

Jak Tanthana

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CAREER HIGHLIGHTS

- Lead and manage multiple research and development projects in advanced CO₂ capture technologies using solid sorbent, aqueous and non-aqueous solvents.
- Broad experience with research in advanced energy, renewables, power generation system, multiphase gas absorption processes, heterogeneous catalysis, and catalytic chemistry.
- Extensive experience in design and construct experimental rigs, develop PLC logic and I/O signal controls, human machine interface (HMI), and automation for lab-scale, bench-scale experimental systems.
- Hands-on experience with various analytical instruments such as FTIR, DRIFTS, ATR, MS, GC, TGA.

EDUCATION

- PhD. in Chemical Engineering, GPA:3.86, University of Akron, Akron, Ohio, U.S.A./2011 – IN SITU INFRARED AND MASS SPECTROSCOPIC STUDY ON AMINE-IMMOBILIZED SILICA FOR CO₂ CAPTURE: INVESTIGATION OF MECHANISMS AND DEGRADATION
- MS in Chemical Engineering. GPA: 3.84, University of Akron, Akron, Ohio, U.S.A./2008 – STUDY OF AMINE IMPREGNATED ON SILICA SUPPORT FOR CO₂ CAPTURE
- BS in Chemical Engineering, GPA: 3.33, Chulalongkorn University, Bangkok, Thailand/2004

CAREER EXPERIENCE

RTI International, Durham, NC, USA (03/2012 to date: Research Chemical Engineer)

- Lead experimental effort, improve process instrumentations and automated controls more than 15 lab-scale and bench-scale experimental systems along with establish the SOPs, implement safety interlocks, and perform HAZOP analysis prior to system operation. The development and automation on these systems allow highly reliable and consistent operation, resulting in significant increase in operational throughput of sample screening, characterization, and performance evaluation across multiple research programs.
- Lead and manage a \$3.6 million Department of Energy project to reduce the amine emission from the CO₂ capture technology.
- Lead multiple internal R&D projects including potential use of non-aqueous solvent technology for pre-combustion, and syngas applications, electrochemical conversion and utilization of CO₂,
- Lead development efforts on both process design and material for both pre- and post-combustion CO₂ capture technologies for coal-fired power plants and cement production.
- Collaborate with National Science and Technology Development Agency of Thailand for biomass conversion to high value-added products research as well as scale-up production for inorganic catalyst

University of Akron, Akron, OH, USA (08/2006 – 01/2012: Graduate student and Post-Doctorate assistant)

CO₂ capture: Immobilized amine on metal oxide support.

- Utilized in situ IR (Infrared spectroscopy) coupled with MS (mass spectrometer) to (i) evaluate the cause of long term cyclic degradation (ii) investigate the adsorption/desorption mechanism and effect of SO₂ content on CO₂ capture (iii) investigate the effect of acidic and basic species on the CO₂ capture performance (iii) quantify capture capacity over different types of amine-impregnated supports such as beta-zeolite, alumina, activated carbon, Na₂CO₃, and silica.
- Introduced chemical stabilizers to the amine-based sorbents to improve long term thermal cyclic stability by 30% and CO₂ capture capacity in the presence of water.
- Coordinated efforts in establishing the automation system of a CO₂ sorbent adsorption/desorption unit
- Evaluated the feasibility of grafting the solid sorbent on the metal monolith structure via powder and liquid coating techniques on metal surface and characterized the samples by FTIR-ATR technique.

SOFC fabrication: Tape casting

- Developed and established (i) tape casting and casting techniques resulting in 60 % increased yield,(ii) optimal casting recipes, (iii) scale up, quality management and recycle strategies of tapes, (iv) cost analysis of SOFC fabrication (v) casting of over 15 variations of anode-supported, interlayer, electrolyte, and YSZ supported tape.
- Designed and fabricated customized parts and equipments to enhance productivity and reduce process variation on planetary ball mill, roll mill, and casting blade.
- Investigated and identified (i) the effect of ceramic/metal oxide ratio on the castibility of the anode support slip and the cause of cracking/defects/agglomeration and carried out the experiment to verify and resolve the issues for tapes.

Momentive Performance Materials, Rayong, Thailand (11/2005 – 07/2006: Process Engineer: Polymerization unit)

- Carried out and cooperated with (i) Japan and US teams to address product quality issues and (ii) operation teams to introduce new products to production line.
- Improved and optimized processes resulting in reduction of operational cost, improvement of product stability, and product quality by process line modifications, filter installations and establishment of PLC control for emulsion process.
- Recommended alternative suppliers for packaging and raw materials leading to reduction of production cycle time over 10 product grades.
- Standardized recipes and product technology manuals for over 15 low viscosity silicone products.
- Documented product quality control process, safety regulations according to ISO 9001/9002/14001
- Led safety effort in high risk operation management according to GE's Global Star Safety regulations.
- Promoted and led the waste reduction campaign.

Siam Mitsui PTA Co.,Ltd., Rayong, Thailand (11/2004 – 10/2005: Production Engineer: Purification of Terephthalic acid unit)

- Prepared and organized commissioning activities for operation team over new production unit
- Optimized condition in oxidation reactor to reduce product conversion cost by decreasing the loss of acetic acid via evaporation.
- Established plant information management system of new production unit by creating process parameters database for engineering section.
- Daily plant troubleshooting and facilitated and furnished new control building.

Dow Chemical Company, Louisiana, USA (5/2003 - 8/2003: Intern: Poly Ethylene unit)

- Optimized solvent usage in the production of polyethylene.
- Determined economics feasibility of reconditioning the die plate locally.
- Identified the problem and implemented the solution of steam generator in the plant.
- Submitted cost estimation package and work progress to engineering center for intercom system upgrade.

Seagate Technology, Samutprakarn, Thailand (2000: internship)

- Worked in Quality Assurance department for determination of surface smoothness and thickness of the disk using FTIR.

Chemical Engineering Faculty, Chulalongkorn University, Bangkok, Thailand (2000-2004)

- Undergraduate study.

PUBLICATIONS

- Emissions Control Technologies for RTI's NAS for CO₂ Capture Mobley, P. D., Tanthana, J., Cody, L., Lee, J., Barbee, D. D., Gupta, V., Pope, R. H., Chartier, R. T., Thornburg, J. W. & Lail, M. A., Nov 16 2020.
- Aerosol emissions from water-lean solvents for post-combustion CO₂ capture, Vijay Gupta, Paul Mobley, Jak Tanthana, Lucas Cody, David Barbee, Jacob Lee, Roger Pope, Ryan Chartier, Jonathan Thornburg, Marty Lail, International Journal of Greenhouse Gas Control, Volume 106,2021, 103284.
- Investigation of the potential for utilization of sugarcane bagasse lignin for carbon fiber production: Thailand case study, Liengprayoon, S.; Suphamitmongkol, W.; Jantarasunthorn, S.; Rungjang, W.; Sunthornvarabhas, J.; Tanthana, J., SN Applied Sciences 2019, 1 (10), 1156.
- Experimental Study of a Hydrophobic Solvent for Natural Gas Sweetening Based on the Solubility and Selectivity for Light Hydrocarbons (CH₄, C₂H₆) and Acid Gases (CO₂ and H₂S) at 298–353 K, Jak Tanthana, Aravind V. Rayer, Vijay Gupta, Paul D. Mobley, Mustapha Soukri, Jim Zhou, and Marty Lail, Journal of Chemical & Engineering Data Article ASAP, DOI: 10.1021/acs.jced.8b00735
- Absorption rates of carbon dioxide in amines in hydrophilic and hydrophobic solvents Rabindran, A. V. R., Mobley, P., Soukri, M., Gohndrone, T. R., Tanthana, J., Zhou, S. & Lail, M. Apr 3 2018 In : Chemical Engineering Journal.
- Polyamines impregnated on MOF/SiO₂ hybrid materials as novel CO₂ fluidized solid sorbents., Luz Minguez, I., Lail, M. A., Soukri, M. & Tanthana, J., 2017
- CO₂ Capture Using Fluorinated Hydrophobic Solvents, Jak Tanthana, Paul D. Mobley, Aravind V. Rayer, Thomas R. Gohndrone, Mustapha Soukri, Luke J. I. Coleman, and Marty Lail, Industrial & Engineering Chemistry Research 2017 56 (41), 11958-11966, DOI: 10.1021/acs.iecr.7b03088
- Investigation of CO adsorption performance and fluidization behavior of mesoporous silica supported polyethyleneimine, Dang Viet Quang, Mustapha Soukri, Jak Tanthana, Pradeepkumar Sharma, Thomas O. Nelson, Marty Lail, Luke J.I. Coleman, Mohammad R.M. Abu-Zahra, Powder Technology, Volume 301, 2016, Pages 449-462, ISSN 0032-5910
- In-Situ Infrared Study of the Role of PEG in Stabilizing Silica-Supported Amines for CO₂ Capture. Chemical & Sustainability Energy & Materials, J. Tanthana et. al., 3: 957–964. doi: 10.1002/cssc.201000090.
- SiO₂-Supported Tetraethylenepentamine and Polyethylene Glycol for CO₂ Capture, Chuang, S., Tanthana J.. Presented at section 685b at AIChE 2010 Annual Meeting

- In-situ Infrared Study of the Effect of HCl and H₂O on CO₂ Adsorption of Amine-Immobilized Silica, J. Tanthana et. al., North American Catalysis Society (NACS) meeting, 06/2011
- Oxide-supported tetraethylenepentamine for CO₂ capture, J. Tanthana et. al., Environmental Progress & Sustainable Energy (2009), 28(4), 589-598.

PATENTS

- Water control in non-aqueous acid gas recovery systems, Coleman, L. J. I., Lail, M. A., Amato, K. E. & Tanthana, J., Jan 1 2019, U.S. Patent No. 10,166,503, Feb 23 2017
- Water Control in Non-Aqueous Acid Gas Recovery Systems Coleman, L. J. I., Lail, M. A., Amato, K. E. & Tanthana, J., Aug 16 2018, Patent No. 61/939,569
- Gas Storage Modules, Apparatus, Systems, and Methods Utilizing Adsorbent Materials, PCT/US14/27840, 2014
- Water Control in Non-Aqueous Acid Gas Removal System, Provisional Patent, RTI Docket no. 13P090-PROV, 2014

PRESENTATIONS

- Characterizing Amine Aerosol Emissions from Water-Lean Solvent CO₂ Capture Process, Mobley, P. D., Tanthana, J., Chartier, R. T., Barbee, D. D., Pope, Jr., R. H., Zhou, S. J. & Thornburg, J. W., Oct 2019.
- Pilot plant testing using a Non-Aqueous Solvent (NAS), Mejdell, T., Tobiesen, A., Grimstvedt, A., Hjarbo, K., Hovdahl, L., Aronu, U. E., Zhou, S. J., Tanthana, J., Mobley, P. D., Rayer, A. V., Gupta, V., Lesemann, M. & Lail, M. A., Sep 17 2019.
- Emissions mitigation technology for advanced water-lean solvent based CO₂ capture processes, Tanthana, J., Gupta, V. (ed.), Lail, M. A. (ed.), Mobley, P. D. (ed.), Rayer, A. V. (ed.), Thornburg, J. W. (ed.), Chartier, R. T. (ed.) & Soukri, M. (ed.), Aug 26 2019.
- Energy analysis of non-aqueous solvents (NASs) for CO₂ capture Process in AIChE Annual meeting Conference, Rabindran, A. V. R. (Invited speaker), Gupta, V. (Speaker), Mobley, P. D. (Speaker), Tanthana, J. (Speaker), Soukri, M. (Speaker), Lail, M. A. (Speaker), Zhou, S. J. (Speaker), Oct 29 2018
- Pilot testing of a non-aqueous solvent (NAS) CO₂ capture process, Zhou, S. J., Tanthana, J., Mobley, P. D., Rayer, A. V., Gupta, V., Lesemann, M., Lail, M. A., Tobiesen, A., Mejdell, T., Aronu, U. E., Grimstvedt, A., Hjarbo, K. & Hovdahl, K., Oct 23 2018.
- RTI Non-Aqueous Solvent (NAS) Process, Lail, M. A., Zhou, S. J., Tanthana, J., Mobley, P. D., Rabindran, A. V. R., Soukri, M., Gupta, V., Gohndrone, T. R., Mejdell, T., Tobiesen, A., Lauritsen, K., Aronu, U. & Hovdahl, L., Jun 7 2018
- Lab-Scale Development of a Solid Sorbent for CO₂ Capture Process for Coal-Fired Power Plants, Soukri, M. (Speaker), Thompson, S. (Speaker), Luz Minguez, I. (Speaker), Kataria, A. S. (Speaker), Gupta, V. (Speaker), Tanthana, J. (Speaker), Amato, K. E. (Speaker), Lail, M. A. (Speaker), 2018 NETL CO₂ capture technology meeting, Pittsburgh
- Engineering Scale Testing of Transformational Non-Aqueous Solvent-Based CO₂ Capture Process at Technology Centre Mongstad, Zhou, S. J. (Speaker), Mobley, P. D. (Speaker), Tanthana, J. (Speaker), Rabindran, A. V. R. (Speaker), Soukri, M. (Speaker), Gupta, V. (Speaker), Lail, M. A. (Speaker), 2018 NETL CO₂ capture technology meeting, Pittsburgh
- Novel Catalytic Process Technology for Utilization of CO₂ for Ethylene Oxide and Propylene Oxide Production, Lail, M. A., Mobley, P. D., Peters, J. E., Zheng, Q., Gupta, V., Tanthana, J. & Zhou, S. J., Aug 17 2018, 2018 NETL CO₂ capture technology meeting, Pittsburgh
- Emissions Mitigation Technology for Advanced Water-Lean Solvent-Based CO₂ Capture Processes, Jak Tanthana, Paul D. Mobley, Aravind V. Rayer, Vijay Gupta, Jonathan W. Thornburg, Ryan T. Chartier, Marty A. Lail, and S. James Zhou, 2018 NETL CO₂ Capture Technology Project Review Meeting, Omni-William Penn. Hotel, Pittsburgh, 08/13/2018-08/17/2018
- Large Bench-scale Development of a Non-Aqueous Solvent CO₂ Capture Process for Coal-fired Power Plants, Jak Tanthana, S. James Zhou, Paul Mobley, Aravind Rabindran, Mustapha Soukri, Vijay Gupta, and Marty Lail, 2018 NETL CO₂ Capture Technology Project Review Meeting, Omni-William Penn. Hotel, Pittsburgh, 08/13/2018-08/17/2018
- Advanced CO₂ Capture Technology: Current Development, Outlook, and Impact to Thailand's Power and Chemical Industries) at National Science and Technology Development Agency, Bangkok Thailand. Tanthana, J. (Invited Speaker), 2017, June
- CO₂ Catalyst for the Production of Ethylene Oxide, Tanthana, J., (Invited Presenter), Mobley, P. D., Marty, A., Lail, Hlebak, Josh, Akunuri, Nandita, , Gordon Research Conference: Carbon Capture, Utilization and Storage, New Colby Sawyer college, Hampshire, 06/11/17-06/16/17.
- Advanced Solid Sorbents and Process Designs for Post-Combustion CO₂ Capture, Nelson, T. O., Kataria, A. S., Mobley, P. D., Soukri, M., & Tanthana, J. (Invited Speaker). (2016, August). Presented at 2016 NETL CO₂ Capture Technology Project Review Meeting, Pittsburgh, PA.
- Large Bench-scale Development of a CO₂ Capture Technology. Presented at 2016 NETL CO₂ capture technology review, Zhou, S. J., Tanthana, J., Mobley, P. D., Rabindran, A., Soukri, M., Akunuri, S. N., Gohndrone, T. R., Lesemann, M., Lail, M. A., Mejdell, T., Andrew, A., Tobiesen, A., Lauritsen, K., Aronu, U., & Hovdahl, L. (2016, August).
- Bench-Scale Development of a Non-Aqueous Solvent (NAS) CO₂ Capture Process for Coal-Fired Power Plants (DE-FE0013865), Tanthana, J., Soukri, M., Mobley, P. D., Rabindran, A., Gohndrone, T. R., Nelson, T. O., Lesemann, M.,

Zhou, S. J., & Lail, M. A. (2016, August).. Presented at 2016 NETL CO₂ capture technology project review meeting, Pittsburgh, PA.

- Bench-Scale Development of a Non-Aqueous Solvents (NAS) CO₂ Capture Process for Coal-Fired Power Plants, Tanthana, J., Soukri, M., Mobley, P. D., Rabindran, A., Farmer, J. R., Lesemann, M., Lail, M. A., Tamhankar, S., Jovanovic, S., Krishnamurthy, K., Grimstvedt, A., & Johanne Vevelstad, S. (Invited Speaker). (2015, June). Presented at 2015 NETL CO₂ Capture Technology Meeting, Pittsburgh, PA.
- Solid Sorbent CO₂ Capture Technology Evaluation and Demonstration at Norcem's Cement Plant in Brevik, Norway, Tanthana, J., Nelson, T. O., Coleman, L. J., Mobley, P. D., Kataria, A. S., Lesemann, M., & Bjerger, L. (2014), *Energy Procedia*, 63(0), 6504–6516. doi:10.1016/j.egypro.2014.11.686
- Non-Aqueous Solvent (NAS) CO₂ Capture Process, Tanthana, J., Lail, M. A. & Coleman, L. J. (2014), *Energy Procedia*, 63(0), 580–594. doi:10.1016/j.egypro.2014.11.063
- Advanced Solid Sorbents and Process Designs for Post-Combustion CO₂ Capture, Tanthana, J., Nelson, T. O., Coleman, L. J., Farmer, J. R., Kataria, A. S., Lail, M. A., Soukri, M., (Invited Speaker). (2014, July), Presented at 2014 DOE NETL CO₂ Capture Technology Meeting, Pittsburgh, PA.
- Non-Aqueous Solvent CO₂ Capture Process Tanthana, J., Coleman, L. J., Lail, M. A., Amato, K. E., Akunuri, S. N & Lesemann, M.(Invited Speaker). (2013, July), Poster presented at 2013 CO₂ Capture Technology Meeting, Pittsburgh, PA.
- Metal Monolithic Amine-grafted Sorbents for CO₂ Capture, Chemical Engineering Advisory Board Lunch with Students and Talk, University of Akron, 04/2010.

HONORS, AFFILIATIONS, and ACTIVITIES

- Recipient of RTI's Innovation Award at RTI's 8th Innovation showcase, 02/2018.
- Active participants of Gordon Research Conference: Carbon Capture, Utilization, and Storage series
- Recipient of RTI's Professional Development Award (PDA), 03/2014.
- Recipient of Kokes Award North American Catalysis Society (NACS) meeting, 06/2011.