2017 ANNUAL REPORT

Linga Lab@NUS

Department of Chemical and Biomolecular Engineering

NUS National University of Singapore | Engineering

Linga Lab

ABOUT US

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Praveen Linga

Praveen Linga is an associate professor in the Department of Chemical and Biomolecular Engineering at NUS. He is also the co-lead for natural gas research in the centre for energy research & technology (CERT) at the Faculty of Engineering, NUS. He also serves as an associate editor in the journal of natural gas science and engineering.

His research interests are in the areas of clathrate (gas) hydrates, storage and transport of fuels, carbon dioxide capture, storage & utilization (CCS & U), seawater desalination and recovery of energy. His research group at NUS particularly focuses on enhancing the kinetics of hydrate formation for several applications of interest by developing novel reactor designs, experimental methods and techniques. Up to date, he has published more than 75 research articles and delivered more than 50 keynote/invited talks and seminars.

OUR PEOPLE

Dr Jianzhong ZHAO
Visiting Scientist

Dr Baoyong ZHANG
Visiting Scientist

Dr Ponnivalavan BABU
Research Fellow

Dr Asheesh KUMAR
Research Fellow

Dr Hari Prakash VELUSWAMY
Research Fellow

Dr Maninder KHURANA
Research Fellow

Dr Kiran BANDARU
Research Fellow

Dr Zhongjin HE
Research Fellow

Dr Jun Lin TOO
Research Fellow

Dr Tianbiao HE
Research Fellow

Mr Abhishek NAMBIAR
Research Engineer

Mr Zheng Rong CHONG
PhD Student

Mr Junjie ZHENG
PhD Student

Mr Zhenyuan YIN
PhD Student

Mr Gaurav PANDEY
PhD Student

Mdm Ai Peng Teo
Senior Lab Technologist

Mr Jian Siong LEOW
Lab Technologist

Mr Yuta ARAI
Visiting Scholar

What's in

ENERGY STORAGE

Statistics

No. of Publication : 3

No. of Conference Presentation : 6

Solidified Natural Gas (SNG) Technology

SNG technology provides a viable alternative to store natural gas in molecular form by locking them in clathrate cages formed by water. A paradigm shift to move away from sI hydrates is needed to realize the potential of SNG (Solidified Natural Gas) technology for large scale storage systems for natural gas. The presence of a promoter that can enhance both thermodynamic and kinetic performance will enable the development of a low cost, energy efficient SNG technology based on clathrate hydrates for natural gas storage. In comparison with compressed natural gas (CNG) technology, for the same gas storage capacity, it is possible to achieve significant reduction in both Capital (CAPEX) and Operating (OPEX) costs through SNG technology which is a promising aspect of this technology. Added benefits include being the safest mode of NG storage compared to any available conventional modes of NG storage. It is also easy to recover the natural gas and there is practically zero energy loss during the storage and recovery using SNG technology.

Dr Hari Prakash VELUSWAMY
Research Fellow

Specializes in experimental studies on the kinetics, and morphology of gas hydrates

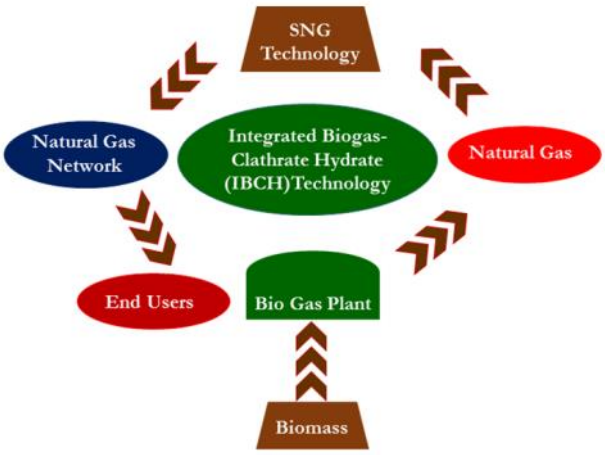
Dr Asheesh KUMAR
Research Fellow

Specializes in high pressure micro-differential scanning calorimeter (DSC) & In-situ Raman Spectroscopy

Dr. Maninder KHURANA
Research Fellow

Specialize in process design & systems integration.

Prof. Praveen Linga and Dr. Asheesh Kumar holding the natural gas hydrate pellet



SNG technology for storing methane generated from Bio gas plant

DESALINATION

Statistics

No. of Publication	: 2
No. of Conference Presentation	: 4
No. of Patent	: 1

HyDesal (Hydrate based Desalination) Process

Hydrate based desalination (HyDesal) process was proposed several decades ago as a potential technology for desalination. Although several progress have been made since then, successful commercialization of this process has not happened. The major challenges that impede the deployment of the HyDesal process are the slow kinetics of hydrate formation, crystal separation from concentrated brine solution and the cold energy required for the process. The team has developed innovative novel prototype designs for HyDesal process and Priority Patent Filing has been completed on 23 February 2017 with Intellectual Property Office of Singapore. The innovative prototype will address the above mentioned challenges of HyDesal process. With the prototype, we have achieved 43% water recovery in 1 hr. The team will be optimizing the operating conditions. The team is also working on process integration of LNG regasification and HyDesal process.

Dr Ponnivalavan BABU
Research Fellow

Specializes in experimental studies on hydrate based gas separation technology for CO_2 capture, desalination and energy recovery

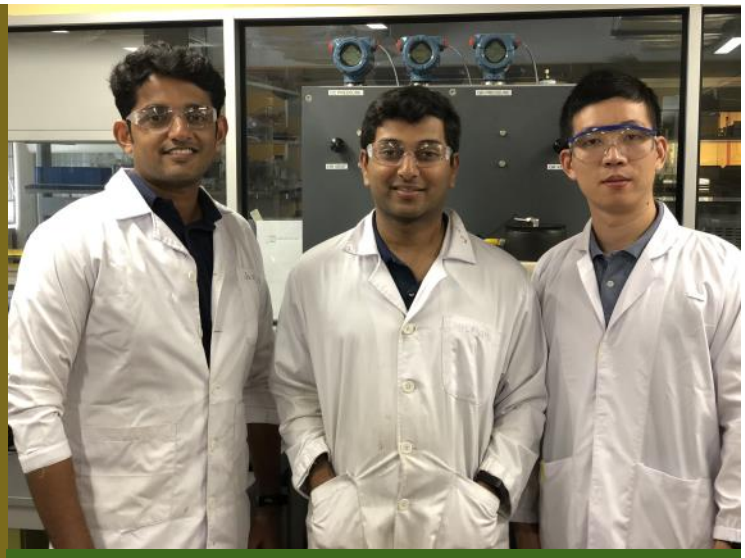
Dr Tianbiao HE
Research Fellow

Specializes in heat exchange network optimization and process integration.

Mr Abhishek NAMBIAR
Research Engineer

Specializes in experimental studies on clathrate hydrate based desalination.

Our Innovative Prototype to demonstrate Hydrate Based Desalination (HyDesal) Process.



HyDesal team in the laboratory. From left: Abhishek Nambiar, Ponnivalavan Babu and Tianbiao He.

ENERGY RECOVERY

Statistics

No. of Publication : 4

No. of Conference Presentation : 10

Recovering natural gas (NG) from hydrate bearing sediments (HBS)

In Linga Lab, we employ a multi-disciplinary approach to investigate the fundamental kinetic behavior during hydrate formation and dissociation in porous media focusing on the fracture-ability of hydrate bearing sediment (HBS), multiphase flow behaviour from HBS during dissociation and numerical simulation. In 1.0L hydrate reactor, natural gas hydrate (NGH) within porous media was formed using excess-water technique and subsequently dissociated it to acquire gas/water production kinetics. Production via thermal stimulation and depressurization have been reported. In numerical modelling, we implemented TOUGH+Hydrate v1.5 to reproduce hydrate dissociation in laboratory-scale condition. It is identified from simulation that hydrate dissociation happens layer by layer and gas accumulates at the upper section of hydrate reactor. Parametric study from simulation also reveals key transport parameters affecting the system, which prompts sophisticated design to recover natural gas from hydrate bearing sediments more effectively and efficiently.

Dr Jun Lin, Too

Research Fellow

*Specializes in **hydraulic fracturing** of hydrate bearing sediment*

Mr Zheng Rong, Chong

Research Associate

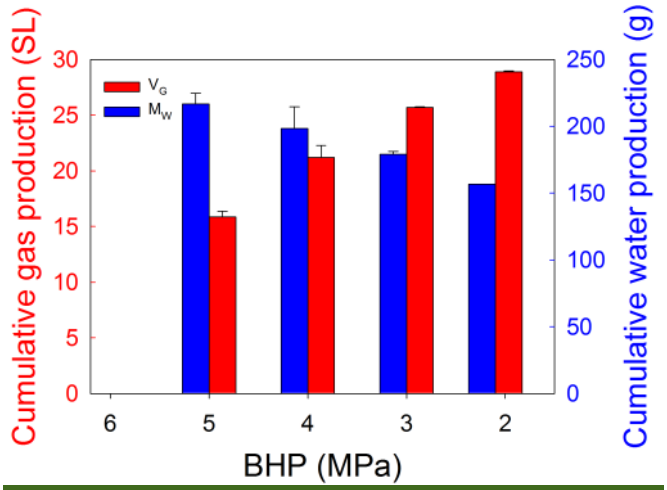
*Specializes in **experimental** studies on the production kinetics of gas/water from HBS*

Mr Zhenyuan, Yin

LR-IPP Ph.D. student

*Specializes in **simulation** of gas/water production behavior from hydrate bearing sediment*

Energy recovery team in the laboratory. From left: Zhenyuan, Dr Zhao Jianzhong (visiting scientist), Regine Moh Jia Wei (our FYP) and Derrick.



Our depressurization study revealed that as the bottom hole pressure decreases, more gas and less water can be recovered from HBS. Read more!

CO_2 CAPTURE

Statistics

No. of Publication : 1

No. of Conference Presentation : 4

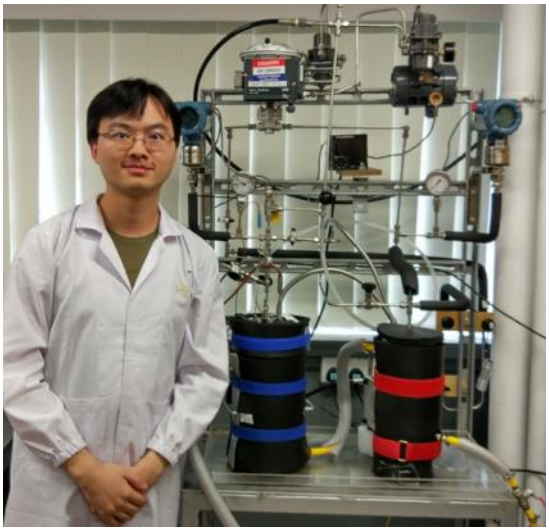
Mr. Junjie ZHENG

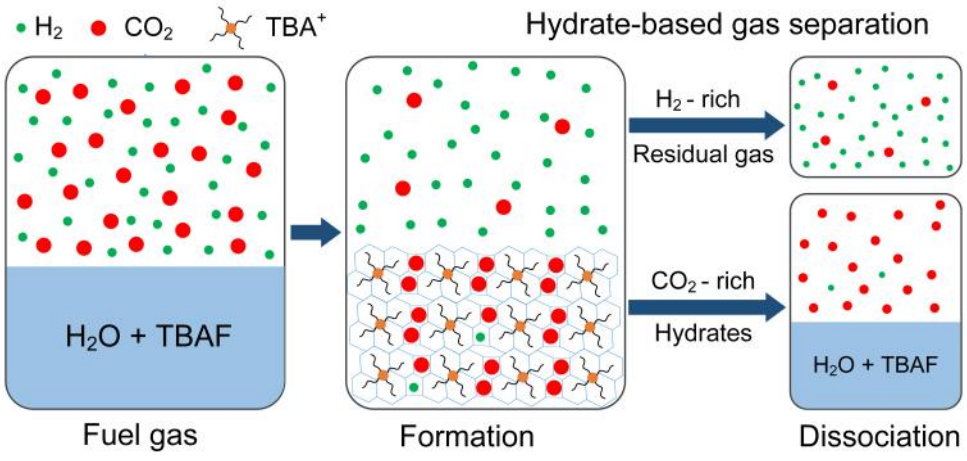
PhD student

Specialize in experimental studies (both thermodynamics and kinetics) on hydrate based gas separation technology for CO_2 capture.

Hydrate based gas separation (HBGS) Technology

CO_2 capture has become an important part in building a sustainable energy system featuring the clean use of fossil fuels with low carbon footprint. Hydrate based gas separation (HBGS) is one of the potential technologies to capture carbon dioxide from pre-combustion and post-combustion streams. In Linga Lab@NUS, we are working towards making HBGS a disruptive technology that has higher kinetics, better separation efficiency, and lower cost. A fixed bed approach has been developed and well-investigated to enhance the kinetics and reduce the energy intensity. We also focus on identifying suitable promoters that can moderate the operating conditions of HBGS process without compromising the kinetics and separation efficiency (CO_2 recovery and separation factor). In addition, various instrumental techniques such as micro-differential scanning calorimetry (μDSC) and Raman spectroscopy are employed to provide valuable insights into the hydrate fundamentals.





A semiclathrate based hydrate process employing TBAF was found to make the HBGS process become feasible at ambient temperature.

Applied Energy (DOI: 10.1016/j.apenergy.2016.10.118)

RECOGNITIONS

2017 has been a fruitful year for us. Our lab members have won numerous awards, a few are highlighted below

Prof. Linga received highly prestigious Donald W. Davidson Award at the 9th International Conference on Gas Hydrates (ICGH9) held in Denver, USA (25 – 30 June 2017). This is a triannual conference that has been in existence since 1993.

The Award is given to a young researcher who has made ground breaking research and significant contributions to the advancement of the gas hydrate field within 10 years of the conferral of the PhD degree, or must be less than 40 years. The award citation reads as “The Davidson Award is a high achievement, given in recognition of your outstanding progress in establishing your research career in natural gas hydrates, and in anticipation of a promising future career”.

Donald W. Davidson Award

Receiving NUS Young Researcher Award (YRA) from NUS President Prof Tan Chor Chuan

Receiving Annual Teaching Excellence Award (ATEA) from NUS Provost Prof Tan Eng Chye

Receiving Engineering Young Researcher Award from Engineering Dean Prof. Chua Kee Chiang

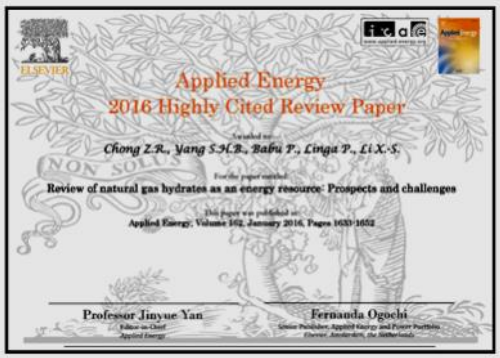
Energies Award

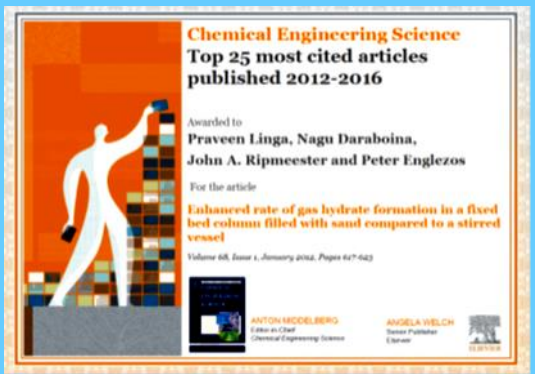
This Award is given in recognition of “ground breaking research and significant contribution to the advancement of the field” within the 10 years of the conferral of the PhD degree. The Award consists of 2,000 CHF (Swiss Francs), an offer to publish a paper free of charge without a fixed deadline in Energies, and an engraved plaque.

Dr. Ponnivalavan Babu received Outstanding PhD Thesis Award during ICGH-2017 Denver USA and AIChE SLS Outstanding Young Researcher Award.

Our FYP, Kulesha won Undergraduate FYP Student Award by AIChE Singapore Local Section (SLS)

Paper Awards





TECHNOLOGY & GRANTS

LNG Cold Energy Utilization to Desalinate Sea water Employing the Hydrate Based Desalination (HBD) Process

Linga Lab@NUS led by Dr. Linga and BG Group have signed a Research Collaboration Agreement (RCA) for developing a hydrate based desalination technology for seawater desalination utilizing LNG cold energy. BG Group will support research activities to the tune of S$120,000 for the duration of three years. BG Group is a world leader in natural gas and a supplier for the first 3 million tonnes per annum of LNG to Singapore.
To know more about BG Group, please visit: http://www.bg-group.com

Dr. Linga has also secured a major research grant to develop a hydrate based desalination technology for producing water from seawater by harvesting LNG cold energy. Energy Market Authority (EMA) has awarded S$27 million in research grants to 13 industry-partnered projects in the areas of Gas Technology and Smart Grids. Read More!

SNG (solidified natural gas) technology for natural gas storage via clathrate hydrates

Linga lab secured a major grant to develop SNG (solidified natural gas) technology for natural gas storage via clathrate hydrates, congrats to the team! Read more on Energy Market Authority (EMA) Media release!

Linga Lab@NUS led by Prof. Linga and Lloyd's Register Global Technology Centre Pte Ltd (LR GTC) have signed a Research Collaboration Agreement (RCA) for developing SNG (solidified natural gas) technology for natural gas storage. LR GTC will support research activities to the tune of S$350,000 for the duration of three years. Read more.

Natural Gas Centre

Centre for Energy Research & Technology (CERT) aims to galvanize a multi-disciplinary university-industry collaborative **Consortium of Excellence on Natural Gas (CENGas)** to innovate technologies for exploiting natural gas both as an energy source and feedstock. It brings together multi-disciplinary strengths in the Faculty of Engineering. The team's mix of expertise ranges from molecular simulation and prototype demonstration to system scale-up and optimization, and its collective strengths are hard-to-match.

Centre for Energy Research & Technology (CERT)

MEDIA REPORT

Associate Professor **Praveen Linga** was interviewed by BBC news on the successful extraction of energy from natural gas hydrates in South China Sea.

For more information, check out the link on BBC News.

ScienceTalk

Eco-friendly ways to harness natural gas efficiently

Praveen Linga

We are halfway through 2017, and electricity tariffs have already increased twice. The price rose by 5.7 per cent for the period of January to March, compared with the last quarter of 2016. It went up another 6.1 per cent for April to June.

The driving force behind the increases is none other than the price of natural gas, a fuel that we import to supply about 95 per cent of our electricity.

Natural gas is the cleanest burning fossil fuel that produces less carbon emission and pollutants than coal or oil, and meets stringent environmental norms. Its prices fluctuate because it is tied to oil prices by commercial contracts, which in turn, depend on global market conditions.

Unlike other cosmopolitan cities, Singapore does not have the luxury of tapping into hydroelectric, nuclear or coal power generation as we do not have such resources. While Singapore gets plenty of sunlight, and has made significant advances in recent years to tap into solar energy to generate power, natural gas is likely to remain the main source of power generation.

Because of its abundance due to the shale gas boom, natural gas can cater to the huge energy demands from industrial, commercial and household users. Natural gas is also abundantly available in nature in the form natural gas hydrates.

Singapore has been importing natural gas from Malaysia and Indonesia through pipelines since the early 1990s for electricity generation and industrial feedstock. From May 2013, the nation also started to import liquefied natural gas (LNG) as a means to diversify and secure its energy sources.

LNG is the product of natural gas which has been condensed into liquid form at close to atmospheric pressure by cooling it to about minus 162 deg C. LNG takes up about 1/600th the volume of natural gas in its gaseous state, making it easy to transport.

To generate electricity, LNG needs to be converted back to natural gas. In Singapore, sea water is at present used to re-gasify LNG by warming it from minus 162 deg C to 20 deg C. During the conversion process, both the cold energy and the sea water are wasted as they are transported back to the ocean.

To put the amount of wastage in context – about 40 tonnes of sea water is needed to convert a tonne of LNG back into gas to be used for power generation. At the same time, one tonne of LNG cold energy can be used for 60 tonnes of refrigeration, which works out to freezing 60,000 litres of water at 0 deg C within 24 hours.

Given the amount of LNG that is converted to meet our electrical needs, there is indeed a lot of potential to develop cost-efficient approaches to harvest the cold energy and use sea water effectively.

At the National University of Singapore (NUS), our research is geared towards generating innovative technologies and solutions with translational impact for a sustainable future.

A part of my work at the Department of Chemical and Biomolecular Engineering and the Centre for Energy Research and Technology, both part of the NUS Faculty of Engineering, looks at ways to overcome challenges in converting and storing natural gas, with the goal of providing sustainable energy resources.

One of the technologies my team is developing is a novel, cost-effective way to store natural gas in a solid form known as solidified natural gas (SNG). It is seen as a promising replacement for LNG. Our work, conducted in collaboration with industry partner Lloyd's Register Global Technology Centre, utilises the cold energy that is removed from LNG to store natural gas in ice-like forms known as clathrate hydrates, commonly referred to as "gas hydrates".

The SNG we produce allows natural gas to be stored using 50 per cent less energy compared with storing it in a compressed form. There is potential to store up to 170 times more gas per unit volume in SNG form, compared with keeping natural gas in its gaseous form at atmospheric pressure and at moderate temperatures.

This method allows for SNG to be stored more easily in an extremely safe and non-explosive manner. SNG can be used as a backup fuel in the event of a natural gas supply disruption.

Another translational research project that my team champions is a technology to resolve the energy-water nexus, the two resources that are critical for Singapore. Working with industry partner Royal Dutch Shell, we have developed a prototype to produce purified water from sea water by harvesting the high quality cold energy produced by LNG re-gasification.

Our technology does not compete with the established reverse-osmosis process that Singapore now uses for producing potable water by desalinating sea water. Instead, we complement it by producing additional potable water. This can also provide Singapore with new business opportunities in the field of new desalination technologies and salt production.

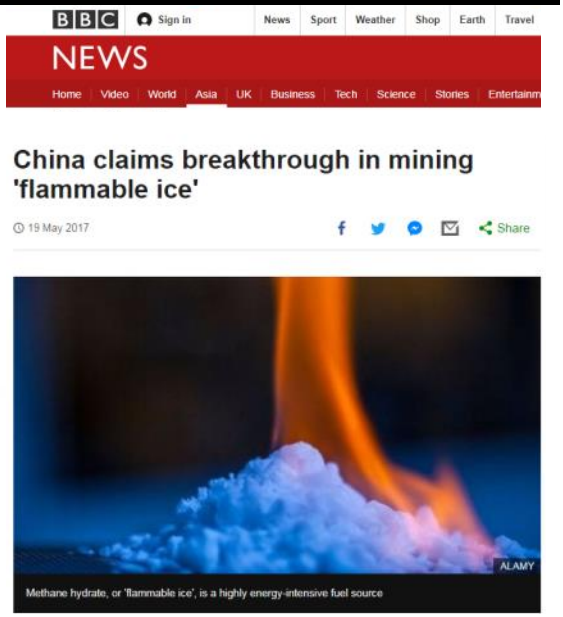
About the writer

Prof Praveen Linga was given the Young Researcher Award in April.

Associate Professor Praveen Linga, 38, is from the Department of Chemical and Biomolecular Engineering. He is also the co-lead for natural gas research at the Centre for Energy Research and Technology. Both are part of the National University of Singapore's Faculty of Engineering.

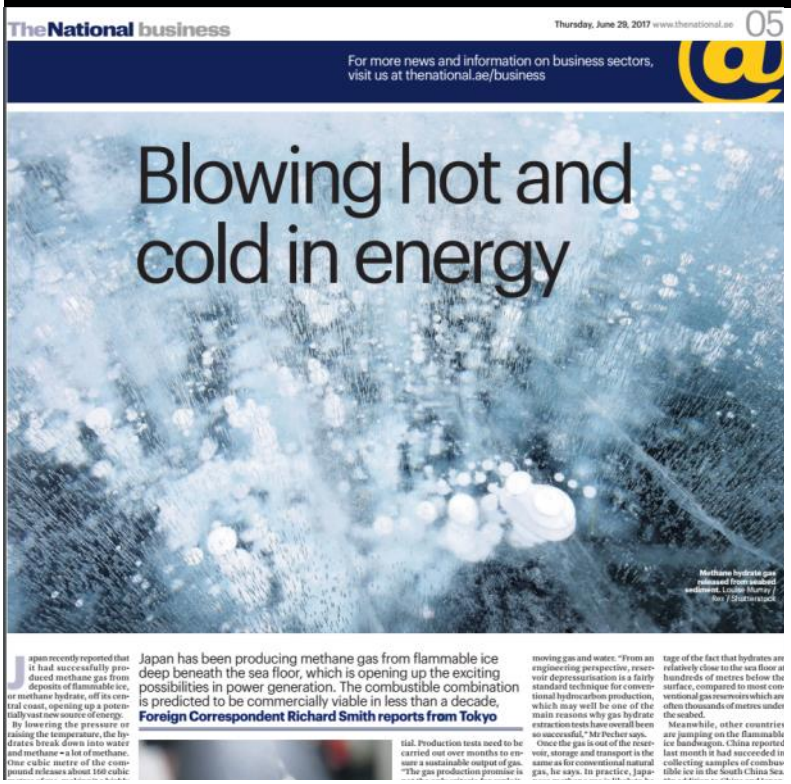
His research interests are in the areas of gas hydrates, storage and transport of fuels, carbon dioxide capture, storage and utilisation, sea water desalination and recovery of energy.

In April, Prof Linga was conferred the Young Researcher Award by NUS at its annual University Awards.



Our projects on energy storage as SNG and desalination was featured in an opinion article on The Straits Times.

Read more about this article.



TheNational business

Thursday, June 28, 2017 www.thenational.ae 05

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Blowing hot and cold in energy

Methane hydrate gas released from seabed sediment. Louise Murray / Ken / Shutterstock

Japan recently reported that it had successfully produced methane gas from deposits of flammable ice, or methane hydrate, off its central coast, opening up a potentially vast new source of energy. By lowering the pressure or raising the temperature, the hydrates break down into water and methane – a lot of methane. One cubic metre of the compound releases about 160 cubic

Japan has been producing methane gas from flammable ice deep beneath the sea floor, which is opening up the exciting possibilities in power generation. The combustible combination is predicted to be commercially viable in less than a decade,

Foreign Correspondent Richard Smith reports from Tokyo

tial. Production tests need to be carried out over months to ensure a sustainable output of gas. "The gas production promise is

mowing gas and water. "From an engineering perspective, reservoir depressurisation is a fairly standard technique for conventional hydrocarbon production, which may well be one of the main reasons why gas hydrate extraction tests have overall been so successful," Mr Pecher says.

Once the gas is out of the reservoir, storage and transport is the same as for conventional natural gas, he says. In practice, Japa-

tage of the fact that hydrates are relatively close to the sea floor at hundreds of metres below the surface, compared to most conventional gas reservoirs which are often thousands of metres under the seabed.

Meanwhile, other countries are jumping on the flammable ice bandwagon. China reported last month it had succeeded in collecting samples of combustible ice in the South China Sea

Prof Linga was interviewed by The National Business for his expert opinion on the extraction of natural gas from hydrates in Japan. Read more on about this interview on The National.

THE WORLD WEEKLY

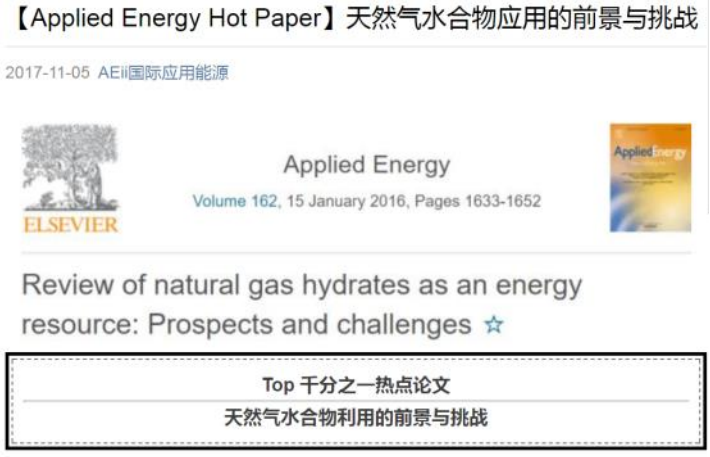
Is flammable ice the fuel of the future?

Energy of the Future

Flammable ice buried under sheets of permafrost around the world is more than just a chemical curiosity. These ice crystals, officially known as methane hydrates, contain huge quantities of methane, making them a rich source of natural gas, and have been pegged as the world's last great source of carbon-based fuel. A method to efficiently tap methane hydrate reserves has so far proven elusive, but China claims to have made a breakthrough this week.

The World Weekly interviewed Prof Linga for his expert opinion on the success of Chinese field test.

Read more on The World Weekly.



【Applied Energy Hot Paper】天然气水合物应用的前景与挑战

2017-11-05 AEii国际应用能源

ELSEVIER

Applied Energy

Volume 162, 15 January 2016, Pages 1633-1652

Review of natural gas hydrates as an energy resource: Prospects and challenges ☆

Top 千分之一热点论文

天然气水合物利用的前景与挑战

Our publication (Applied Energy *162*, 1633—52) was highlighted in China. It is a hot paper in Essential Science Indicators of Clarivate Analytics representing the top 0.1% in the field of Engineering worldwide published in the last two years. Read more!

NUS | Engineering

National University of Singapore

EXPLORE DISCOVER APPLY FUND RESEARCH

Home / Awards / NUS Engineering researchers win two top awards at the 9th International Conference on Gas Hydrates

NUS Engineering researchers win two top awards at the 9th International Conference on Gas Hydrates

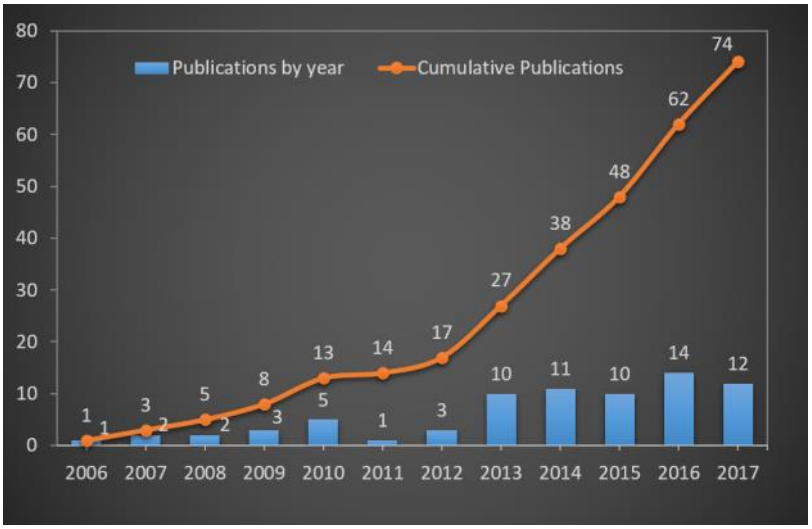
Some of our awards in 2017 (e.g. Donald W. Davidson Award, inaugural outstanding PhD thesis award, Energies Young Investigator Award, 2016 Applied Energy Award) were featured in NUS Engineering Newsfeed.

PUBLICATIONS

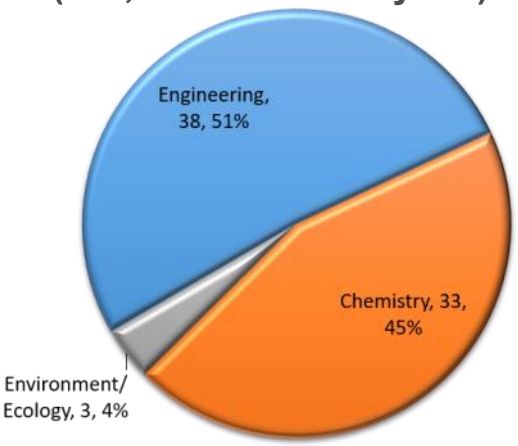
1. Semiclathrate hydrate process for pre-combustion capture of CO_2 at near ambient temperatures. Zheng, J.; Zhang, P.; Linga, P. *Applied Energy* 2017, 194, 267-278. [DOI: 10.1016/j.apenergy.2016.10.118]. (Invited submission for a special issue for SET2016 conference; **Highly Cited Paper**).
2. Advances in nuclear magnetic resonance (NMR) techniques for the investigation of clathrate hydrates. Yang, M.; Chong, Z. R.; Zheng, J.; Song, Y.; Linga, P. *Renewable and Sustainable Energy Reviews* (2017), 74, 1346-1360. [DOI: 10.1016/j.rser.2016.11.161] .
3. A review of reactor designs and materials employed for increasing the rate of gas hydrate formation. Linga, P.; Clarke, M. A. *Energy and Fuels* 2017, 31 (1), 1-13. [DOI: 10.1021/acs.energyfuels.6b02304]. (**Highly Cited Paper**).
4. An innovative approach to enhance methane hydrate formation kinetics with leucine for energy storage application. Veluswamy, H. P.; Kumar, A.; Kumar, R.; Linga, P. *Applied Energy* 2017, 188, 190-199. [DOI: 10.1016/j.apenergy.2016.12.002].
5. High pressure rheology of natural gas hydrate formed from multiphase systems using modified couette rheometer. Pandey, G.; Linga, P.; Sangwai, J. *Review of Scientific Instruments* 2017, 88 (2), 025102. [DOI: 10.1063/1.4974750].
6. Effect of KCl and MgCl2 on the kinetics of methane hydrate formation and dissociation in sandy sediments. Chong, Z. R.; Koh, J. W.; Linga, P. *Energy* 2017, 137, 518-529. [DOI: 10.1016/j.energy.2017.01.154]. (Invited submission for a special issue for SET2016 conference).
7. Experimental investigations on energy recovery from water-saturated hydrate bearing sediments via depressurization approach. Chong, Z. R.; Yin, Z.; Tan, J. H. C.; Linga, P. *Applied Energy* 2017, 204, 1513-1525. [DOI: 10.1016/j.apenergy.2017.04.031]. (Invited submission for ICAE2016 conference) .
8. What are the key factors governing the nucleation of CO2 hydrate?. He, Z.; Linga, P.; Jiang, J. *Physical Chemistry Chemical Physics* 2017, 19, 15657-15661. [DOI: 10.1039/C7CP01350G].
9. Effect of bio-friendly amino acids on the kinetics of methane hydrate formation and dissociation. Veluswamy, H. P.; Lee, P. Y.; Premesinghe, K.; Linga, P. *Industrial and Engineering Chemistry Research* 2017, 56 (21), 6145-6154. [DOI: 10.1021/acs.iecr.7b00427]. (Invited submission for a special issue "2017 Class of Influential Researchers").
10. Effect of guest gas on the mixed tetrahydrofuran hydrate kinetics in a quiescent system. Veluswamy, H. P.; Kumar, A.; Premasinghe, K.; Linga, P. *Applied Energy* 2017, 207, 573-583. [DOI: 10.1016/j.apenergy.2017.06.101]. (Invited submission for a special issue for ICAE2016 conference).
11. CH_4 hydrate formation between silica and graphite surfaces: Insights from microsecond molecular dynamics simulations. He, Z.; Linga, P.; Jiang, J. *Langmuir* 2017, 33 (43), 11956-11967. [DOI: 10.1021/acs.langmuir.7b02711].
12. A review of clathrate hydrate nucleation. Khurana, M.; Yin, Z.; Linga, P. *ACS Sustainable Chemistry & Engineering* 2017, 5 (12), 11176-11203. [DOI: 10.1021/acssuschemeng.7b03238].

IMPACT ANALYSIS

Publication Statistics

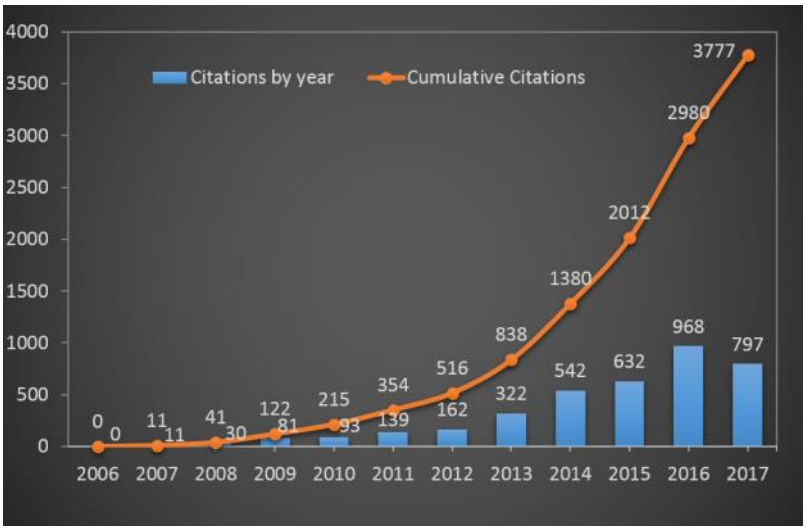


Subject Classification (ESI, Clarivate Analytics)



Citation Statistics

Essential Science Indicators (ESI) Clarivate Analytics	
Highly Cited Papers	12
Hot Papers in 2017	1



	Scopus	Web of Science	Google Scholar
Total Publications (as of 2017)	74	74	74
Total Citations (as of 2017)	2943	2912	3777
Citations per paper	39.77	39.35	51.04
h-index	32	31	33
Field-Weighted Citation Impact (FWCI)*	4.23	-	-

*FWCI in SciVal (Elsevier) indicates how the number of citations received by an entity's publications compares with the average number of citations received by all other similar publications. An FWCI of 1.0 indicates a scientist's impact is about the global average, a value above 1.0 indicates impact is above global average (i.e. FWCI of 2.11 means, 111% above the global average).

VISITORS

A team from Llyod's Register Global Technology Center

Prof. T. Pradeep, IIT Madras

Prof Ming Jer Lee, NTUST Taiwan

Prof. Jean-Michel HERRI, Saint Etienne School of Mines

Prof. Dongliang Zhong, Chongqing University

Royal Dutch Shell team

Prof . Ryo Ohmura, Keio University

Linga Lab hosted the second meeting of UNiLAB HET (Hydrate Energy Technologies)

KEYNOTE/INVITED

World Congress of Chemical Engineering (WCCE10)

Keynote

Barcelona, Spain, October 2, 2017

International Workshop on Gas Hydrates

Keynote

Guangzhou, China, April 10, 2017

The First China-Singapore Frontier Technology Innovation Conference

Invited Talk

Chongqing, China, July 16, 2017

23rd PPC Symposium on Petroleum, Petrochemicals, and Polymers

Invited Talk

Bangkok, Thailand, May 23, 2017

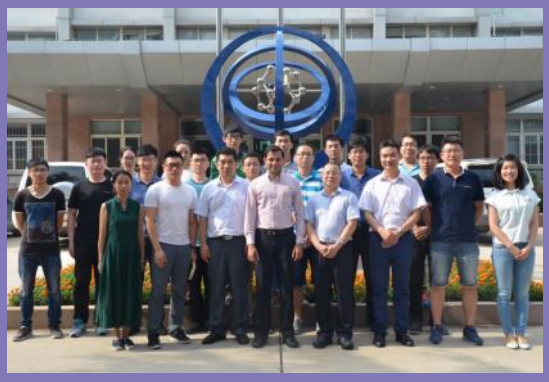
KEYNOTE/INVITED

International Conference on Sustainable Development for Energy and Environment (ICSDEE2017) Pune, India, January 17, 2017

Invited Seminar
College of Petroleum and Geosciences, King Fahd University of Petroleum and Minerals (KFUPM)
Saudi Arabia, September 20, 2017

Invited Seminar
Department of Mechanical Engineering, Shanghai Jiao Tong University, China, July 21, 2017

Invited Seminar
Clean Combustion Research Center, King Abdullah University of Science and Technology (KAUST)
Saudi Arabia
September 18 , 2017



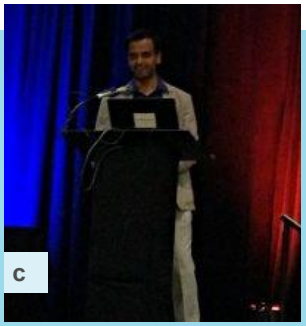
Invited Seminar
Key Lab of Gas Hydrate, Qingdao Institute of Marine Geology, China
July 19, 2017

Invited Seminar
Department of Power Engineering and State Key Lab of Coal Mine Disaster Dynamics and Control
Chongqing University, China
July 17, 2017

CONFERENCES


a


b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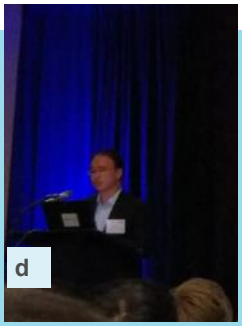

d

9th International Conference on Gas Hydrates

In June 2017, Linga Lab team presented our research in ICGH9 held in Denver, Colorado and interacted with hydrate groups around the world. In the conference, our team presented 13 posters and delivered 4 oral presentation (delivered bv Dr Too [a], Dr Kumar [b], Dr Veluswamy [c] and Dr He [d]). NUS was among the top 5 contributing institutes for ICGH9 conference. During the conference banquet [e], Prof Linga was awarded with Donald W. Davidson Award [Pg9]. Dr Babu was conferred the best thesis award [f, Pg10]. In addition, Singapore won the bid to host ICGH10 in 2020. See you in Singapore!


e


f

WES-CUE 2017

In July 2017, our team presented our research activities on gas hydrates in World Engineers Summit—Applied Energy Symposium & Forum and interacted with various researcher on the future towards low carbon cities. [a] From left: Dr Zhao, Junjie, Zhenyuan, Prof Lee Jim Yang (NUS), Gaurav and Derrick. During the conference, Derrick [b], Zhenyuan, Gaurav [c] and Junjie [d] presented their research on energy recovery from hydrates, energy storage and CO_2 capture respectively.

a


b


c


d

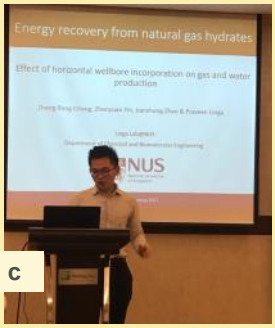
PRESENTATIONS

Petroleum Meeting 2017

In November 2017, Zhenyuan [a] and Derrick [c] presented their research on energy recovery from natural gas hydrates in International Conference on Petroleum Meeting.


a

b



c

6th International Conference on Advances in Energy Research

In December 2017, Dr Asheesh [a] and Abhishek [b] presented their research on energy storage and hydrate based desalination during the 6th International Conference on Advances in Energy Research hosted by IIT Bombay.

a

b

AGU Fall Meeting

In December Zhenyuan presented a poster in AGU Fall Meeting 2017 in New Orleans, Louisiana.

IMHRD 2017

In December, Zhenyuan delivered an oral presentation in IMHRD held by Texas A&M University

GRADUATIONS

Our FYPs Lim Wen Jun, Wong Wen Qiang, Sharanya Sharma Vedula and their mentors Dr. Ponnivalavan Babu, Abhishek Nambiar, Jun Jie Zheng and Dr. Asheesh Kumar with Prof Praveen Linga

Our FYPs Rudi Chan, Dhwani Jain, Krittika Bhatnagar and their mentors Dr. Derrick , Jun Jie Zheng and Dr. Hari Prakash Veluswamy with Prof Praveen Linga .

Our FYP Kulesha Premasinghe with Prof Praveen Linga and her mentor Dr. Hari Prakash Veluswamy

Our FYP Jun Wee Koh & his family with his mentor Dr. Derrick and Prof Praveen Linga.

Our FYP Jia Wee Low with his mentor Dr Hari Prakash Veluswamy, and Prof Praveen Linga.

SERVICES

Editorial Services

- **Associate Editor**

  Journal of Natural Gas Science and Engineering, March 2015 – Present

- **Editorial Board Member**

  Journal of Natural Gas Industry B, July 2017 – Present

Professional Services

- Coordinator for “Gas Hydrates” joint workshop, 10th World Congress of Chemical Engineering, WCCE10 – 2017, 1 – 5 October, Barcelona, Spain
- Session Chair/Co-Chair, 9th International Conference on Gas Hydrates, ICGH9, Denver, June 24-30, USA 2017
- Scientific Committee Member, 3rd International Conference on Fluid Flow, Heat and Mass Transfer, FFHMT – 2017, Ottawa, Canada
- Secretary and Webmaster, AIChE Singapore Local Section, 2014 – Present

Linga Lab Team with our collaborators and friends after ICGH9 banquet dinner.

ACKNOWLEDGMENT

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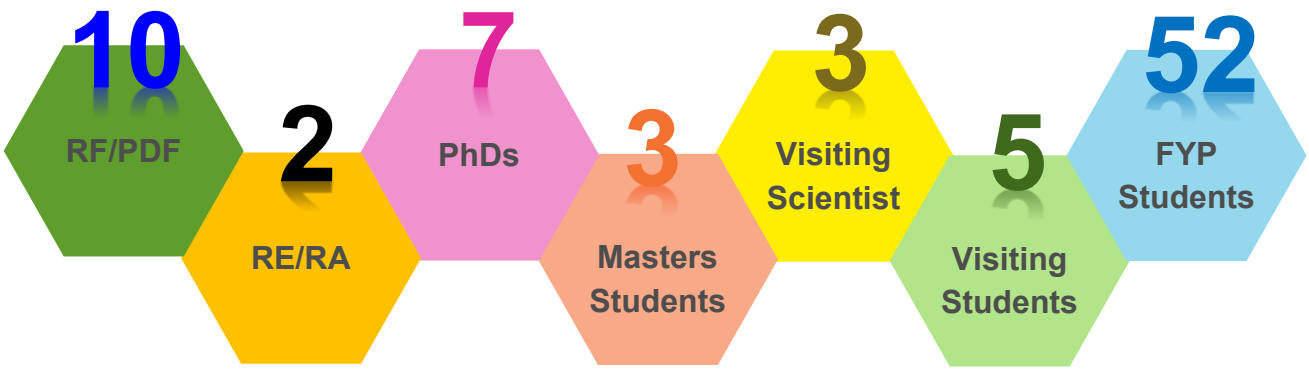
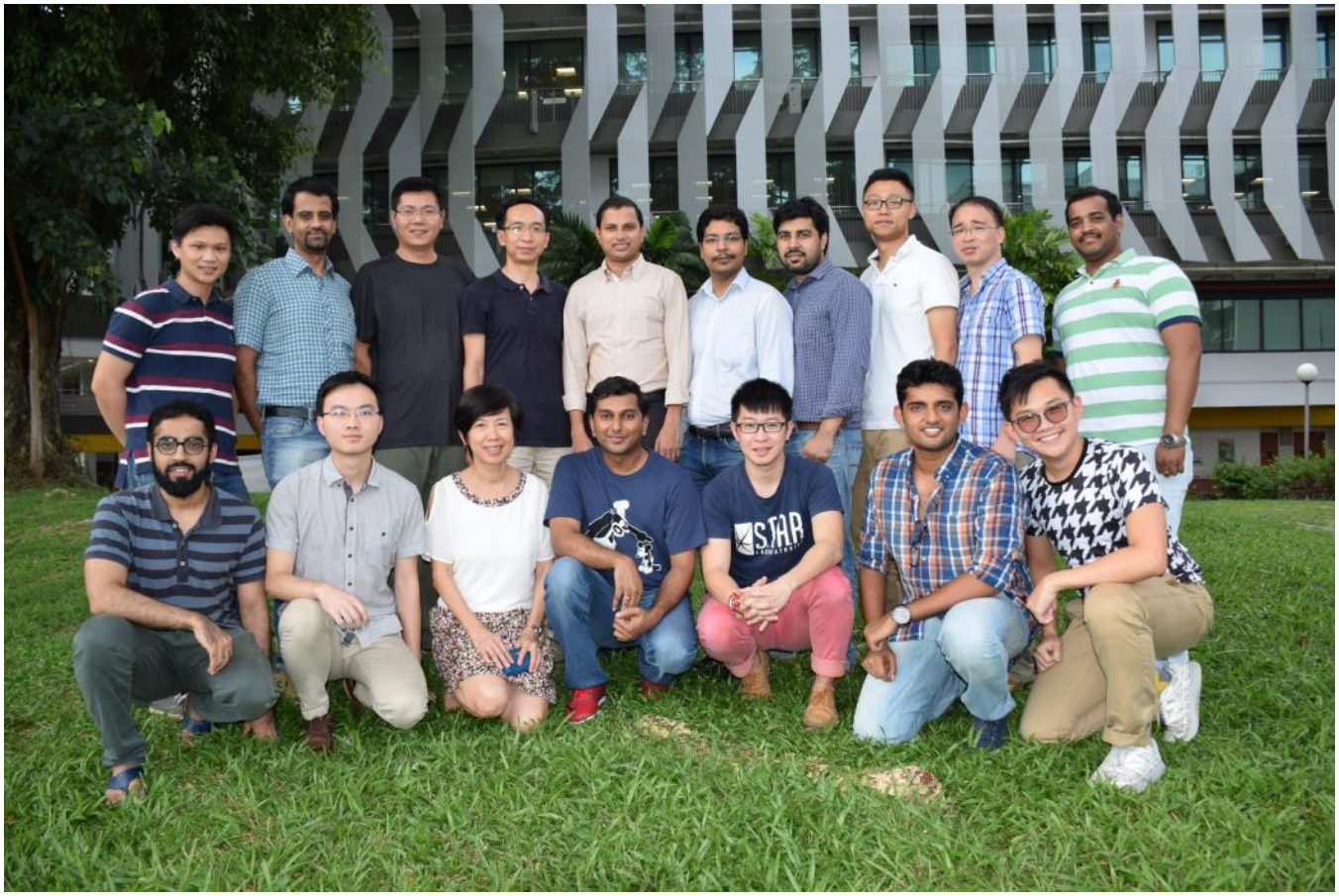
UBC The University of British Columbia
Seoul National University
Shanghai Jiao Tong University
Chulalongkorn University จุฬาลงกรณ์มหาวิทยาลัย
KITECH

Our Family





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