploring the protein adsorption behavior at the droplet/air interface during drying of composite protein/sugar droplets”, 1: FoodPRINT International Associated Laboratory INRAE, School of Chemical and Environmental Engineering, College of Chemistry, Chemical Engineering and Materials Science, Soochow University, Suzhou, Jiangsu 215123, China; 2: Agrocampus Ouest, UMR1253 STLO, F-35042 Rennes, France; 3: STLO, INRAE, Institut Agro, 35042 Rennes, France (online)

#704 Llavata, Beatriz; Torres, Rita; Mulet, Antonio; Carcel, Juan A.
“Influence of temperature on the drying kinetics of ‘magaya’ cider by hot air drying” Universitat Politècnica de València, Spain (online)

#415 Ogunlakin, Grace; Ajekigbe, Olajire; Tunde-Akintunde, Olatoyosi; Afolabi, Tinuade
“Ascorbic acid and Beta-carotene degradation kinetics for okro” Ladoke Akintola University of Technology, Nigeria (online)
Session 14: Drying of Biomass Materials (Room 205)
Chair: Mengqiao Yang, PPG Industries, Inc., USA

#530 Havlík, Jan; Dlouhý, Tomáš; Sabatini, Michel
“Drying biomass with a high water content – the influence of the final degree of drying on the energy system with indirect dryers”, Czech Technical University in Prague, Czech Republic (in-person)

#713 Kobayashi, Nobusuke (1); Ito, Takumi (2); Ooki, Hironari (2); Itaya, Yoshinori (1); Suami, Akira (1)
“Screening of Drying Accelerators for High Efficient Sludge Drying”, 1: Gifu University, Japan; 2: Gen Gen Crporatin, Japan (online)

#534 Nouri, Moudhaffar (1); Perré, Patrick (1,2)
“Direct numerical simulation of coupled heat and mass transfer in hygroscopic porous media”, 1: CentraleSupélec, CEBB, Pomacle, France; 2: CentraleSupélec, Université Paris-Saclay, France (in-person)

#452 Liu, Ming; Li, Mengjie; Liu, Rongtang; Xu, Can; Han, Xiaoqu; Yan, Junjie
“Influence of pre-drying on the coal-fired power plant incinerating municipal solid waste: A thermo-economic analysis”, Xi’an Jiaotong University, China, People’s Republic of (online)

#449 Li, Jie (1); Fraikin, Laurent (2); Salmon, Thierry (2); Toye, Dominique (2); Léonard, Angélique (2)
“Influence of back mixing and sawdust addition on convective drying of wastewater sludge: Temporal evolution of structural characteristics”, 1: Wuhan University of Technology, China, People’s Republic of China; 2: University of Liège, Belgium (online)

#682 Septien, Santiago; Rayavelllore Suryakumar, Arunkumar; Getahun, Samuel Tenaw; Mupinga, Ratidzaish Tracey; Naidoo, Danica; Mary, Eva; Singh, Anusha; Pocock, Jonathan
“Moisture boundness of faecal sludge from on-site sanitation”, WASH R&D Centre, University of KwaZulu-Natal, Durban, 4041, South Africa (online)

#524 Soleymani Angili, Tahereh (1); Sanchez, Nestor (2); Rosentrater, Kurt A. (3); Kaltschmitt, Martin (4); Grzesik, Katarzyna (1)
“Life Cycle Assessment of DDGS produced by stillage drying in a corn-based biorefinery”, 1: AGH University of Science and Technology, Poland; 2: Universidad de La Sabana; 3: Iowa State University; 4: Hamburg University of Technology (online)
Session 15: Process Intensification (Room 105)  
Chair: YoungSoo Lee, University of Illinois, USA

#422 Briest, Lucas (1); Vorhauer, Nicole (1); Tretau, Anne (2); Wagner, Ralf (3); Tsotsas, Evangelos (1)
“Microwave drying of wet clay in pilot-scale plant”, 1: Otto-von-Guericke-University Magdeburg; 2: Brick and Tile Research Institute Essen regd.; 3: Bauhaus University Weimar (in-person)

#521 Wawrzyniak, Pawel (1); Piatkowski, Marcin (1); Jaskulski, Maciej (1); Zbicinski, Ireneusz (1); Jubaer, Hasan (2)
“Analysis of Product Properties in Counter-current Spray Drying with Two Nozzles System”, 1: Lodz University of Technology, Poland; 2: Monash University, Clayton, Australia (in-person)

#427 Muñiz-Becerá, Sahylin (1); Méndez-Lagunas, Lilia Leticia (1); Rodríguez Ramírez, Juan (1); Sandoval-Torres, Sadoth (1); López-Ortiz, Anabel (2); Barriada-Bernal, Luis Gerardo (1,3); Cruz-Gracida, Marlene (1)
“Water and solute transfer within plant tissue during osmotic dehydration of apple in sucrose solution”, 1: Instituto Politécnico Nacional, Mexico; 2: Universidad Nacional Autonoma de México; 3: CONACyT (online)

#442 Bless, Frédéric; Bertsch, Stefan; Purkathofer, Gerhard
“Low cost heat pump fruit dryer for developing countries: technology and opportunities”, NTB University of Applied Sciences of Technology Buchs, Switzerland (in-person)

#431 Wang, Jin (1); Hemis, Mohamed (2,3); Raghavan, Vijaya (1)
“The Effects of Hot-air Drying Coupled with a Microwave System on Chia Seeds (Salvia Hispanica L.”); 1: Department of Bioresource Engineering, McGill University, Sainte-Anne-de-Bellevue, QC, Canada; 2: University of Khemis Miliana, Algeria; 3: Laboratoire de l’énergie et des systèmes intelligents (LESI), University of Khemis Miliana, Road of Theniet El-Had, 44225, Khemis Miliana, Algeria (online)

#707 Baeghbali, Vahid (1); Ngadi, Michael (2)
“Performance of an Ultrasound and Infrared Assisted Conductive Hydro-Dryer as a High Quality and Energy Efficient Drying Method: A Mini-review”, 1: Shiraz University, Iran; 2: McGill University, Canada (in-person)

#389 Han, Xiaoqu (1); Liu, Feng (2); Liu, Ming (1); Liu, Jiping (2); Yan, Junjie (1); Karellas, Sotirios (3)
“Energy, exergy and economic analyses of lignite power plant integrated with flue gas pre-drying and a novel boiler exhaust gas waste heat recovery system”, 1: State Key Laboratory of Multiphase Flow in Power Engineering, Xi’an Jiaotong University, Xi’an 710049, China; 2: MOE Key Laboratory of Thermal Fluid Science and Engineering, Xi’an Jiaotong University, Xi’an 710049, China; 3: Laboratory of Steam Boilers and Thermal Plants, National Technical University of Athens, 9, Heroon Polytechniou Street, Zografou 15780, Greece (online)
12:00-12:30 SYMPOSIUM CLOSING CEREMONY
(Rubin Campus Center, 2nd Floor, Odeum)

12:15-13:30 LUNCH BOXES
(Rubin Campus Center, 2nd Floor)
Posters Session 1  Chair: Mark Lippi, CARD, USA

#446  Touil, Amira (1); Gritli, Souhir (1); Ben Taieb, Ahmed (2)
“Experimental study and Modeling of the Fluidized Bed Drying Process of Alumina”, 1: Université de Carthage, Institut Supérieur des Sciences et Technologies de l’Environnement de Borj Cédria, LR16ES09 Laboratoire de Recherche des Sciences et Technologies de l’Environnement LRSTE; Tunisia; 2: Institut Supérieur des Etudes Technologiques de Kelibia (ISET Kelibia); Tunisia

#496  Robles-Herrera, Adriana Nayeli (1); Juan, Rodríguez-Ramírez (1); Aquino-González, Laura Victoria (1); Méndez-Lagunas, Lilia L. (1); González-Martínez, María Consuelo (2)
“Color change and antioxidant content in dehydrated apple slices previously coated with HPMC and vegetable extracts”, 1: Instituto Politécnico Nacional, CIIDIR Oaxaca, Mexico; 2: Universidad Politécnica de Valencia, IIAD, España

#498  Méndez-Lagunas, Lilia L. (1); García-Cerqueda, Christopher (1); Rodríguez-Ramírez, Juan (1); López-Ortiz, Anabel (2)
“Evaluation of drying agents in honey spray drying and its effect on its physicochemical properties”, 1: Instituto Politécnico Nacional, Mexico; 2: Instituto de Energías Renovables, UNAM, México

#532  Vega-Galvez, Antonio (1); Uribe, Elsa (1,2); Cantuarias, Carolina (1); García, Vivian (1); Pastén, Alexis (1); Poblete, Jacqueline (1); Lamas, Francisca (1)

#618  Rojcewicz, Konrad; Oksiuta, Zbigniew
“Vertical fountain dryer adjusted to sawdust and chips drying”, Bialystok University of Technology, Poland

#662  Yang, Mengqiao; Yagoobi, Jamal
“Statistical Analysis of Drying of Paper with Dielectrophoresis Mechanism”, Worcester Polytechnic Institute, United States of America

#698  Varju, Evelin; Poós, Tibor
“Investigation of simultaneous heat and mass transfer for open-surface evaporation in mixed and forced convection”, Department of Building Services and Process Engineering, Faculty of Mechanical Engineering, Budapest University of Technology and Economics, Hungary

#699  Poós, Tibor
“Review of design parameters of rotary drum dryers used in the research”, Budapest University of Technology and Economics, Hungary

#445  Thomik, Maximilian (1); Briest, Lucas (1); Vorhauer, Nicole (1); Gruber, Sebastian (2); Petra, Först (2); Schuchmann, Harald (3); Tsotsas, Evangelos (1)
“Evaluation of methods to represent the structure in tomographic images of freeze-dried porous media” 1: Otto-von-Guericke University Magdeburg, Germany; 2: Technical University of Munich, Germany; 3: Wilhelm Büchner College of Darmstadt, Germany
Yu, Hanshen (1); Narra, Sneha (2); Yagoobi, Jamal (1)

“Machine learning enabled rapid simulation of the paper drying process” 1: Worcester Polytechnical Institute, United States of America; 2: Carnegie Mellon University, United States of America

Dardashti, Mehrnoush; Noori O’Connor, Zahra; Yang, Mengqiao; Yagoobi, Jamal

“Slurry dehydration with ultrasound mechanism” Worcester Polytechnic Institute, United States of America

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Posters Session 2 Chair: Mark Lippi, CARD, USA

Souza, Amarilis Severino (1); Souza Pinto, Thiago Cézar (2); Béttega, Rodrigo (1); Pádua, Thiago Faggion (1)

“Drying Kinetics of Iron Ore Pellet Feed in a Fluidized Bed”, 1: Federal University of São Carlos, Brazil; 2: Instituto Tecnológico Vale, Brazil

Patel, Sanjay Kumar; Gupta, Aditya Kumar; Bade, Mukund

“Exergy Analysis of a Spray Dryer for Effluent Management”, Sardar Vallabhbhai National Institute of Technology, India

Vidinamo, Frank; Karim, Azharul; Fawzia, Sabrina; Alsbaa, Reham

“Effect of intermittent microwave convective drying on the phytochemicals in fruits”, Queensland University of Technology, Australia

Sandoval-Torres, Sadoth (1); García-Patiño, Mayra (1); Hernández-Bautista, Emilio (2); Rodríguez-Ramírez, Juan (1); Méndez-Lagunas, Lilia Leticia (1); Barriada-Bernal, Luis Gerardo (1,3)


Bhatkar, Nikita Sanjay (1); Pai, Kalash Rajendra (2); Shirkole, Shivanand Shankrao (3); Thorat, Bhaskar Narayan (4)

“Drying of tomatoes & tomato processing waste: a critical analysis of drying and quality attributes”, 1: Food Engineering and Technology Department, Institute of Chemical Technology, Matunga, Mumbai-400019, India; 2: Department of Chemical Engineering, Institute of Chemical Technology Mumbai, ICT-IOC Odisha Campus, Bhubaneswar -751013, India.; 3: Department of Chemical Engineering, Institute of Chemical Technology Mumbai, ICT-IOC Odisha Campus, Bhubaneswar -751013, India.; 4: institute of Chemical Technology Mumbai, ICT-IOC Odisha Campus, Bhubaneshwar -751013, India
Savitha, Srinivasan (2); Chakraborty, Snehasis (1); Thorat, Bhaskar N. (3)
“Techno-economic aspects of Dehydrated Spice Products”, 1: Food Engineering and Technology Department, Institute of Chemical Technology, Matunga, Mumbai, India; 2: Department of Chemical Engineering, Institute of Chemical of Technology Mumbai, ICT-IOC Campus, Bhubaneswar, India; 3: Institute of Chemical of Technology Mumbai, ICT-IOC Campus, Bhubaneshwar, India

Pise, Viplav Hari (1); Thorat, Bhaskar N. (2)
“Role of Drying Process on Quality of Essential Oils and in F&F Industry”, 1: Department of Chemical Engineering, Institute of Chemical Technology, Matunga, Mumbai — 400019, India.; 2: Department of Chemical Engineering, Institute of Chemical Technology, Matunga, Mumbai — 400019, India.

Modak, Sweta (1); Thorat, Bhaskar N. (2); Kaimal, Admajith M. (2)
“Value addition to locally produced potato by drying technology for maximizing the selling price of farmers: A case study from India”, 1: Chemical Engineering Department, Institute of Chemical Technology, Matunga, Mumbai, 400019, India; 2: Chemical Engineering Department, Institute of Chemical Technology, ICT-Mumbai- IOC Odisha Campus, Bhubaneshwar, 751013, India

Moraes, Nicolas Perciani; Anselmo, Rodrigo Barbosa; Alvarens, Liana Rodrigues; Chaguri, Livia
“Carbon xerogel/Nb2O5 composites produced by hot air drying: effect of fluoride presence during synthesis and thermal treatment”, EEL USP, Brazil

Pawar, Ashwajeet B (1); Jadhav, Sachin V (1); Thorat, Bhaskar N (2)
“Mass Transfer Regime Approach for Drying of Apple”, 1: Institute of Chemical Technology, Mumbai, India; 2: Institute of Chemical Technology Mumbai, ICT-IOC Campus, Bhubaneswar, 751013, India

Singh, Pratyasha (1); Pani, Aparupa (2); Shirkole, Shivanand S (3)
“Phytoremedial Efficacy of Lemongrass Under Varying Level of Mine Contaminated Soil”, 1: School of Civil Engineering, KIIT University, Bhubaneswar-24, Odisha, India; 2: School of Civil Engineering, KIIT University, Bhubaneswar-24, Odisha, India; 3: Department of Food Engineering and Technology, Institute of Chemical Technology Mumbai, ICT-IOC Odisha Campus, Bhubaneshwar-13, Odisha, India

Septien, Santiago (1); Naidoo, Pareshin (1); Akhil, Ramlucken (1); Freddie, Inambao (2); McGregor, Craig (3)
“Development and testing of solar thermal drier technologies for the treatment of faecal sludge from onsite sanitation facilities”, 1: WASH R&D Centre, University of KwaZulu–Natal, Durban, 4041, South Africa; 2: Mechanical Engineering, University of KwaZulu-Natal, Durban, 4041, South Africa; 3: Solar Thermal Energy Research Group, University of Stellenbosch, Stellenbosch, 7602, South Africa

Pani, Aparupa (1); Shirkole, Shivanand S (2)
“A Critical Review on Vegetation Assisted Dewatering and Remediation of Contaminated Industrial Sludge”, 1: School of Civil Engineering, KIIT University, Bhubaneswar-24, Odisha, India; 2: Department of Food Engineering and Technology, Institute of Chemical Technology Mumbai, ICT-IOC Odisha Campus, Bhubaneshwar-13, Odisha, India
Kathane, Nirmal; Jadhav, Sachin V.; Thorat, Bhaskar N.
“Mass Transfer Regime Approach for Drying of Potato”, Institute of Chemical Technology, Mumbai, India

Benahmed Djilali, Adiba (1); Benseddik, Abdellouahab (2); Besombes, Colette (3); Nabieiev, Mohamed (4); Allaf, Karim (3)
“Effect of two drying processes (open and hot air) on the availability of flavonoids of Pyracantha coccinea powders”, 1: Mouloud Mammeri University of Tizi-Ouzou (Algeria), Algeria; 2: Unité de Recherche Appliquée en Energies Renouvelables, URAER, Centre de Développement des Energies Renouvelables, CDER, 47133, Ghardaia, Algérie; 3: Laboratory of Engineering Science for Environment LaSIE-UMR-7356 CNRS, University of La Rochelle, France; 4: Laboratory of Petrochemical Synthesis FHC, University M’Hamed Bougara of Boumerdes, 35000, Algeria

Yuan, Yuejin (1); Ma, Kaikun (1); Xu, Yingying (1); Yang, Lijia (1); Li, Yan (1); Yuan, Yueding (2)
“Research on Operation Performance of Multi-heat Source Complementary System of Combined Drying Based on TRNSYS”, 1: College of Mechanical and Electrical Engineering, Shaanxi University of Science and Technology, Xi’an 710021, China; 2: School of Mathematics and Statistics, Hunan University of Finance and Economics, Changsha 410205, China

Ogunbayo, Atoke O.; Akinola, Akinjide A.; Olanipekun, Ogirma O.; Abdulsalam, Abdulmalik
“Colour Change Kinetics of Plantain During Refractance Window Drying at Different Temperatures”, University of Lagos, Lagos, Nigeria
Benahmed Djilali, Adiba (1,2); Besombes, Colette (1); Nabiev, Mohamed (3); Allaf, Karim (1)
“Effect of Conventional Air Drying on the Biochemical and Functional Properties of Vine Leaf Powder”, 1: LaSIE, La Rochelle University, UMR 7356 CNRS, France; 2: Mouloud Mammeri University of Tizi-Ouzou 15000 Algeria; 3: University of M’Hamed Bougara Boumerdes 35000 Algeria

Berrich, Oumaima (1,2,3); Besombes, Colette (3); Azzouz, Soufien (1); Hamrouni, Lamia (2); Allaf, Karim (3)
“Effect of the swell-drying by Instant Controlled Pressure-Drop DIC treatment on the physical properties of Myrtle”, 1: Laboratoire d’Energétique et des Transferts Thermiques et Massiques, Département de Physique, Faculté des sciences de Tunis, Campus Universitaire, 2092 Manar II, Tunis, Tunisia; 2: Laboratoire de Gestion et Valorisation des Ressources Forestières, Institut National de Recherche en Genie Rural Eaux er Forets, Ariana 2080, Tunisia; 3: Laboratory of Engineering Sciences for the Environment (LaSIE) UMR 7356 CNRS, Avenue Michel Crépeau, La Rochelle University, 17042 La Rochelle, France

Nishikawara, Masahito (1,2); Sako, Toshihiro (1); Yokoyama, Hiroshi (1); Yanada, Hideki (1)
“Development and wicking-drying characteristics evaluation of porous media using copper micro/nano short fiber.”, 1: Toyohashi University of Technology, Japan; 2: Worcester Polytechnic Institute

Pai, Kalash Rajendra (1); Ramachandran, Palghat A. (2); Thorat, Bhaskar N. (1)
“Using Mass Transfer Approach in Drying to Interpret Pore-Scale Models that explain Drying Phenomena”, 1: Department of Chemical Engineering, Institute of Chemical Technology, ICT-IOC Bhubaneshwar, Odisha, India.; 2: Department of Energy, Environmental & Chemical Engineering, Washington University, St. Louis, MO, 63130, USA

Kaimal, Admajith M. (1); Pise, Viplav Hari (2); Thorat, Bhaskar N. (1)
“Mushroom Dehydration Technologies for Value addition to Wild Mushrooms of Odisha”, 1: Chemical Engineering Department, Institute of Chemical Technology, ICT Mumbai - IOC Bhubaneshwar, Odisha Campus, Bhubaneshwar – 751013, India; 2: Laboratory of Engineering Science for Environment (LaSIE), University of La Rochelle, 17042 La Rochelle, France

Zakraoui, Mariem (1,2,3); Besombes, Colette (1); Hamrouni, Lamia (2,3); Allaf, Karim (1)
“Optimization of stabilization processes for the valorization of bioactive compounds in Olive leaves”, 1: Laboratory of Management and Valorization of Forest Resources –National Researches Institute of Water, Forests and Rural Engineering, University of Carthage, 2080 Ariana, Tunisia; 2: Laboratory of Engineering Science for Environment (LaSIE), University of La Rochelle, 17042 La Rochelle, France; 3: Faculty of Sciences of Tunis, University of El Manar, 2092 Tunis, Tunisia
22nd International Drying Symposium

JUNE 26-29, 2022

Worcester Polytechnic Institute
Worcester, Massachusetts

#616
Deka, Darshana (1); Savitha, Srinivasan (1); Narayan, Bhaskar (2)
“Economic Analysis of Dried Phage Formulation”,
1: Department of Chemical Engineering, Institute of Chemical Technology, Mumbai, ICT-IOC Bhubaneswar, India; 2: Institute of Chemical Technology Mumbai, ICT-IOC Campus, Bhubaneswar, India

#614
Mourda, Tamara (1); Boy, Virginie (1); Besombes, Colette (2); Allaf, Karim (2); Lanoisellé, Jean-Louis (1)
“Comparative Intensification of Shrimp Drying using Instant Controlled Pressure-Drop DIC and Air Jet Impingement” 1: Université Bretagne Sud, France; 2: La Rochelle University, France

#416
Olanipekun, Bosede; Ogunlakini, Grace; Ajekigbe, Olajire; Afolabi, Timade; Tunde-Akintunde, Olatoyosi; Oyelade, Olusegun
“Effect Of Pretreatment On Drying Of Orange Flesh Sweet Potato (Ipomea Batatas Lam.) Chips” Ladoke Akintola University of Technology, United States of America