TIANBIAO HE

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PERSONAL INFORMATION

- Nationality: China
- Date of Birth: March 11, 1989
- Gender: Male
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WORK EXPERIENCE

- **Post-doctoral Research Fellow (May 2017 - Present)**

  Department of Chemical and Biomolecular Engineering, **National University of Singapore**, Singapore

EDUCATION

- **Ph.D. in Refrigeration and Cryogenics Engineering (September 2011 – April 2017)**

  School of Mechanical Engieering, **Shanghai Jiao Tong University**, Shanghai, China
  Supervisor: Prof. Yonglin Ju
- **Bachelor of Engineering in Thermal and Power Engineering (September 2007 – June 2011)**

  School of Resource and Environment**, East China University of Science and Technology,** Shanghai, China
  Supervisor: Prof. Yifei Wang

RESEARCH AREA

- Energy system design and optimization, Liquefied natural gas (LNG) technology, Gas hydrate technology, Desalination

RESEARCH EXPERIENCE

5/2017 ~ Present ***Energy minimization at the Singapore LNG regasification terminal***

- First principle modelling LNG tank with multi-components and two phase
- Compiling detail design specification and operational data.
- Developing comprehensive model cover the operational window.
- Achieving state objectives by applying optimization methodology.

7/2017 ~ Present ***LNG Cold Energy Utilization to Desalinate Seawater Employing the Hydrate Based Desalination (HBD) Process***

- Optimize guest gas composition, porous media properties and operating conditions to maximize the separation efficiency (salt removal, water recovery) for the HBD process.
- Design, build and test a prototype of HBD process for sea water desalination utilizing LNG cold energy.
- Minimize the energy requirement of the HBD process by optimizing heat exchanger networks and by process and systems integration.

9/2011 ~ 3/2017 Process Optimization and Experimental Study of Cold Box on Small-Scale Liquefied Natural Gas Plant with Skid-Mounted Packages (ph.D. thesis, Supervisor: Prof Yonglin Ju)

- R&D on small-scale LNG systems in skid-mounted packages to liquefy and recover coal-bed methane for saving energy, decreasing GWP and preventing mine hazard.
- Designed and simulated (by ASPEN-HYSYS) a single mixed refrigerant liquefaction process and a parallel nitrogen expansion liquefaction process for small-scale skid-mounted packages LNG plant with liquefaction capacity of 50000 Nm3/d.
- Optimized two processes by adopting genetic algorithm to obtain the maximum Figure of Merit (FOM) and the minimum energy consumption.
- Built dynamic simulation model of the single mixed refrigerant liquefaction process and investigated the dynamic behaviors of the process.
- Designed the control structure for the single mixed refrigerant liquefaction process.
- Building an experimental system of novel cold box with BPHEs to investigate CO_2 frozen phenomenon with different CO_2 concentrations in CH_4/CO_2 mixture gas at 3MPa.

9/2011 ~ 6/2012 Study of Floating Production Storage and Offloading (FPSO) for Offshore Oil Field Associated Gas

- Designed adsorption system for LNG-FPSO to remove CO_2 from natural gas. The adsorption system could reduce the size of purification system on LNG-FPSO.
- Designed and constructed an adsorption/desorption experimental apparatus to examine the performance and adsorption capacities of three typical 13X-type molecular sieves, 13-XP, 13X-HP and APG-II.
- The adsorption capacities with different CO_2 concentrations of natural gas and different natural gas pressures were obtained and analyzed. The experimental results indicated that if CO_2 concentration was lower than 2%, the molecular sieves could remove most of CO_2 and the natural gas could reach the purification requirement before entering the cold box.

10/2014 ~ 4/2017 Design a Novel Cold Box with Plate Heat Exchanger for Small-scale LNG Plant (Sponsored by SWEP)

- Proposed and designed a prototype of novel cold box with plate heat exchanger in order to replace the traditional cold box with plate-fin heat exchanger. The main advantage of the novel cold box is high CO2 tolerance in natural gas.
- Studied on the CO_2 frozen phenomenon with different CO_2 concentrations in CH_4/CO_2 mixture gas at 3MPa.
- Designed a Solid-Liquid Separator to separate solid CO_2 in LNG. Different separation temperatures were obtained with different CO_2 concentration.

HONORS AND AWARDS

- ***2017，Xia Anshi – Heatcraft Award, (Only three Phd students won this award in China),*** Xia Anshi Eduation Foundation

- ***2017, Google Scholar Citations Index***: 127, h-index: 7, i10-index: 6
- ***2017, Shanghai Outstanding Graduate,*** Shanghai Jiao Tong University
- ***2016, Zhaozhumulan Third-Class Scholarship for ph.D.***, Shanghai Jiao Tong University
- ***2015, Zhaozhumulan First-Class Scholarship for ph.D.***, Shanghai Jiao Tong University
- ***2014, National Scholarship for ph.D.***, The Ministry of Education, China
- ***2014, Outstanding Student***, Shanghai Jiao Tong University
- ***2013, Tang Youshuqi Scholarship,*** Shanghai Jiao Tong University
- ***2011, Shanghai Outstanding Graduate***, East China University of Science and Technology
- ***2010, National Scholarship***, The Ministry of Education, China
- ***2009, National Inspiration Scholarship,*** East China University of Science and Technology
- ***2009, Basf Scholarship***, East China University of Science and Technology
- ***2008, National Inspiration Scholarship,*** East China University of Science and Technology

PUBLICATIONS IN JOURNALS

1. **Tianbiao He**[*], Iftekhar A. Karimi, Yonglin Ju. Review on the Design and Optimization of Natural Gas Liquefaction Processes for Onshore and Offshore Applications. **Chemical Engineering Research and Design**, Accepted.
2. **Tianbiao He**, Yonglin Ju[*]. Dynamic simulation of mixed refrigerant process for small-scale LNG plant in skid mount packages. **Energy**, 2016, 97: 350-358.
3. **Tianbiao He**, Yonglin Ju[*]. Optimal synthesis of expansion liquefaction cycle for distributed-scale LNG plant. **Energy**, 2015, 88: 268-280.
4. **Tianbiao He**, Yonglin Ju[*]. Design and optimization of a novel mixed refrigerant cycle integrated with NGL recovery process for small-scale LNG plant. **Industrial & Engineering Chemistry Research**, 2014, 53 (13), 5545–5553.
5. **Tianbiao He**, Yonglin Ju[*]. A novel conceptual design of parallel nitrogen expansion liquefaction process for small-scale LNG (liquefied natural gas) plant in skid-mount packages. **Energy**. 2014, 75: 349-359.
6. **Tianbiao He**, Yonglin Ju[*]. A novel process for small-scale pipeline natural gas liquefaction. **Applied Energy**, 2014, 115: 17–24.
7. **Tianbiao He**, Yonglin Ju[*]. Performance improvement of nitrogen expansion liquefaction process for small-scale LNG plant. **Cryogenics**, 2014, 61(5): 111-119.
8. **Tianbiao He**, Yonglin Ju[*]. Design and optimization of LNG process by utilizing gas pipeline pressure energy. **Applied Thermal Engineering**, 2013, 57(1): 1-6.
9. **Tianbiao He**, Qiuying Li, Yonglin Ju[*]. Adsorption and Desorption Experimental Study of Carbon Dioxide/Methane Mixture Gas on 13X-Type Molecular Sieves. **Journal of Chemical Engineering of Japan,** 2013, 46(12): 811-820.

PUBLICATIONS IN INTERNATIONAL CONFERENCE PROCEEDINGS

1. **Tianbiao He**, Yonglin Ju[*]. Performance improvement of nitrogen expansion liquefaction process for small-scale LNG plant. **The 5th International Conference on Cryogenics and Refrigeration**, Hangzhou, China, April 6-9, 2013.
2. **Tianbiao He**, Yonglin Ju[*]. Dynamic simulation of mixed refrigerant process for small-scale LNG plant. **CEC/ICMC 2015**, Tucson, Arizona, USA, June 28 – July 2, 2015.
3. Yonglin Ju, Jitan Wu, **Tianbiao He**, B. Felgenhauer, P.Z. Cong. Brazed plate heat exchanger (BPHE) for small scale natural gas liquefaction plant application. **14th Cryogenics 2017**, Dresden, Germany, May 15-19, 2017.

PATENTS

1. Yonglin Ju and **Tianbiao He.** The approach for producing LNG by using direct expansion process, Chinese Patent, No. 2013101595503, 2016.
2. Yonglin Ju and **Tianbiao He.** The liquefaction approach for producing LNG by utilizing the pipeline pressure drop, Chinese Patent, No. 201310086863.0, 2015.
3. Yonglin Ju and **Tianbiao He.** The liquefaction approach and system with single mixed refrigerant process for small-scale LNG plant, Chinese Patent, No. 201310082270.7, 2015.
4. Yonglin Ju and **Tianbiao He.** Mixed refrigerant process integrated with NGL recovery system for small-scale LNG plant, Chinese Patent, No. 201410083220.5, 2015.
5. Yonglin Ju and **Tianbiao He.** The liquefaction approach with nitrogen expansion process for small-scale LNG plant, Chinese Patent, No. 201310082291.9, 2014.
6. Yonglin Ju and **Tianbiao He.** The liquefaction approach and system with modularized single mixed refrigerant process based on plate heat exchanger cold box, Chinese Patent, No. CN 105737515 A, 2016.
7. Yonglin Ju and **Tianbiao He.** Liquefaction and purification cold box for small-scale LNG plant, Chinese Patent, No. CN 105890281 A, 2016.