Nanjing Agricultural University

International Symposium on Biomass Utilization in Agriculture and Forestry (BUAF2022)

Conference Schedule

Virtual Conference

Nanjing, China December 15-16, 2022

Conference Background

Low-carbon technologies, renewable energies and development strategies in accordance with the United Nations Sustainable Development Goals (SDGs) are essential for our future. Biomass utilization in agriculture and forestry has become a research hotspot in chemical, environment, energy and materials science fields. To accelerate scientific and technological development of biomass and forestry resources, the International Symposium on Biomass Utilization in Agriculture and Forestry (BUAF2022, Virtual Conference) is being held on December 15-16, 2022 and hosted by Nanjing Agricultural University and Jiangsu Foreign Expert Lab. Scholars from Belgium, Canada, Germany, Italy, Japan, Malaysia, USA, Spain and China will share their most recent research activities on biomass energy, bio-based materials, bio-based chemicals, bio-active compounds and biopolymers, and global carbon balance. The purpose of the forum is to promote international academic exchange and education and to stimulate cooperative activities in sustainable development of renewable biomass resources.

Organization Committee

Chair： Prof. Zhen Fang (Fellow of the Canadian Academy of Engineering, FCAE), Nanjing Agricultural University, China

Co-chair： Prof. Janusz A. Kozinski (FCAE), Lakehead University, Canada
Prof. Richard L. Smith Jr., Tohoku University, Japan
Prof. Charles Xu (FCAE), Western University, Canada

Secretaries: Dr. Chengyu Dong (Email: donchengyu@njau.edu.cn, c: 15011223564)
Ms. Jingmei Chen (Email: chenjingmei@njau.edu.cn, c: 13776504416)

Details of the BUAF2022 Conference:

Date: December 15-16, 2022 (Beijing Time)

Venue: Online Platform

On-line Forum Platform:

Microsoft Teams ID: 444 796 075 663, password: 2qJSKV
Microsoft Teams： https://www.microsoft.com/zh-cn/microsoft-teams/join-a-meeting

URL: https://mp.weixin.qq.com/s/PGscMcq-FbyPQv56HILafQ

http://woodrefinery.com/zhenfang/buaf2022-symp/
https://biomass-group.njau.edu.cn/info/1016/1882.htm

Conference Program

Beijing Time	Local time	Plenary Lecture	Host
Beijing Time: Dec 15, am 9:00-9:10		Prof. Tao Zhang, Vice-President of Chinese Academy of Sciences Prof. Yanfeng Ding, Vice-President of Nanjing Agricultural University Prof. Zhen Fang, Fellow of the Canadian Academy of Engineering	Opening Ceremony
Beijing Time: Dec 15, am 9:10-9:40	Ontario Time: Dec 14, pm 21:20-21:50	**Biofuture: Exotic Combustion in Supercritical Water** Prof. Janusz A Kozinski, Fellow of the Canadian Academy of Engineering, Dean of Engineering, Lakehead University (Canada)	Prof. Janusz A Kozinski
Beijing Time: Dec 15, am 9:40-10:10		**Biomass Conversion to Ethylene Glycol: from Fundamental Research to Industrial Application** Prof. Tao Zhang, Academician of Chinese Academy of Sciences, Dalian Institute of Chemical Physics, Chinese Academy of Sciences (China)	
Beijing Time: Dec 15, am 10:10-10:40		**Group photo and Break**	
Beijing Time: Dec 15, am 10:40-11:10		**Conversion of Biomass into Chemicals and Fuels** Prof. Buxing Han, Academician of Chinese Academy of Sciences, Institute of Chemistry, Chinese Academy of Sciences (China)	Prof. Janusz A Kozinski
Beijing	Minnesota	**Sustainable Agricultural Solid**	

Time: Dec 15, am 11:10-11:40	Time: Dec 14, pm 21:00-21:30	**and Liquid Waste Utilization for Circular and Sustainable Economy Development** Prof. Roger Ruan, Fellow of American Society of Agricultural and Biological Engineers, University of Minnesota (USA)	

Beijing Time	Local time	Plenary Lecture	Host
Beijing Time: Dec 15, pm 2:00-2:30	Tokyo Time: Dec 15, pm 3:00-3:30	**Green Chemical Processes for Upgrading Biomass and Agricultural Wastes** Prof. Richard L Smith Jr. Tohoku University (Japan), Editor J Supercritical fluids	Prof. Richard L Smith Jr.
Beijing Time: Dec 15, pm 2:30-3:00	Berlin Time: Dec 15, am 7:30-8:00	**Recovery of Organic Waste and Residues (in Germany) - The Role in Waste Management, Energy System, Bioeconomy and Climate Protection** Prof. Dr. mont. Michael Nelles, University of Rostock (Germany), Scientific Director of the German Biomass Research Center (DBFZ)	
Beijing Time: Dec 15, pm 3:00-3:30	Rome Time: Dec 15, am 8:00-8:30	**Enabling Technologies for Biomass Extraction and Conversion** Prof. Giancarlo Cravotto, Editor-in-Chief of Processes, University of Turin (Italy)	
Beijing Time: Dec 15, pm 3:30-3:40		**Break**	
Beijing Time: Dec 15, pm 3:40-4:10	Brussels Time: Dec 15, am 8:40-9:10	**Gaining Fundamental Understanding of Biomass Fast Pyrolysis by Advanced Experimentation, Genetic Modifications and Kinetic Modeling** Prof. Kevin M. Van Geem, Ghent University (Belgium)	Prof. Richard L Smith Jr.

Beijing Time: Dec 15, pm 4:10-4:40	Tokyo Time: Dec 15, pm 5:10-5:40	**Hiroshima Scenario: Possibility of Biomass as Carbon Source and Contribution of Agriculture for Carbon Neutral Society** Prof. Yukihiko Matsumura, Hiroshima University (Japan)	

Beijing Time	Local time	Plenary Lecture	Host
Beijing Time: Dec 16, am 9:00-9:30	Ontario Time: Dec 15, pm 20:00-20:30	**Re-engineering Natural Wood into High Strength Lightweight Bio-composite Material for Structural Application** Prof. Charles Xu, Fellow of the Canadian Academy of Engineering (Canada)	Prof. Charles Xu
Beijing Time: Dec 16, am 9:30-10:00	Kuala Lumpur Time: Dec 16, am 9:30-10:00	**Effect of hybridization of inorganic/organic acid as the liquefaction catalyst on the properties of liquefied kenaf polyols** Prof. Sarani Zakaria, The National University of Malaysia (Malaysia)	
Beijing Time: Dec 16, am 10:00-10:30	Toronto Time: Dec 15, pm 21:00-21:30	**Monolithic Wood Biochar as Functional Material for Sustainability** Prof. Charles Q. Jia, Fellow of the Canadian Academy of Engineering, President of Canadian Society for Chemical Engineering, University of Toronto (Canada)	
Beijing Time: Dec 16, am 10:30-10:40		**Break**	
Beijing Time: Dec 16, am 10:40-11:10	California Time: Dec 15, pm 18:40-19:10	**Transforming Food and Agricultural Waste into Bioenergy and Bioproducts** Prof. Ruihong Zhang, Fellow of American Society of Agricultural and Biological Engineers, University of California, Davis (USA)	Prof. Charles Xu

Beijing Time: Dec 16, am 11:10-11:40	To be announced	

Beijing Time	**Local time**	**Plenary Lecture**	**Host**
Beijing Time: Dec 16, pm 2:00-2:30	Madrid Time: Dec 16, am 7:00-7:30	**Biomass Valorisation into High-added Value Products: from Energy Vectors to Pharmaceuticals** Prof. Rafael Luque, Editor in Chief of Molecular Catalysis, University of Cordoba (Spain)	Prof. Fang Zhen
Beijing Time: Dec 16, pm 2:30-3:00	Berlin Time: Dec 16, am 7:30-8:00	**The Hohenheim On-farm Biorefinery** Prof. Dr. habil, Andrea Kruse, University of Hohenheim (Germany)	
Beijing Time: Dec 16, pm 3:00-3:05		**Closing Ceremony**	

Biographies of Plenary Lecturers

Professor Giancarlo Cravotto

Bio： Giancarlo Cravotto has been Director of the Department of Drug Science and Technology (University of Turin) since 2007 until October 2018, he is currently Full Professor of Organic Chemistry and vice-Director. He is Editor-in-Chief of Processes (MDPI, Basel) and associate Editor of other journals. His research activity in the domain of green organic synthesis and processing, is documented by more than 500 scientific, peer-reviewed papers (H. Index 62, 16,500 citations by Scopus; H. Index 71, 21,200 citations by Google Scholar), 21 patents, 42 book chapters and 7 books as editor. His studies have paved the way for new, non-conventional energy source driven synthetic procedures (microwaves, ultrasound, hydrodynamic cavitation, mechanochemistry, extruders, flow chemistry, etc.), while also prompting the development of innovative hybrid reactors. He has been visiting scientist and board member of several international institutions.

Title： Enabling Technologies for Biomass Extraction and Conversion

Abstract: Circular economy models have been applied to agro-industrial biomass, with natural products for fine and pharmaceutical chemistry at the top of the value pyramid. At a second level, we find primary metabolites (proteins, fats, and carbohydrates) and soluble fibers for the food chain and animal feed.[1] It is now clear that conventional extraction and conversion techniques cannot be considered a green and sustainable process. In the last two decades, the literature has highlighted the considerable effort made by researchers to find efficient and environmentally friendly extraction[2] and conversion techniques. A cascade strategy could maximize biomass exploitation. Highly efficient biomass pretreatment processes and new enabling technologies allow selective extraction of high value-added components and subsequent chemical or biochemical conversion of the remaining insoluble fraction (cellulose, hemicellulose, and lignin)[3]. Biorefinery, which uses biomass as a feedstock and converts it into valuable products, is a core technology for sustainable green industry and has high potential as an alternative to the current petrochemical-based industry. Improved heat (microwaves, radio frequencies, ohmic heating, etc.) and mass transfer (acoustic and hydrodynamic cavitation)[4] lead to higher efficiency with lower energy consumption. Besides process intensification by the above-mentioned energy sources, the new paradigms in plant extraction and residual biomass conversion mainly refer to continuous flow processes, which is in contrast to the typical batch processes. One of the most versatile and environmentally friendly methods utilizes the unique properties of subcritical water extraction above the boiling point up to 150°-160°C (pressure 5-6 bar). Under these conditions, hydrogen bonds are broken and the water changes polarity and dielectric constant, improving extraction power and mimicking the behaviour of hydroalcoholic mixtures. Integrated strategies for biomass treatment with physical, chemical and biotechnological conversions[5], [6] demonstrated great potential and large applicability[7].

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[3] Lauberte, L.; Telysheva, G.; Cravotto, G.; Andersone, A.; Janceva, S.; Dizhbite, T.; Arshanitsa, A.; Vevere, L.; Jurkjane, V.; Grillo, G.; Calcio Gaudino, E.; Tabasso, S. J. Cleaner Prod. 2021, 303, 126369.
[4] Calcio Gaudino, E.; Cravotto, G.; Manzoli, M.; Tabasso, S. Chem. Soc. Rev. 2021, 50, 1785.
[5] Verdini, F.; Tabasso, S.; Mariatti, F.; Bosco, F.; Mollea, C.; Cirio, A.; Cravotto, G. Fermentation 2022, 8, 556.
[6] Calcio Gaudino, E.; Grillo, G.; Tabasso, S.; Stevanato, L.; Cravotto, G. et al. J. Cleaner Prod. 2022, 380, 134897.
[7] Belwal, T.; Chemat, F.; Venskutonis, P.R.; Cravotto, G.; Jaishwal, D.K.; Bhatt, I.D.; Devkota, H.P.; Luo, Z. TrAC Trends in Analytical Chem. 2020, 127, 115895.

Professor Kevin M. Van Geem

Bio: Kevin Van Geem (full professor) is member of the Laboratory for Chemical Technology of Ghent University. Thermochemical reaction engineering in general and in particular the transition from fossil to renewable resources are his main research interests. He is a former Fulbright Research Scholar of MIT and directs the Pilot plant for steam cracking and pyrolysis. He is the author of more than hundred scientific publications and has recently started his own spin-off company.

He is involved in on-line and off-line analysis of complex petrochemical and biochemical samples using comprehensive two-dimensional gas chromatography. Pyrolysis, detailed kinetic modeling, process, scale-up, modeling, and ant-fouling technology belong to his main expertise

Title: Gaining Fundamental Understanding of Biomass Fast Pyrolysis by Advanced Experimentation, Genetic Modifications and Kinetic Modeling

Professor Buxing Han

Bio: Buxing Han is Professor at Institute of Chemistry, Chinese Academy of Sciences (CAS); Academician of Chinese Academy of Sciences; Fellow of The World Academy of Sciences (TWAS) for the advancement of science in developing countries; Fellow of Royal Society of Chemistry. He is Chairman of The Interdivisional Committee on Green Chemistry for Sustainable Development, International Union of Pure and Applied Chemistry (IUPAC); Chief Scientist of China Innovation Think Tank; Chairman of Green Chemistry Division, Chinese Chemical Society; President of Beijing Energy and Environment Society; Editor-in-Chief of The Innovation, Associate Editors of Green Chem., Associate Editor of Chinese Sci. Bulletin, Associate Editor of Acta Physico-Chimica Sinica, Associate Editor of Chem. J. Chinese Universities. His research interests include physicochemical properties of green solvent systems and application of green solvents in green chemistry, especially on transformation of CO_2, biomass, waste plastics, and kitchen waste into valuable chemicals and fuels.

Title: Conversion of Biomass into Chemicals and Fuels

Abstract: Chemical industry contributes greatly to the development of our society. However, many conventional chemical processes produce wastes and pollute environment. Sustainable development is one of the most important issues for humans and is a great challenge. Use of biomass as carbon source to produce value-added chemicals and fuel is of great importance for the sustainable development of our society. In recent years, we are very interested in catalytic conversion transformation of CO_2, biomass, waste plastics, and kitchen waste into valuable chemicals and fuels. In this

presentation, I would like to discuss some of the recent results in our group on design of green catalysts and their application in conversion of biomass into valuable chemicals and fuels.

Professor Charles Q. Jia

Bio: Dr. Charles Q. Jia is a professor and Associate Chair of the Department of Chemical Engineering and Applied Chemistry at the University of Toronto, directing the Green Technology Lab since 1996 after obtaining a Ph.D. from McMaster University. Before his career in Canada, he had taught at Chongqing University in China, where he had his first two engineering degrees. An internationally recognized expert on nanoporous carbon materials and applied sulphur chemistry, Dr. Jia is passionate about sustainability and the planet's well-being. Through strategic partnerships with industries, his creative work has unlocked the potential of some major industrial wastes in enhancing sustainability. In addition, his pioneering work on exploring new ways to utilize carbon extracted from natural resources has helped create much-needed solutions to reduce carbon dioxide emissions and alleviate climate change. Dr. Jia is a devoted community leader, has consulted for industries and governments and recently served as President of the Canadian Society for Chemical Engineering (CSChE). He is a Fellow of the Chemical Institute of Canada (FCIC) and a Fellow of the Canadian Academy of Engineering (FCAE).

Title: Monolithic Wood Biochar as Functional Material for Sustainability

Abstract: Trees are crucial to humankind's survival, releasing the oxygen we breathe, growing the fruits we eat, and supplying wood to build and warm our shelters. Heating wood at high temperatures with little or no oxygen creates wood biochar, a carbonaceous product. Wood biochar monoliths have a continuous carbon matrix and morphological features that resemble anatomical elements in a tree, including xylem and phloem, which transport water from the root and deliver sugars from leaves to individual cells. Structurally and chemically, monolithic wood biochar belongs to nanoporous carbons (NPCs) consisting of carbon nanotubes arrays and integrated graphene sheets. Researchers have extensively explored NPCs as functional materials for applications essential to sustainability,including electrical energy storage, water purification, and CO_2 capture. However, the lack of scalable manufacturing technology continues to hinder the large-scale utilization of NPCs despite their demonstrated superiority in enhancing materials performance. Derived from abundant woody biomass with simple processes, wood biochar monoliths offer a new opportunity for overcoming this limitation. Focusing on electrical energy storage and water purification, this talk representsrecent progress in applying wood biochar monoliths in areas critical to sustainability and demonstrates the potential of monolithic wood biochar as a greener, more cost-effective, and scalable nanoporous functional material.

Professor Richard Lee Smith, Jr.

Bio: Richard L. Smith, Jr. is professor in the Graduate School of Environmental Studies (GSES)/GP-RSS, Tohoku University, Japan. Professor Smith obtained his PhD in Chemical Engineering from the Georgia Institute of Technology (USA) in 1985 under the supervision of Professor Amyn S. Teja. He held faculty positions at Tohoku University (Japan) and the University of South Carolina (USA) before joining the Research Center of Supercritical Fluid Technology (RCSFT) at Tohoku University in 1994 and was a visiting scholar at Cornell University (USA) in the Department of Geological Sciences (Professor William A. Bassett). His research focuses on developing green chemical processes especially those that use water or carbon dioxide as reaction or separation solvents. He has published more than 300 scientific papers and is the author of the textbook, "Introduction to Supercritical Fluids" (Smith, Inomata, Peters) published by Elsevier in 2013 and the co-editor for the continuing (2014 - present) Book Series "Biofuels and Biorefineries" (Zhen Fang, Editor-In-Chief) published by Springer-Nature. Professor Smith is the Asia Regional Editor for the Journal of Supercritical Fluid.

Title: Green Chemical Processes for Upgrading Biomass and Agricultural Wastes

Abstract: In this lecture, green and sustainable processes for converting biomass and agricultural wastes via supercritical, hydrothermal, solvothemal and mechanochemical methods will be discussed along with their relationship to the UN SDGs and UN 2021 Call for Action Issues. Methods that use water have broad application when applied in processes using fast-heating, short-contact heating, or long-contact heating modes. Fast-heating modes can be used advantageously to depolymerize biopolymers, proteins or for recovering and recycling nutrients. Short-contact methods can be used advantageously in separations including extraction, while long-contact heating modes can be used to synthesize functional biocarbons that can be applied to upgrade biomass. Solvothermal methods use liquids such as ethanol or supercritical fluids such as carbon dioxide to transform biomass-related compounds into biofuels, whereas mechanochemical methods are typically applied under solventless conditions and have great appeal for versatile synthesis of inexpensive bifunctional catalytic materials. Some fundamental guidance will be given in the lecture to aid in green chemical process development.

Professor Janusz A Kozinski

Bio: Professor Koziński has enjoyed a distinguished academic career in leading institutions in the USA, Europe, and Canada. He is an internationally-renowned higher education leader, researcher and entrepreneur, and one of the world's most widely acknowledged experts in sustainable energy systems.

Educated in Kraków, Poland, he subsequently conducted research at the Massachusetts Institute of Technology and spent much of his academic career at McGill University where he was Associate Vice-Principal for Research & International Relations.

He was Founding Dean of the Lassonde School of Engineering in Toronto and Founding President of a new University in Hereford, which is one of the most ambitious ventures in British higher education.

He is currently leading a new trans-disciplinary initiative applying key driving forces in the 21st century science and engineering to create a novel type of research-based academic programs. The emphasis of his own research is on symbiosis between energy and the environment.

Title: Biofuture: Exotic Combustion in Supercritical Water

Abstract: We shall focus on combustion in water. In fact, the combustion in supercritical water (SCW), which is one of the most unexplored processes. We will present a novel concept for the in situ study of SCW flames, flameless oxidation, and gasification. Original data on the fundamental behaviour of organic compounds as well as structural and chemical evolution of these compounds have been determined for the first time. We will focus on the mechanistic explanation of the combustion pathways of the main components as well as their interactions during SCW combustion. A variety of novel experimental set ups, including diamond/flames cells and synchrotron beams, allowing for simultaneous observation and measurement of chemical reactions will be discussed. A relevant evolution mechanism based on the time-resolved profiles of intermediates formed during the SCW combustion will be proposed. The results suggest that complex organics can be completely decomposed in SCW and that combustion of different hydrocarbons in the supercritical region seems to be alike

Prof. Dr. habil, Andrea Kruse

Bio: Professor Kruse's interests are focused on: platform chemicals from biomass (furfurales, phenols, etc.) for old and new polymers (nylons from chicory, resins from straw); new carbon-rich materials from biomass (biochar, activated coal, carbon black, materials for fuel cells….); and fertilizer by nutrient recycling (for example from sewage sludge or manure). Her current position is chair of "Conversion Technology and Life Cycle Assessment of Renewable Resources" at UHOH and guest scientist at the Karlsruhe Institute of Technology, Institute for Catalysis Research and Technology.

Title: The Hohenheim on-farm biorefinery

Abstract: The whole concept is demonstrated in the research station, Lindenhöfe“ of the University of Hohenheim. The biorefinery is demonstrated in the scale of a few kg/h as small pilot plant. The mass flows of the research-station, which is a farm, are used as input of the biorefinery. One part of the biorefinery concept is locating up stream and in parallel to the biogas plant. This biorefinery deals with the production of platform chemicals and proteins. This part of the biorefinery concept is coupled with the biogas plant by processing residues to biogas and using the heat of the burner. In addition to this residues, manure is fed into the biogas plant. The phosphate recovery and production of activated carbons is down-streaming of the biogas plant. This is the second part of the biorefinery concept.

Professor Rafael Luque

Bio: Rafael Luque (PhD in 2005 from the Universidad de Cordoba, Spain) has significant experience in biomass and waste valorization practices to materials, fuels and chemicals as well as nanoscale chemistry, green chemistry and catalysis (600+ publications, h-index 93, >39,000 citations, 7 patents, 10 edited books). He is Editor-in-chief of Molecular Catalysis (Elsevier) and serves on the Advisory/Editorial Board of over 10 Q1 RSC, Wiley, ACS and Elsevier journals. He has been named 2018, 2019, 2020, 2021 and recently 2022 Highly Cited Researcher (Clarivate Analytics).

Tile: Biomass Valorisation into High-added Value Products: from Energy Vectors to Pharmaceuticals

Abtract: The design of benign and environmentally sound methodologies has been the driving force of scientists in recent years towards more sustainable methodologies.

Attractive and innovative protocols that nowadays are even part of industrial ventures including biomass-derived porous carbonaceous materials, designer nanomaterials for catalytic applications and catalytic strategies for biomass/waste conversion into useful materials, chemicals and fuels have been recently developed in our group in recent years. These topics have extensively covered the preparation and design of (nano)materials, biocatalysts and photocatalysts and their utilisation in heterogeneously (bio)(photo)(electro)catalysed processes, flow chemistry as well as in biomass/waste valorisation practices. An important research avenue from the group deals with the search for novel and alternative reaction media in Organic Synthesis including mechanochemistry, organocatalysis and photo-redox processes as well as greener catalytic processes in Organic Chemistry (flow chemistry) for the synthesis of APIs.

In this lecture, we aim to provide an overview of recent efforts from our group in leading the future of global scientists in benign-by-design methodologies for biomass valorization including and the “waste-to-pharma” concept.

Professor Yukihiko Matsumura

Bio: My academic field is thermal engineering and chemical engineering. My research field is supercritical water and hydrothermal technologies. My research topic is biomass utilization. Within the framework of Advanced Core of Energetics (HU-ACE), I am discussing the future carbon neutral energy system. I am also cooperating to realize the Carbon Neutral x Smart Campus 5.0 Declaration.

Title: Hiroshima Scenario: Possibility of Biomass as Carbon Source and Contribution of Agriculture for Carbon Neutral Society

Abstract: Hiroshima Scenario toward carbon neutral society has been developed. To achieve carbon neutral society in 2050, supply of renewable energy is the most important point. Considering the decrease in photovoltaic, wind turbine, and battery, mainly due to the effort of China, these technologies are to be fully employed. However, it can produce only electricity and cannot cover carbon supply needed for jet fuel, iron production, and plastic. How biomass can contribute for this use is discussed.

Professor Dr. mont. Michael Nelles

Bio: Prof. Michael Nelles is an environmental engineer and studied Technical Environmental Protection (Technical University of Berlin). From 1994 to 1999 he was the Vice Director of the Department Waste Management of the Montanuniversität Leoben in Austria. From 2000 to 2006 he was Professor of Environmental Engineering of the University of Applied Science in Göttingen (Germany). Since 2006 he is full professor of Waste and Resource Management of the Faculty of Agricultural and Environmental Sciences of the University of Rostock, Germany. Since 2012 Prof. Nelles is also the Scientific Director of the German Biomass Research Center (DBFZ) in Leipzig.

His research activity is based on: fundamental and applied aspects of waste management with focus on technological, environmental and economic aspects to mechanical, biological and thermal treatment systems of waste and biomass in different recycling and recovery routes.

He is a member of national and international Advisory Boards of organisations in the field of waste management and biomass utilisation and also a Board-Member of different national and international conferences and journals. He is author of over 500 articles and chapters in books and journals since 1994. His international activities focus on the Asian Region and in particular on China (Guest Professor in Beijing, Hefei, Shanghai & Shenyang; National Friendship Award 2011).

Title: Recovery of Organic Waste and Residues (in Germany) - The Role in Waste Management, Energy System, Bioeconomy and Climate Protection

Abstract: It may be difficult in the face of the brutal Russian attack on the Ukraine, but other global challenges continue demand our attention. This especially holds true for the transformation of our society into a climate-neutral one – bearing in mind that this is also one key prerequisite for preventing future armed conflicts.

Put very simply, climate neutrality will only happen if the following formula is observed:

Climate neutrality (CN) = Renewable energies (RE) + Circular economy (CE)

As explained in the present paper, Germany still has a long way to go towards its 2045 goals. In 2021, the country emitted 762 Mill. t CO_2, and reduction rates compared with 1990 are back to below 39 %.

On the one hand side, the share of RE in both primary energy consumption (PEC) – currently just under 16 % – and total final energy consumption (FEC, < 20 %) is still quite low. For PEC as well as for FEC, the share of bioenergy in total RE was about 60 % in 2021. This means we must halve our current energy consumption as fast as possible. Both rigorous energy saving actions and substantial increases in energy efficiency will be required to achieve this. Germany's energy supply must switch to RE completely and in all sectors over the next decades. This will require a massive expansion and optimised integration of wind, solar, bio-, geothermal and hydro-energy for heating/cooling, electricity and transport. Bioenergy will primarily be required to close the gaps where other RE cannot guarantee security of supply. Moreover, energetic use of biogenic resides and wastes will continue to increase in importance.

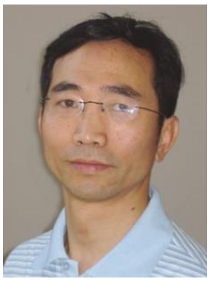
On the other hand side, our linear economic system must become a true circular economy. Currently, we are still far from achieving this. Organic raw materials for industry need be bio-based instead of petroleum-based, as far as possible. Again, an optimised use of biogenic residues and wastes for materials and energy will be key here. Such integration of biomass into a sustainable bioeconomy and energy system can only be realised in the long term if the former is used efficiently, in an environmentally compatible way and to a maximum total economic benefit. This will require new technological concepts, increased coupled and cascading usage as well as negative emissions, which are generated by storing "green" carbon.

The biomass must also come from biogenic residues and wastes, or from sustainable cultivation.

The current technical potential of biogenic residues and wastes in Germany amounts to 85.6 to 139.6 Mill. t dry mass. Between 67 and 85 % of this are already being used for material or energy production. The DBFZ assumes that, one the one hand side, the existing usage can still be optimised, and on the other hand side, an additional 12.8 to 45.5 Mill. t dry mass could and should be mobilised for further processing.

These are also central research areas of the German Biomass Research Centre (DBFZ - Deutsches Biomasseforschungszentrum gGmbH) and the Chair of Waste and Resource Management at the University of Rostock.

Keywords: organic waste, bioenergy, bioeconomy, climate neutrality, resource efficiency



Professor Roger Ruan

Bio: Dr. Roger Ruan, Professor and Director of Graduate Studies, Department of Bioproducts and Biosystems Engineering, and Director of Center for Biorefining at University of Minnesota, is a Fellow of ASABE, IFT, IAAM, and Vebleo, and have received many other awards, including CAFS Professional Achievement, Scientist of IAAM, Member of EUAS, etc. Dr. Ruan's research areas include renewable energy and environment technologies for sustainable development and circular economy. Specifically, he has conducted research and published his findings in the areas of biomass and solid wastes such as plastic wastes pyrolysis and gasification for chemicals, materials, fuels and energy production; municipal, agricultural, and industrial wastewater treatment and utilization through novel anaerobic digestion, microalgae cultivation, and hydroponics; airborne and other pathogen disinfection and pollutant control; innovative catalytic non-thermal plasma, low temperature microwave and pulse microwave, photocatalytic intensive pulse light, and NMR/MRI technologies development and applications in nitrogen fixation, food safety assurance, and food quality improvement; and food engineering and various value-added processing.

Professor Ruan has published over 500 papers in refereed journals, two books, and 24 book chapters, and holds 20 US patents. He is also a top-cited author in engineering and technologies with an h-index of 84, i10-index of 424, and over 28,800 citations (https://scholar.google.com/citations?user=seJPiQkAAAAJ&hl=en). He has supervised over 75 graduate students, 140 post-doctors, research fellows, and other engineers and scientists, and many of his Ph.D. students and post-doctors hold university faculty positions. He has also been invited to give over 300 keynote lectures, invited symposium presentations, company seminars, and short courses, and has been a consultant for government agencies, and many local, national, and international companies and agencies in bioprocess engineering, food engineering, and renewable energy and environment areas. Professor Ruan has received and managed over 200 projects totaling over $45 million in various funding for research, including major funding from USDA, DOE, DOT, DOD, LCCMR, and industries. He has served as guest editor or editorial board member of Bioresource Technology, Renewable Energy, Engineering, Applied Catalysis and Chemical Engineering, Journal of Food Process Engineering, The Open Plasma Physics Journal, and Associate Editor of Transactions of ASABE, Engineering Applications in Agriculture, and Transactions of CSAE, and Chairman of Editorial Board and Editor-in-Chief of International Journal of Agricultural and Biological Engineering, etc. He has also organized and chaired multiple international conferences including Conference of Food Engineering (CoFE2018), International Conference on Environmental Pollution and Governance (ICEPG 2021), 2nd International Symposium on Environmental Protection and Chemical Engineering (ISEPCE 2021), International Conference on Energy

Engineering, New Energy Materials and Devices (NEMD 2021), etc., and served on many conference organization committees.

Title: Sustainable Agricultural Solid and Liquid Waste Utilization for Circular and Sustainable Economy Development

Abstract: Agricultural solid waste conversion for the production of green fuels, chemicals, and materials can help protect our environment and reduce the consumption of fossil energy, thereby help alleviating the climatic effects and achieving the 1.5 ºC Paris climate goal. We have developed a series of advanced technologies/systems to extract values out of these wastes. For lignocellulosic biomass and plastics, we proposed a novel catalytic microwave-assisted pyrolysis/gasification technology that is designed to achieve the conversion of solid wastes to high quality fuels and chemicals. For animal manure, it will be injected into an integrated system, including thermal vacuum stripping, mesophilic anaerobic digestion, microalgae treatment, hydroponic cultivation, with the goal of complete conversion and utilization and producing methane, microalgae, and fresh vegetables. In summary, we aim to support a circular and sustainable economy development with recycling and utilizing agricultural solid and liquid wastes in an environmentally friendly manner.

Professor Chunbao (Charles) Xu

Bio： Dr. Charles Xu is full Professor of Chemical and Biochemical Engineering at Western University, Fellow of Chemical Institute of Canada (FCIC) and Fellow of Canadian Academy of Engineering (FCAE). He was the NSERC/FPInnovations Industrial Research Chair in Forest Biorefinery (2011-2016), acquiring an international reputation in development of high-value bioproducts (biofuels, bio-based chemicals and materials) from renewable resources (forestry/agricultural residues, algal biomass and other organic wastes, etc.), production of renewable hydrogen via aqueous phase/supercritical water/steam gasification of biomass, catalytic conversion of glycerol and sugars into green chemicals, and application of bioenergy in iron and steel making processes. He has authored/edited 3 books on biorefinery, and published 20+ book chapters and 280+ papers in peer-reviewed journals and 170+ conference papers/abstracts and over 90 invited seminars/keynote/plenary lectures worldwide. According to Google Scholar, his work has received 15,000+ total citations with an H-index of 68 to date. With 16 PCT/US/Canadian/Chinese Patents issued/pending and a start-up company (Western Maple Bio Resources Inc.) founded, Dr. Xu has made outstanding contributions to applied science and engineering practice. He was the recipient of the 2011 Syncrude Canada Innovation Award and the 2019 Award in Design and Industrial Practice from Canadian Society of Chemical Engineering. In addition, Dr. Xu is co-Editor-in-Chief of International Journal of Chemical Reactor Engineering (IJCRE).

Title： Title of Presentation： Re-engineering Natural Wood into High Strength Lightweight Bio-composite Material for Structural Application

Abstract： The preparation of wood composites involves long preparation steps and non-renewable matrices while generating lignin waste without high-value utilization. Here, we present a reengineering approach to developing a high-strength and lightweight bio-composite material through fractionating natural wood into highly porous delignified wood (DW) and lignin, synthesis of a lignin-based epoxy resin (LER), followed by composting the DW and the LER. The newly developed wood-based composite has drastically improved properties of hydrophobicity, antioxidation and thermal stability, and more notably extraordinary mechanical properties superior to many metal alloys. Hence the reengineered wood composite developed can be a renewable functional material for structural applications.

Professor Sarani Zakaria

Bio: Prof Zakaria currently is a Professor at the Department of Applied Physics, Faculty of Science and Technology, Universiti Kebangsaan Malaysia (also known as The National University of Malaysia). She was graduated in BSc (Hons) Chemistry from Bishop's University, Quebec, Canada , MSc and PhD in Pulp and Paper Technology from UMIST, Manchester, United Kingdom Prof Zakaria is an expert in utilising bio-resources lignocellulosic materials especially from plant biomass in converting them into various high value-added products. Her research expertise focuses on the area of pulp and paper technology, wood plastic composites, bioresin, cellulose derivatives and regenerated cellulose with the combination of nano functional materials (organic and inorganis materials) for various applications. Prof Zakaria has published her research finding in 223 research articles (>100 Q1) in the international and local journals and more than 150conference proceeding papers, 12 Chapter in book, 6 books. She has filed 19 patents/utility in Malaysia (MyIPO) (14 with MY/Utiliti Number Granted). Prof Zakaria has received various research grants from local and international body as the head project and key researcher. Prof Zakaria has received more than RM12.5 Million research funding as project leader and key researcher from local and international agencies and industries; total of 113 research/mobility projects in which 54 projects as project leader. Prof Zakaria has supervised 57 PhD and 58 MSc postgraduate students and 5 Post Docs. Up to April 2022 her H index reported in Scopus were 36 with 3388 citation. Prof Zakaria was awarded World Top 2% Scientist – Career Long Citation Impact for Year 2022 and Top 2% Citation Impact in 2002, Global the Venus International Women Award 2017 (Distinguish Women in Science) and various prestigious research fellowships such as Tianjin Government for Expert in China to Tiangong University (4 weeks 2019); APEC Women Fellowships (4 months 2016-2017) and Flinders International Research Fellowships (3 weeks 2016) both to Flinders University, Australia; Brain Gain, Academy Science of Malaysia to Universität für Bodenkultur (BOKU), Vienna, Austria (12 months 2009-2010); Canadian Industrial Development Agency (CIDA) to McGill University, Canada (1 month 2003); Association of Commonwealth University (ACU) to Manchester University, United Kingdom (6 months 2002-2003); TEKES-Finland to Jyvaskyla Institute of Science and Technology (JyTOL), Finland (1 month 1997); Japan

Promotion for Science (JSPS) as visiting scientist at Kyoto University, Japan (1 month 1996, 10 months 2003).

Title: Effect of Hybridization of Inorganic/Organic Acid as the Liquefaction Catalyst on the Properties of Liquefied Kenaf Polyols

Abstract: Production of kenaf polyols (KP) via liquefaction process was carried out using polyethylene glycol 400 and glycerol as the liquefying solvent. Optimization of parameters such as temperature, time, and the ratio of catalyst composition was done extensively. The effect of the hybridization of inorganic acid (sulphuric acid) and organic acid (lactic acid) as the liquefaction catalyst on the liquefaction product was studied. The results demonstrated that the lowest amount of residue (10.04%) was obtained at 160 °C with 3:1 (sulphuric acid: lactic acid) ratio of catalyst composition for 90 min. The hydroxyl (OH) number and viscosity of the kenaf polyol were examined. FTIR and NMR analyses revealed that most kenaf cellulose, hemicellulose, and lignin were degraded. XRD analysis was employed to examine the crystallinity index of kenaf residues (KR) at different temperatures, times, and catalyst ratio compositions. The morphology of KR at different temperatures was examined by using SEM analysis. The results showed that a smooth-surface KR was obtained at the optimum temperature (160 °C), indicating most of the cellulose was already decomposed at 160 °C. Hence, the results demonstrated that the KP can be further used for the making of bio-based polyurethane foam.

Keywords: Biomass processing and applications; green product; lignocellulosic biomass; kenaf residues; physical properties; chemical properties;

Professor Ruihong Zhang

Bio: Dr. Ruihong Zhang is a Professor in the Department of Biological and Agricultural Engineering at University of California, Davis (UC Davis) and Fellow of American Society of Agricultural and Biological Engineers. Dr. Zhang has many years of research, teaching and consulting experiences in the fields of bioenergy and biochemical production, waste treatment and environmental quality management and control. She has successfully transferred new technologies from her laboratories to commercial companies and was a co-founder of several start-up companies. She has served as Chief Technology Advisor for CleanWorld. She was recognized as the Phenomenal Faculty by UC Davis, and Engineering Innovator by the UC Davis College of Engineering. Dr. Zhang directed UC Davis Biogas Energy Project, which was sponsored by an alliance between UC Davis and private companies. Dr. Zhang received many awards, including Achievement Award from California Bioresources Alliance and CleanTech Innovator of the Year from Sacramento Regional Technology Alliance (SARTA), Environmental Award from the U.S. Environmental Protection Agency, and Distinguished Career Award from Association of Overseas Chinese Agricultural, Biological and Food Engineers.

Title: Transforming Food and Agricultural Waste into Bioenergy and Bioproducts

Abstract: Converting food and agricultural waste into energy, fertilizer and other valuable products is an effective pathway to reduce the carbon footprint and improve the environmental and economic sustainability of food production and supply systems. UC Davis's high solids anaerobic digestion technology has enabled the co-production of renewable natural gas, biofertilizers, and biochemicals from food and agricultural waste. The new anaerobic digestion technology has been successfully used in commercial food waste to energy projects in the Sacramento region of California. UC Davis Renewable Energy Anaerobic Digestion (READ) facility is used for converting 50 tons of food waste per day into renewable natural gas that is used to power the university campus. This presentation provides a review of the UC Davis READ project for converting food and agricultural waste to biogas energy and biofertilizers. It also provides insight into recent innovative research in the development of other high value bioproducts.

Professor Tao Zhang

Bio: Prof. Tao Zhang received his PhD in 1989 from Dalian Institute of Chemical Physics (DICP), Chinese Academy of Sciences (CAS). After one year in University of Birmingham as a post-doctoral fellow, he joined DICP again in 1990 where he was promoted to a full professor in 1995. He has been the director-general of DICP for 10 years (2007-2017). He is currently the vice president of Chinese Academy of Sciences.
His research interests are mainly focused on single-atom catalysis and catalytic conversion of biomass. He discovered a new process from cellulose to ethylene glycol in 2008 and has just accomplished a pilot demonstration (1000 ton/year) this year in China. Particularly, In 2011， he coined the new concept "Sngle-Atom Catalysis", which is now one of the hot research frontiers in catalysis. He has won many important awards, such as the National Invention Prize, Distinguished Award of CAS, and Excellent Scientist Award of Chinese Catalysis Society. Prof Tao Zhang is the author or co-author of more than 500 peer-reviewed scientific publications and 110 patents. He serves as the Editor-in-Chief of Chinese Journal of Catalysis, Editorial Board Members of Applied Catalysis B, Green Chemistry, ACS Sustainable Chemistry & Engineering，ChemPhysChem and Industrial & Engineering Chemistry Research . He was elected as academician of Chinese Academy of Sciences in 2013, fellow of TWAS in 2018, and international fellow of Canadian Engineering Academy in 2020.
Title: Biomass conversion to ethylene glycol: from fundamental research to industrial application

Abstract： Catalytic conversion of biomass to bulk energy chemicals like ethylene

glycol (EG) is of significant importance to mitigating the reliance on fossil resources and reducing CO2 emissions.1 In this presentation, I will introduce our systematical study in the past decade on the biomass conversion to EG over tungsten-based

bifunctional catalysts, including the discovery of one-pot conversion of cellulose to bio-EG (DLEG process), the catalyst evolution,2-5 reaction mechanism and kinetics, product selectivity modulating,6, 7 Bio-EG applications for PET resin synthesis8. Based on our Bio-EG technology, we have successfully built a 1000 ton/a pilot plant in Henan province in 2022, and high-purity bio-EG has been produced in this plant. Finally, brief comments on the opportunity and challenges of biomass conversion to bio-EG and chemicals will be delivered.

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