



Biochar Workshop @ 15th International Conference on Sustainable Energy Technologies (SET2016)

22 July 2016, 1415-1635, National University of Singapore

This workshop plays two important roles. Firstly, it formalizes the development of a Singapore-based biochar interest group and network that involves a wide range of stakeholders; yet, this network has an international relevance and reach, this serves as a connection platform for local stakeholders with regional and international networks, including the International Biochar Initiative. Secondly, it aims to highlight the kind of challenges faced in developing the knowledge base and applying biochar to the various industry contexts in Singapore. This workshop will include some interesting **talks/ lectures by speakers working in the biochar/ gasification field**. Following the talks, there will be a **round table panel discussion** and a **Q&A session** for audiences to interact with the panel members.

Prof. Chi-Hwa Wang
Chemical & Biomolecular Engineering
National University of Singapore

Prof. Yong Sik Ok
Korea Biochar Research Center
Kangwon National University

Prof. Sibudjing Kawi
Chemical & Biomolecular Engineering
National University of Singapore

Session chairs

Prof. Jiangyong Hu
Civil & Environmental Engineering
National University of Singapore

Dr. Francis Ng
Editor, UTAR Agriculture
Science Journal

Mr. Clive Chong
Bioplas Energy (S) Pte Ltd

Mr. Trevor Richards
Biochar production
and application
consultant

Prof. Harn Wei Kua
Assistant Dean,
School of Design &
Environment, NUS

Prof. Charles Q. Jia
Department of Chemical
Engineering & Applied Chemistry
University of Toronto

Dr. Ee Wen Chai
Chief Scientist
Bioplas Energy (S) Pte Ltd

Dr. Subhadip Ghosh
Centre for Urban Greenery and
Ecology (CUGE) (Research), National
Parks Board, Singapore

Mr. Norman J Wanto
CEO, Nuovo Gasifier Pte Ltd



Led by **Mr. Trevor Richards** (Biochar production and application consultant) and **Associate Professor Harn Wei Kua** (Assistant Dean, School of Design and Environment, National University of Singapore), this workshop aims to bring together an international group of participants to discuss the following topics related to biochar:

- Sustainability challenges related to the production and application of biochar in Singapore and Southeast Asia (that is, challenges faced with respect to the social, economic and environmental aspects of biochar).
- Biochar as a soil enhancement for tropical agriculture and horticulture.
- Biochar in the urban environment (including use in green roofs, bio-swales and bioretention basins).
- The potential for biochar in a post-COP-21 world. Carbon sequestration and carbon accounting methodology of biochar, including the application of life cycle assessment to account of life cycle carbon of biochar.
- Biochar building materials and consumer composites.
- Biochar's role in waste management.
- Haze – from slash-&-burn to slash-&-char? Can biochar play a role in solving this annual crisis?

Other topics of biochar are welcome. If you are interested to contribute to this workshop, please submit your abstract through the online submission system <http://set2016.chbe.nus.edu.sg/papersub.html>.

Session chairs



Mr. Trevor Richards

Biochar production and application consultant

Mr. Trevor Richards is a New Zealand civil engineer and environmental management consultant who has been based in Malaysia since 1996. He has been associated with the development of the nascent biochar industries in South East Asia and NZ since 2009, established the SEA Biochar interest Group (<http://sea-biochar.blogspot.my/>) in the same year. He led a FAO and ADB funded biochar study in Yunnan, China in 2010 and he is now involved in a wide range of biochar production, application and development projects in the Asia-Pacific region. He also supports regional research activities and works closely with the [International Biochar Initiative](#), recently appointed to their newly formed information hub committee.



He is the managing director of Biochar Systems Ltd (NZ), founder of the NZ Biochar Interest Group (www.soilcarbon.org.nz) and a director at Synergy Materials & Biomass Products Sdn Bhd in Malaysia.



Professor Harn Wei KUA

Assistant Dean, School of Design and Environment,
National University of Singapore

Associate Prof Harn Wei Kua is an associate professor with the Department of Building, SDE, NUS. He is the Deputy Head (Research), Assistant Dean (Academic) of SDE, and the leader of the Smart Materials Laboratory of the Department of Building. Graduated from the Massachusetts Institute of Technology with a PhD in sustainable building technology and policy, his research interests are bio-based carbon smart building materials and life cycle sustainable assessment. He is also very active in community service, including implementing household energy conservation measures throughout Singapore.

Other than using biochar as a soil enhancement, works by Associate Professor Harn Wei Kua at the Smart Materials Laboratory at the Department of Building show that the CO₂ air capture capacity of biochar can be employed in the use of it as a building material. That is, during their applications in buildings, these materials are shown to be able to actively adsorb/absorb CO₂ from the surrounding and “lock” the CO₂ in the biochar that can later be recycled as soil enhancer.

Speakers/ Panel members



Professor Yong Sik OK

School of Natural Resources and Environmental Science,
Kangwon National University (KNU)

Director of the Korea Biochar Research Center (KBRC), Korea

Lecture: [SMART biochar technology - A shifting paradigm towards advanced materials and healthcare research](#)

Dr. Yong Sik Ok is a Full Professor at the School of Natural Resources and Environmental Science, Kangwon National University (KNU) and is currently serving as the Director of the Korea Biochar Research Center



(KBRC) in Korea. Prof. Ok is currently the Coordinating Editor for *Environmental Geochemistry and Health*, a Subject Editor for *Journal of Soils and Sediment*, an Associate Editor for *Canadian Journal of Soil Science* and an Editorial Board Member for *Chemical Speciation and Bioavailability*. Additionally, he has served as a Guest Editor for the leading journals including *Bioresource Technology*, *Journal of Hazardous Materials*, *Chemosphere*, *Plant and Soil*, *Journal of Environmental Management*, *Environmental Science and Pollution Research*, *Environmental Geochemistry and Health*, *Geoderma*, *Journal of Soils and Sediments* among others. As a Visiting Professor, Prof. Ok contributes to the Department of Renewable Resources, University of Alberta (Canada), the Faculty of Bioscience Engineering, Ghent University (Belgium) and the Department of Civil and Environmental Engineering, Hong Kong Polytechnic University (Hong Kong). Prof. Ok is also serving as Guest Professor at the University of Wuppertal (Germany) and China Jiliang University (China). Prof. Ok has organized many international conferences including, most recently, CLEAR 2014 (Korea) and Biological Waste 2014 (Hong Kong).



Professor Jianguo HU

Department of Civil & Environmental Engineering
National University of Singapore

Associate Professor Jianguo Hu at Department of Civil and Environmental Engineering, Faculty of Engineering, at the National University of Singapore specializes in the field of water treatment and reclamation. She has more than twenty year research experience on water treatment technology enhancement and water quality control. Her main research interests include emerging contaminants detection and removal, water disinfection and biofilm control, organic compounds characterization and treatability, water quality and health effect, water innovative treatment technology. She is currently invited by National Environmental Agency (NEA) to serve as members of Technical Committee on National Drinking Water Quality Standards and Technical committee on water quality guidelines for aquatic facilities.

A/P Hu is currently Director of the Environmental Program and Director for Center for Water Research, Faculty of Engineering, NUS. She has so far published 200 technical papers in various journals. She is actively involved in professional societies as the secretary of management committee of water reuse specialist group of International Water Association (IWA), management committee member of hazardous materials specialist group of IWA, and the President of Environmental Engineering Society of Singapore (EESS). She is also board member of IUVA. She currently serves as editor, associate editor, editorial board members, issue editors and reviewers for a number of international and regional journals as well as funding agencies. She is the award winner of Prosper.net-Scopus Young Scientist Award (Engineering and Technology category) in 2009. In 2011 she was elected as IWA fellow.



Mr Clive CHONG

Bioplas Energy (S) Pte Ltd

Lecture: [A New Horizon in Gasification](#)

Mr. Clive Chong holds a B.Sc. Degree in Chemistry & Environmental Science and a Post-Graduate Diploma in Building Science. He began his career as a process engineer in Hitachi Chemical, held various senior positions in product & process development, research and development in electrochemical, chemical processing and new energy development. He specializes in advance technology in waste chemical recovery, membrane technology, unconventional new energy and cohesive sediments and organic waste valorization. As the technical director, he designs and builds engineering services for the various processes of the company, one of which is the biomass gasification. His current work focuses on an integrated gasification system - A New Horizon in Gasification for Integrated Waste Valorization for the Production of Animal & Aquaculture Feeds, Organic/Organomineral Fertilizers, Quality Activated Carbons with an Integrated Soil-based Vertical Agriculture And Aqua-farming.



Dr. Ee Wen CHAI

Chief Scientist
Bioplas Energy (S) Pte Ltd

Dr. Ee Wen Chai received her B.Sc. in Forestry Science from Universiti Putra Malaysia in 2011 and obtained her Ph.D. in Wood Science and Technology. She specializes in composting process and technology, wood science and technology, biowaste management and forest production. She was involved in a number of research projects in oil palm waste composting in Universiti Putra Malaysia and represented Malaysia as one of the participants in the GCUA International Summer School organised by Swedish University of Agricultural Sciences. She also underwent research attachment in Warsaw University of Life Science, Poland in 2014. During her Ph.D. study, Ee Wen had involved in organising several international conferences as well as participating in several conferences and seminars in wood science and biowastes management.



Currently she is appointed as a Senior Scientist in Bioplas Energy (Asia Pacific) Group and overlooks the R&D functions of the Group in Sustainability Energy and Environmental Solutions for Organic Agriculture and Integrated agro-farming, aquaculture & animals feeds and single cell production. She is also seconded to Euroline Biofuel Sdn Bhd as the plant manager in responsible in the technology transfer and new process for the organic/organo-minerals fertilizer production in Malaysia.



Mr Norman J Wanto

CEO, Nuovo Gasifier Pte Ltd

Mr. Norman Wanto is a chemical engineering graduate from the National University of Singapore, holding a B.Eng (Hons). While in university, Norman started 2 companies, an apparel company Tee Inkers Pte Ltd, as well as a mobile phone buyback company, Aeon Mobile Pte Ltd, both of which employ a total of 60 full-time employees.

After graduating from NUS in 2015, Norman founded **Nuovo Gasifier** with Ivan Suriady and Felix Ang, providing gasification systems for companies that want to convert their excess biomass waste into electricity. Their solution focuses on specific biomass feeds such as wood chips, palm kernel shells, and empty fruit bunches.



Dr. Subhadip Ghosh

Senior Researcher (Urban Soils)
Centre for Urban Greenery and Ecology (CUGE) (Research),
National Parks Board, Singapore

Dr. Subhadip Ghosh is a Senior Researcher (Urban Soils) with Centre for Urban Greenery and Ecology (CUGE) (Research), National Parks Board, Singapore. He holds his Bachelor of Science in Agriculture with



Honours from Bidhan Chandra Krishi Viswavidyalaya (BCKV), India and Master's in Soil Science from Punjab Agricultural University (PAU), Punjab, India with national scholarship. He completed his Ph.D. from the University of New England, Australia and postdoctoral research with Primary Industries and Innovation Centre, New South Wales (NSW), Australia.

Subhadip has published more than 75 scientific articles. He is an Adjunct Lecturer at the University of New England, NSW, Australia. His major fields of research interests are soil quality, biochar studies, greenhouse gas emission, carbon sequestration and land-use change, environmental soil science and climate change, nutrient dynamics, and management of urban and peri-urban soils.



Professor Charles Q. Jia

Department of Chemical Engineering & Applied Chemistry
University of Toronto

Dr Charles Q. Jia is a Professor and Associate Chair in Department of Chemical Engineering and Applied Chemistry at the University of Toronto in Canada. He taught at Chongqing University in China since 1984 after receiving an M.Eng degree from the same university. He later moved to Canada and obtained a PhD degree from McMaster University in 1994. He was an NSERC postdoctoral fellow for two years, before joining his current department as an Assistant Professor in 1996. His research is concerned with maximizing the value of natural resources and minimizing the impact of industrial operations on the environment, currently focusing on nanoporous carbon materials and applications in sustainable energy and the environment. His Green Technology Lab has trained over 60 Masters, PhD students and postdoctoral researchers who now work in academic, industrial and public sectors around the world. He has authored about 100 research papers, held US and Canadian patents, and consulted for international companies and governments. In 2015, he received the MetSoc Environmental Award, recognizing his significant contributions to the field of environmental science & technology and sustainable development. Dr Jia is an avid cyclist; he enjoys challenges on the road and on the badminton court.

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NUS
National University of
Singapore

WSET
World Society of
Sustainable Energy Technologies



Dr Francis S.P. NG

Editor, *UTAR Agriculture Science Journal*
Consulting Editor, *Journal of Tropical Forest Science*

Lecture: [Biochar in horticulture and carbon sequestration in the humid tropics](#)

Dr Francis S.P. Ng BSc (Tasmania) DPhil (Oxford) – botanist, forester, horticulturist and science editor – has been Deputy Director General of the Forest Research Institute Malaysia (1986 – 1990), Chief of the Forest Research, Education and Training Branch of the Food and Agriculture Organization (FAO) of the United Nations 1991 – 1994) and President of the Malaysian Nature Society in the 1980s.

He is the author/producer of a dozen books including *The Tree Flora of Malaya* documenting the 2830 species of trees of the Malay Peninsula; *Tropical Forest Fruits, Seed, Seedlings and Trees* which is the reference text of the urban tree-planting in Malaysia and Singapore; and *Tropical Horticulture and Gardening* which is a standard reference for gardening in the tropics. He is Editor of the *UTAR Agriculture Science Journal* and Consulting Editor to the *Journal of Tropical Forest Science*.

He pioneered the large-scale use of biochar in the Malaysia in creating the ‘Rainforest in the Mall’ and the rooftop ‘Secret Garden’ at the 1Utama shopping mall in Kuala Lumpur.



Professor Sibudjing KAWI

Department of Chemical & Biomolecular Engineering
National University of Singapore

Associate Professor Sibudjing Kawi is currently with the Department of Chemical and Biomolecular Engineering, National University of Singapore. He received MSc (Chem. Eng.) from Illinois in 1988 and BSc (Chem. Eng) from Texas in 1985. He obtained PhD in Chemical Engineering from Delaware in 1992. For his research, currently he is looking at biomass gasification for clean energy production. He is also interested in studies on next generation catalyst that will provide a knowledge base for novel synthesis techniques and molecular engineering of highly active and selective catalysts, as well as the design and growth of novel inorganic membranes preferred by industries.



Professor Chi-Hwa WANG

Department of Chemical & Biomolecular Engineering
National University of Singapore

Prof Chi-Hwa Wang is a full professor with the Department of Chemical and Biomolecular Engineering, Faculty of Engineering, NUS. His research interests are conversion of biomass waste to clean energy using gasification technology and characterization/reutilization of gasification residues such as ash and biochar, with the aim of solving energy and environmental sustainability problems. Supported under the E2S2-CREATE program, he and his team has studied gasification or co-gasification of a wide variety of feedstocks (wood waste, sewage sludge, food waste, saw dust, manures, etc.) for syngas/ electricity generation, while the feasibility of gasification derived biochar and ash as fertilizer or soil conditioner has also been explored.