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Research Assistant Professor
Department of Chemical Engineering
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RESEARCH INTERESTS

1. Novel Process Designs (i.e, PSA and TSA) for Gas Separation, Recovery, and Vapor Solvent Recovery
2. Novel Hydride Materials for Hydrogen Storage.
3. Hydrogen Storage Systems.
4. Applications Magnetic Separation Principles

EDUCATION

Ph.D., Chemical Engineering (September 2000)
University of South Carolina, Columbia, SC
GPA 4.0/4.0
B.S., Industrial Engineering with major in Chemical Engineering
Universidad Catolica de Chile, 1995
Average grade: (from 1 to 7): 6.1 (A+)
Rank in class: First out of all engineering disciplines (1/160)

PROFESSIONAL EXPERIENCE

Research Professor, University of South Carolina, Department of Chemical Engineering, Columbia, SC, July 2015 to present.
Research Associate Professor, University of South Carolina, Department of Chemical Engineering, October 2006 to July 2015.
Research Assistant Professor, University of South Carolina, Department of Chemical Engineering, October 2001 to October 2006
Post-doctoral Research Associate, University of South Carolina, Department of Chemical Engineering, October 2000 to October 2001
Internship at Saval's Laboratory –Chile at Inventory Department
January-February 1995
Internship at COPEC-Mobil-Chile at Marketing Department
February 1993

SERVICE ACTIVITIES

American Institute of Chemical Engineers (AIChE)

Vice Chair, Area 2E Separations Division of the AIChE, 11/23 to 11/25.

University of South Carolina

Chair, Professional Track Faculty Committee, Department of Chemical Engineering.

AWARDS

1. Best Poster Award: AIChE 2008 Annual Meeting, Philadelphia, PA, November, 2008 (S. Bhadra, C. H.

Holland, M. A. Nicholson, A. D. Ebner, F. Jegede and J. A. Ritter, "Production of Ammonia with Pressure Swing Adsorption Utilized in Key Separations Steps").

2. Best Poster Award: AIChE 2005 Annual Meeting, Cincinnati, OH, November, 2005 (M. O. Aviles, A. D. Ebner and J. A. Ritter, "In Vitro Studies of Ferromagnetic Coils for Implant Assisted Magnetic Drug Targeting").
3. Best Poster Award: 8th International Conference on Fundamentals of Adsorption FOA8, Sedona, AR, May, 2004 (S. A. Gadre, A. D. Ebner and J. A. Ritter, "Two and Three Dimensional Models for the Design of Metal Hydride Hydrogen Storage Systems").
4. *Gillete Award of Fluid-Particle Separations*, AIChE Annual Meeting, 1999.
5. *Outstanding Graduate Student 1999 in Chemical Engineering,* University of South Carolina, South Carolina,1999.
6. *Best B.S. Chemical Engineering Student of Chile for the year 1996*, Colegio de Ingenieros de Chile (Chilean Association of Chemical Engineers), Santiago, Chile, 1997.
7. Diploma *"Departamento de Ingeniería Química"* as the best B.S. Chemical Engineering Student, Universidad Católica de Chile, Chile, 1997.
8. Maximum Distinction in Chemical Engineering and Engineering Sciences, Universidad Católica de Chile, Chile, 1997.

SOCIETY MEMBERSHIPS

American Institute of Chemical Engineers

REFEREED JOURNAL ARTICLES

1. A. D. Ebner, J. A. Ritter, and H. J. Ploehn, "Feasibility and Limitations of Nanolevel High Gradient Magnetic Separation", *Separation and Purification Technology*, 11, 199-210 (1997).
2. A. D. Ebner, J. A. Ritter and B. N. Popov, "Potentially Enhanced Complexation Model for the Determination of Isopotential Equilibrium Curves," *J. Colloid and Interface Science*, 203(2), 488 (1998).
3. A. D. Ebner, J. A. Ritter, H. J. Ploehn, R. L. Kochen and J. D. Navratil "New Magnetic Field Enhanced Process for the Treatment of Aqueous Wastes," *Sep. Sci. Tech*., 34, 1277- 1300 (1999).
4. A. D. Ebner, J. A. Ritter and L. Nunez, "High Gradient Magnetic Separation for the Treatment of High Level Radioactive Wastes," *Sep. Sci. Tech*., 34, 1333-1350 (1999).
5. J. Shen, A. D. Ebner and J. A. Ritter, "Points of Zero Charge and Intrinsic Equilibrium Constants of Silica-Magnetite Composite Oxides," *J. Colloid and Interface Science*, 214, 333-343 (1999).
6. A. D. Ebner, J. A. Ritter, H. J. Ploehn, "Magnetic Hetero-Flocculation of Paramagnetic Colloidal Particles," *J. Colloid and Interface Science*, 225, 39-46 (2000).
7. A. D. Ebner and J. A. Ritter, "New Correlation for the Capture Cross Section in High Gradient Magnetic Separation," *AIChE Journal*, 47, 303-313 (2001).
8. A. D. Ebner, J. A. Ritter and J. D. Navratil, "Adsorption of Cesium, Strontium and Cobalt Ions on Magnetite and Magnetite-Silica Composite," *Ind. Eng. Chem. Res.*, 40, 1615-1623 (2001).
9. A. M. Puziy, O. I. Poddubnaya, J. A. Ritter, A. D. Ebner and C. E. Holland, "Elucidation of the Ion Binding Mechanism in Heterogeneous Carbon Composite Adsorbents," *Carbon*, 39, 2313-2324 (2001).
10. A. D. Ebner and J. A. Ritter, "Equilibrium Theory Analysis of a Rectifying Pressure Swing Adsorption Process for Producing Pure Heavy Component," *AIChE Journal*, 48, 1679-1691 (2002).
11. A. D. Ebner and J. A. Ritter, Concentrating Dilute Sludge Wastes with High Gradient Magnetic Separation: Breakthrough Experiments and Performance, *Ind. Eng. Chem. Res.*, 41, 5049-5057 (2002).
12. A. D. Ebner, J. A. Ritter, and H. J. Ploehn, "Magnetic Field Orientation and Spatial Effects on the Retention of Paramagnetic Nanoparticles with Magnetite," *Sep. Sci. Tech.*, 37, 3727-3753 (2002).
13. S. A. Gadre, A. D. Ebner, S. A. Al-Muhtaseb and J. A. Ritter, "Practical Modeling of Metal Hydride Hydrogen Storage Systems," *Ind. Eng. Chem. Res.*, 42, 1713-1722 (2003).

14. J. A. Ritter, A. D. Ebner, J. Wang and R. Zidan, "Implementing a Hydrogen Economy," *Materials Today*, September, 18-23 (2003).
15. J. A. Ritter, A. D. Ebner, K. D. Daniel, and K. L. Stewart, "Application of High Gradient Magnetic Separation Principles to Magnetic Drug Targeting," *J. Magnetism and Magnetic Materials*, 280, 184-201 (2004).
16. A. D. Ebner and J. A. Ritter, "Retention of Paramagnetic Particles by Magnetite Particle Clusters with Multifunctional Character," *Sep. Sci. Tech.*, 39, 2785-2808 (2004).
17. A. D. Ebner and J. A. Ritter, "Retention of Iron Oxide Particles by Stainless Steel and Magnetite Magnetic Matrix Elements in High Gradient Magnetic Separation," *Sep. Sci. Tech.*, 39, 2865-2892 (2004).
18. A. D. Ebner and J. A. Ritter, "Equilibrium Theory Analysis of Dual Reflux PSA for Separation of a Binary Mixture," *AIChE Journal*, 50, 2418-2429 (2004).
19. H. Chen, A. D. Ebner, A. J. Rosengart, M. D. Kaminski, and J. A. Ritter "Analysis of Magnetic Drug Carrier Particle Capture by a Magnetizable Intravascular Stent. Part 1: Parametric Study with Single Wire Correlation," *J. Magnetism and Magnetic Materials*, 284, 181-194 (2004).
20. S. P. Reynolds, A. D. Ebner and J. A. Ritter, New Pressure Swing Adsorption Cycles for Carbon Dioxide Sequestration," *Adsorption*, 11, 531-536 (2005).
21. J. Wang, A. D. Ebner and J. A. Ritter, "On the Reversibility of Hydrogen Storage in Novel Complex Hydrides," *Adsorption*, 11, 811-816 (2005).
22. S. A. Gadre, A. D. Ebner and J. A. Ritter, "Two Dimensional Model for the Design of Metal Hydride Hydrogen Storage Systems," *Adsorption*, 11, 871-876 (2005).
23. J. Wang, A. D. Ebner, R. Zidan, and J. A. Ritter, "Synergistic Effects of Co-Dopants on the Dehydrogenation Kinetics of Sodium Aluminum Hydride," *J. Alloys and Compounds*, 391, 245-255 (2005).
24. Z. Jiang, R. A. Dougal, S. Liu, S. A. Gadre, A. D. Ebner and J. A. Ritter, "Simulation of a Thermally-Coupled Metal Hydride Hydrogen Storage and Fuel Cell System," *J. Power Sources*, 142, 92-102 (2005).
25. J. Wang, A. D. Ebner, T. Prozorov, R. Zidan, and J. A. Ritter, "Effect of Graphite on the Dehydrogenation and Hydrogenation Kinetics of Ti-Doped Sodium Aluminum Hydride," *J. Alloys and Compounds*, 395, 252-262 (2005).
26. M. O. Aviles, A. D. Ebner, H. Chen, A. J. Rosengart, M. D. Kaminski, and J. A. Ritter, "Theoretical Analysis of a Transdermal Ferromagnetic Implant for Retention of Magnetic Drug Carrier Particles," *J. Magnetism and Magnetic Materials*, 293, 605-615 (2005).
27. A. J. Rosengart, M. D. Kaminski, H. Chen, P. L. Caviness, A. D. Ebner and J. A. Ritter, "Magnetizable Intraluminal Stent and Functionalized Magnetic Carriers: A Novel Approach for Non-Invasive Yet Targeted Drug Delivery," *J. Magnetism and Magnetic Materials*, 293, 633-638 (2005).
28. H. Chen, A. D. Ebner, A. J. Rosengart, M. D. Kaminski, and J. A. Ritter "Analysis of Magnetic Drug Carrier Particle Capture by a Magnetizable Intravascular Stent. Part 2: Parametric Study with Multi-Wire Two-Dimensional Model," *J. Magnetism and Magnetic Materials*, 293, 616-632 (2005).
29. S. A. Gadre, A. D. Ebner, and J. A. Ritter, "Further Validation of the Quartic Concentration Profile Approximation for Describing Intraparticle Transport in Cyclic Adsorption Systems," *Adsorption*, 11, 295-312 (2005).
30. S. P. Reynolds, A. D. Ebner, and J. A. Ritter, "Novel Enriching PVSA Cycle for the Production of Nitrogen from Air," *Ind. Eng. Chem. Res.*, 45, 3256-3264 (2006).
31. J. Wang, A. D. Ebner and J. A. Ritter, "Physiochemical Pathway for Cyclic Dehydrogenation and Rehydrogenation of $LiAlH_4$," *J. American Chemical Soc.*, 128, 5949-5954 (2006).
32. S. P. Reynolds, A. D. Ebner, and J. A. Ritter, "Stripping PSA Cycles for CO_2 Recovery from Flue Gas at High Temperature Using a Hydrotalcite-Like Adsorbent," *Ind. Eng. Chem. Res.*, 45, 4278-4294 (2006).
33. T. Prozorov, J. Wang, A. D. Ebner and J. A. Ritter, "Sonochemical Doping of Ti-Catalyzed Sodium Aluminum Hydride," *J. Alloys and Compounds*, 419, 162-171 (2006).
34. A. D. Ebner, S. P. Reynolds and J. A. Ritter, "Understanding the Adsorption and Desorption Behavior of CO_2 on a K-Promoted HTlc through Non-Equilibrium Dynamic Isotherms," *Ind. Eng.*

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35. J. Wang, A. D. Ebner, and J. A. Ritter, "Kinetic Behavior of Ti-Doped Sodium Aluminum Hydride when Co-Catalyzed with Carbon Nanostructures," *J. Phys. Chem. B*, 110, 17353-17358 (2006).
36. S. P. Reynolds, A. D. Ebner and J. A. Ritter, "Carbon Dioxide Capture from Flue Gas by PSA at High Temperature using a K-Promoted HTlc: Effects of Mass Transfer on the Process Performance," *Environmental Progress*, 25, 334-342 (2006).
37. M. O. Avilés, A. D. Ebner and J. A. Ritter, "Ferromagnetic Seeding for the Magnetic Targeting of Drugs and Radiation in Capillary Beds," *J. Magnetism and Magnetic Materials*, 310, 131-144 (2007).
38. A. D. Ebner, S. P. Reynolds and J. A. Ritter, "Non-Equilibrium Kinetic Model that Describes the Reversible Adsorption and Desorption Behavior of CO_2 in a K-Promoted HTlc," *Ind. Eng. Chem. Res.*, 46, 1737-1744 (2007).
39. M. O. Avilés, H. Chen, A. D. Ebner, A. J. Rosengart, M. D. Kaminski and J. A. Ritter, "*In Vitro* Study of a Ferromagnetic Stent for Implant Assisted Magnetic Drug Targeting," *J. Magnetism and Magnetic Materials*, 311, 306-311 (2007).
40. J. A. Ritter and A. D. Ebner, "State-of-the-Art Adsorption and Membrane Separation Processes for Hydrogen Production in the Chemical and Petrochemical Industries," *Sep. Sci. Tech*, 42, 1123-1193 (2007).
41. H. Chen, M. D. Kaminski, A. D. Ebner, J. A. Ritter, and A. J. Rosengart, "Theoretical Analysis of a Simple Yet Efficient Portable Magnetic Separator Design for Separation of Magnetic Nano/Micro-Carriers From Human Blood Flow," *J. Magnetism and Magnetic Materials*, 313, 127-134 (2007).
42. J. Wang, A. D. Ebner and J. A. Ritter, "Synthesis of Complex Hydrides for Hydrogen Storage," *J. Physical Chemistry C*, 111, 14917-14924 (2007).
43. H. Chen, A. D. Ebner, D. Bockenfeld, J. A. Ritter, M. D. Kaminski, X. Liu, D. Rempfer, and A. J. Rosengart, "A Comprehensive *In Vitro* Investigation of a Portable Magnetic Separator Device for Human Blood Detoxification," *Physics in Medicine and Biology*, 52, 6053-6072 (2007).
44. T. Wang, J. Wang, A. D. Ebner and J. A. Ritter, "Reversible Hydrogen Storage Properties of $NaAlH_4$ Catalyzed with Scandium," *J. Alloys and Compounds*, 459, 293-300 (2008).
45. S. P. Reynolds, A. Mehrotra, A. D. Ebner and J. A. Ritter, "Heavy Reflux PSA Cycles for CO_2 Recovery from Flue Gas. Part I. Performance Evaluation," *Adsorption*, 14 399-413 (2008).
46. H. Chen, A. D. Ebner, J. A. Ritter, M. D. Kaminski and A. J. Rosengart, "Theoretical Analysis of a Magnetic Separator Device for *Ex-Vivo* Blood Detoxification," *Separation Science and Technology*, 43, 996-2010 (2008).
47. M. O. Avilés, J. O. Mangual, A. D. Ebner, and J. A. Ritter, "Isolated Swine Heart Ventricle Perfusion Model for Implant Assisted-Magnetic Drug Targeting," *International Journal of Pharmaceutics*, 361, 202-208 (2008).
48. M. O. Avilés, A. D. Ebner, and J. A. Ritter, "*In Vitro* Study of Magnetic Particle Seeding for Implant Assisted-Magnetic Drug Targeting," *J. Magnetism and Magnetic Materials*, 320, 2640-2646 (2008).
49. M. O. Avilés, A. D. Ebner, and J. A. Ritter, "Implant Assisted-Magnetic Drug Targeting-Comparison of *In Vitro* Experiments with Theory," *Journal of Magnetism and Magnetic Materials*, 320, 2704-2713 (2008).
50. A. D. Ebner and J. A. Ritter, "State-of-the-Art Adsorption and Membrane Separation Processes for Carbon Dioxide Production from Carbon Dioxide Emitting Industries," *Sep. Sci. Tech*, 44, 1273-1421 (2009).
51. M. O. Avilés, A. D. Ebner, and J. A. Ritter, "*In Vitro* Study of Magnetic Particle Seeding for Implant Assisted-Magnetic Drug Targeting: Seed and Magnetic Drug Carrier Particle Capture," *J. Magnetism and Magnetic Materials*, 321, 1586-1590 (2009).
52. A. D. Ebner, A. Mehrotra, and J. A. Ritter, "Graphical Approach for Complex PSA Cycle Scheduling," *Adsorption*, 15, 406-421 (2009).
53. J. A. McIntyre, A. D. Ebner and J. A. Ritter, "Experiemtnal Study of a Dual Reflux Enriching PSA Process for Concetrating Dilute Feed Streams," *Ind. Eng. Chem. Res*, 49, 1848-1858 (2010).
54. H. Du, A. D. Ebner and J. A. Ritter, "Temperature Dependence of the Non-Equilibrium Kinetic Model that Describes the Adsorption and Desorption Behavior of CO_2 in K-Promoted HTlc," *Ind.*

Eng. Chem. Res., 49, 3328-3336 (2010).

55. H. Du, C. T. Williams, A. D. Ebner, and J. A. Ritter, "*In Situ* FTIR Spectroscopic Analysis of Carbonate Transformations during Adsorption and Desorption of CO_2 in K-Promoted HTlc," *Chemistry of Materials*, 22, 3519-3526 (2010).
56. A. Mehrotra, A. D. Ebner, and J. A. Ritter, "Arithmetic Approach for Complex PSA Cycle Scheduling," *Adsorption*, 16, 113-116 (2010).
57. J. O. Mangual, S. Li, H. J. Ploehn, A. D. Ebner and J. A. Ritter, "Biodegradable Nanocomposite Magnetite Stent for Implant-Assisted Magnetic Drug Targeting," *Journal of Magnetism and Magnetic Materials*, 322, 3094-3100 (2010).
58. H. Du, A. D. Ebner and J. A. Ritter, "Pressure Dependence of the Non-Equilibrium Kinetic Model that Describes the Adsorption and Desorption Behavior of CO_2 in K-Promoted HTlc," *Ind. Eng. Chem. Res.*, 50, 412-418 (2011).
59. A. Mehrotra, A. D. Ebner, and J. A. Ritter, "Simplified Graphical Approach for Complex PSA Cycle Scheduling," *Adsorption*, 17, 337-345 (2011).
60. A. D. Ebner, M. L. Gray, N. G. Chisholm, Q. T. Black, D. D. Mumford, M. A. Nicholson, and J. A. Ritter, "Suitability of a Solid Amine Sorbent for CO_2 Capture by Pressure Swing Adsorption, *Ind. Eng. Chem. Res.*, 50, 5634-5641 (2011).
61. J. A. Ritter, S. J. Bhadra and A. D. Ebner "On the Use of the Dual Process Langmuir Model for Correlating Unary and Predicting Mixed Gas Adsorption Equilibria," *Langmuir*, 27, 4700-4712 (2011).
62. J. O. Mangual, M. O. Avilés, A. D. Ebner and J. A. Ritter, "In Vitro Study of Magnetic Nanoparticles as the Implant for Implant-Assisted Magnetic Drug Targeting" *Journal of Magnetism and Magnetic Materials*, 323, 1903-1908 (2011).
63. S. J. Bhadra, A. D. Ebner and J. A. Ritter, "On the Use of the Dual Process Langmuir Model for Prodiciting Unary and Binary Isosteric Heats of Adsorption," *Langmuir*, 28, 6935-6941 (2012).
64. J. Wang, A. D. Ebner and J. A. Ritter, "Preparation of a New Ti Catalyst for Improved Dehydrogenation and Hydrogenation Performance of $NaAlH_4$," *International Journal of Hydrogen Energy*, 37, 11650-11655 (2012).
65. T. Wang, J. Wang, A. D. Ebner and J. A. Ritter, "Synergistic Effects of Bimetallic Catalysis on the Cycling Behavior of $NaAlH_4$ Doped with Zr and Fe," *Journal of Alloys and Compounds*, 539, 242-248 (2012).
66. J. A. Ritter, F. Wu and A. D. Ebner, "New Apprpoach for Modeling Hybrid PSA-Distillation Processes," *Ind. Eng. Chem. Res*, 51, 9343-9355 (2012).
67. D. J. Owens, A. D. Ebner and J. A. Ritter, "Equilibrium Theory Analysis of a Pressure Swing Adsorption Cycle Utilizing a Favorable Langmuir Isotherm: Approach to Periodic Behavior," *Ind. Eng. Chem. Res*, 13454-13462 (2012).
68. S. J. Bhadra, A. D. Ebner and J. A. Ritter, "Carbon Monoxide Isotope Enrichment and Separation by Pressure Swing Adsorption," *Adsorption*, 19, 11-23, (2013).
69. A. D. Ebner, A. Mehrotra, and J. A. Ritter, "Graphical unit block approach for complex PSA cycle scheduling of parallel interacting trains of columns and tanks," *Adsorption*, 21, 229-241 (2015).
70. A. Abdollahi-Govar, A. D. Ebner, and J. A. Ritter, "New Kinetic Model That Describes the Reversible Adsorption and Desorption Behavior of CO_2 in a Solid Amine Sorbent," Energy & Fuels, 29, 4492-4502 (2015)

71. S. J. Bhadra, A. D. Ebner, V. van Brunt, and J. A. Ritter, "Ideal cascade theory applied to carbon monoxide isotope separation by pressure swing adsorption," *Adsorption*, 21, 467-478 (2015).
72. J. C. Knox, A. D. Ebner, M. D. LeVan, R. F. Coker and J. A. Ritter"On the Limitations of Breakthrough Curve Analysis in Fixed Bed Adsorption," *Ind. Eng. Chem. Res*, 55, 4734-4748 (2016).
73. M. I. Hossain, A. D. Ebner, and J. A. Ritter, "New Linear Driving Force Correlation Spanning Long and Short Cycle Time Pressure Swing Adsorption Processes," *Adsorption*, 22, 939-950 (2016).
74. N. Mohammadi, M.I. Hossain, A.D., Ebner, and J. A. Ritter, "New Pressure Swing Adsorption Cycle Schedules for Producing High-Purity Oxygen Using Carbon Molecular Sieve," *Ind. Eng. Chem. Res*, 55, 10758-10770 (2016).
75. A. Abdollahi-Govar, A. D. Ebner, and J. A. Ritter, "Effect of H_2O Vapor on the Adsorption and Desorption Behavior of CO2 in a Solid Amine Sorbent," Energy & Fuels, 30, 10653-10660 (2016).
76. N. Choomphon-anomakhun, A.D. Ebner, M. Natenapit and J. A. Ritter, "Simulation of Dynamic Magnetic Particle Capture and Accumulation Around a Ferromagnetic Wire," *Journal of Magnetism and Magnetic Materials*, 428, 493-505 (2017).
77. P. Eghbal, S.Fatemi, A. Vatani, J. A. Ritter and A. D. Ebner, "Purification of Helium from Nitrogen Rejection Unit in Cryogenic Natural Gas Process by Pressure Swing Adsorption," *Sep. and Purif. Technol.*, 193, 91-102 (2018).
78. Armin D. Ebner, Jason G. S. Ho and James A. Ritter, "Graphical Approach for Formulating Pressure Swing Adsorption Cycle Schedules with Unlimited Equalization Steps," *Adsorption,* 24, 221-232 (2018).
79. S. Mirshahghassemi, A. D. Ebner, B. Cai and J. R. Lead, "Application of High Gradient Magnetic Separation for Oil Remediation Using Polymer-Coated Magnetic Nanoparticles, *Sep. Purif. Technol.*, 179, 328-334 (2017).
80. Nguyen, H. G. T.; Espinal, L.; van Zee, R. D.; et al., "A reference high-pressure CO2 adsorption isotherm for ammonium ZSM-5 zeolite: results of an interlaboratory study (vol 24, pg 531, 2018), *Adsorption-J. Inter. Adsorption Society*, 24, 703-703 (2018).
81. Nguyen, H. G. T.; Espinal, L.; van Zee, R. D.; et al. "A reference high-pressure CO2 adsorption isotherm for ammonium ZSM-5 zeolite: results of an interlaboratory study, *Adsorption-J. Inter. Adsorption Society*, 24, 531-539 (2018).
82. Erden, Hanife; Ebner, Armin D.; Ritter, James A., "Development of a Pressure Swing Adsorption Cycle for Producing High Purity CO2 from Dilute Feed Streams. Part I: Feasibility Study," *Ind. Eng. Chem. Res*, 57, 8011-8022 (2018).
83. Erden, Lutfi; Ebner, Armin D.; Ritter, James A, "Separation of Landfill Gas CH4 from N-2 Using Pressure Vacuum Swing Adsorption Cycles with Heavy Reflux," *Energy & Fuels*, 32, 3488-3498 (2018).
84. Hossain, Mohammad, I; Holland, Charles E.; Ebner, Armin D.; et al., "Mass Transfer Mechanisms and Rates of CO2 and N-2 in 13X Zeolite from Volumetric Frequency Response, " *Ind. Eng. Chem. Res*, 58, 21679-21690 (2019)
85. Ritter, James A.; Bumiller, Kathryn C.; Tynan, Kyle J.; et al., "On the use of the dual process Langmuir model for binary gas mixture components that exhibit single process

or linear isotherms“, *Adsorption-J. Inter. Adsorption Society*, 25, 1511-1523 (2019)

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87. Amalraj, Pravin B. C. A.; Ebner, Armin D.; Ritter, James A., “Effective Radial Thermal Conductivity of a Parallel Channel Corrugated Metal Structured Adsorbent“, *Ind. Eng. Chem. Res*, 58, 16922-16933 (2019)
88. Ritter, J. A.; Bumiller, K. C.; Tynan, K. J.; and Ebner, A. D., “ On the use of the dual process Langmuir model for binary gas mixture components that exhibit single process or linear isotherms,” *Adsorption-J. Inter. Adsorption Society*, 25, 1511-1523 (2019)
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91. Nguyen, H. G. T.; Sims, C. M.; Toman, B.; et al., “A reference high-pressure CH(4)adsorption isotherm for zeolite Y: results of an interlaboratory study“, *Adsorption-J. Inter. Adsorption Society*, 26, 1253-1266 (2020)
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94. Jiang, H.; Ebner, A.D.; and Ritter, J.A.,“Theoretical Analysis of the Necessary and Sufficient Conditions for the Formation of Adsorption Azeotropes in Binary Gas Mixtures,” *Langmuir* , 37, 13584-13594 (2021).
95. Jiang, H; Ebner, A.D.; and Ritter, J.A., “Theoretical Analysis of the Pressure Regions Where Adsorption Azeotropes Exist in Binary Gas Mixtures,” *ACS OMEGA* 7, 43242-43253 (2022)

96. Adegunju, S.A.; Ebner, A.D. and Ritter, J.A., "Kinetically Limited Linear Driving Force Model for Diffusion-Based Adsorptive Separations," *Ind. Eng. Chem. Res.*, 61, 17615-17630 (2022).
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100. Turner, J.S.; Ebner, A.D. and Ritter, J.A., "Five definitions of adsorption and their relevance to the formulation of dynamic mass balances in gas adsorption columns," *Adsorption*, 30, 2267-2281 (2024).
101. Turner, J.S.; Burke, A.M.; Smithson, O.; Hossain, M.I.; Holland, C.E.; Ebner, A.D.; and Ritter, J.A., "Volumetric Frequency Response Investigation of the Mass Transfer Mechanisms of N2, O2, and Ar in Carbon Molecular Sieve," *Ind. Eng. Chem. Res.*, 64, 5671-5688 (2025)

PATENTS

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8. J. A. Ritter, S. P Reynolds, A. D. Ebner, J. C. Knox and M. D. LeVan, "Design and Performance of the Sorbent-Based Atmosphere Revitalization System for Orion," in *Proceedings of the 37th International Conference on Environmental Systems*, SAE Aerospace (2007).
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3. A.M. Puziy, P. Lodewyckx, J.A. Ritter, A.D. Ebner, and F. Suarez-Garcia, eds. "Physisorption of Gases: Adsorbent Characterization, Adsorbent-Adsorbate Equilibrium and Kinetics". Special; issue of Frontiers in Chemistry, 9 (2021)

TECHNICAL MEETING PRESENTATIONS

231. A. D. Ebner, R. T. Sanders and J. A. Ritter, "Novel Experimental Technique for Measuring Equilibrium Adsorption Isotherms Under Dynamic Conditions," AIChE Annual Meeting, San Diego, CA, October, 2024, presented.
230. J. A. Ritter, J. S. Turner and A. D. Ebner, "Actual, Absolute, Excess, Net and Column Amounts Adsorbed Formulated for Dynamic Mass Balances in a Gas Adsorption Column," AIChE Annual Meeting, San Diego, CA, October, 2024, contributed.
229. J.A. Ritter, R. T. Sanders, C. E. Holland, Z. Frick, M. C. Ticona, A. D. Ebner, R. Ciora, J. Lyu, J. Lee and M. Yu, "Evaluation of a Bench-Scale 3-Bed PSA Cycle Utilizing a Modified 13X Zeolite at the National Carbon Capture Center (NCCC)," AIChE Annual Meeting, San Diego, CA, October, 2024, contributed.
228 A. D. Ebner, A. Nemati Tamar, and J. A. Ritter, "Expansion and Fluidization of Pelletized Activated Carbon Columns: Effect of Carbon Column Diameter and Glass Bead Retention Layer," AIChE Annual Meeting, San Diego, CA, October, 2024, presented.
227. J.A. Ritter, R. T. Sanders, S. Alborzi, and A. D. Ebner, "Development of a Pressure Swing Adsorption Reactor to Produce NH_3 for Use as Naval Fuel," AIChE Annual Meeting, San Diego, CA, October, 2024, contributed.
226. H. Jiang, J. A. Ritter, A. D. Ebner and C. Celik, "13X Zeolite Modification for Process Scaling and Design of Large Scale PSA CO_2 Capture," AIChE Annual Meeting, Orlando, FL, November, 2023, contributed
225. J. A. Ritter, A. M. Burke, J. S. Turner, M. I. Hossain, O. A. Smithson, C. E. Holland and A. D. Ebner, "Revisiting the Transport of Gases in a Carbon Molecular Sieve using the Volumetric Frequency Response Technique**,"** AIChE Annual Meeting, Orlando, FL, November, 2023, contributed.
224. A. D. Ebner, S. A. Adegunju, P. B. C. A. Amalraj and J. A. Ritter, "Ability of the New Kinetically Limited Linear Driving Force Model to Predict the Behavior of Kinetically Limited Gas Separations in Light of Penetration Theory**,"** AIChE Annual Meeting, Orlando, FL, November, 2023, contributed.
223. R. T. Sanders, S. A. Adegunju, B. F. Kisomi, C. E. Holland, A. D. Ebner, J. A. Ritter, G. S. Foo, R. P. Grasso, S. K. Stark, J. Knopf and J. W. Henderson, "Evaluation of an Expanded PTFE Structured Adsorbent for Gas Separation and Purification," AIChE Annual Meeting, Orlando, FL, November, 2023, contributed.

222. R. T. Sanders, S. A. Adegunju, B. F. Kisomi, C. E. Holland, A. D. Ebner, J. A. Ritter, G. S. Foo, R. P. Grasso, S. K. Stark, J. Knopf and J. W. Henderson, "Development of an Expanded PTFE Structured Adsorbent Containing Activated Carbon," AIChE Annual Meeting, Orlando, FL, November, 2023, contributed.
221. A. D. Ebner D. M. Ernst, C. E. Holland and J. A. Ritter "Evaluation of a Pelletized PSA Bed while Operating under Bed Fluidization and Expansion Conditions," AIChE Annual Meeting, Orlando, FL, November, 2023, presented.
220. R. T. Sanders, A. D. Ebner and J. A. Ritter, "New Universal Pressure Drop Correlation for Structured Adsorbents with Parallel Channels of Any Cross-Sectional Shape**,"** AIChE Annual Meeting, Orlando, FL, November, 2023, contributed.
219. Development of Large-Scale PSA Processes for CO2 Capture with O2 Removal Capability, Fourteenth International Conference on Fundamentals of Adsorption (FOA14), Broomfield, CO, May 2022, Presented.
218. New Kinetic Model that Describes the Adsorption Dynamics in Diffusion Limited Separation Systems Utilizing Adsorbents Like Carbon Molecular Sieve, Fourteenth International Conference on Fundamentals of Adsorption (FOA14), Broomfield, CO, May 2022, Contributed.
217. Development of Expanded PTFE Structured Adsorbents with High Bed Density and Low Pressure Drop, Fourteenth International Conference on Fundamentals of Adsorption (FOA14), Broomfield, CO, May 2022, Presented.
216. Applicability of an Equilibrium Theory Model of a PSA Process Involving Equalization Steps, AIChE Annual Meeting, Boston, MA, November, 2021, contributed.
215. Large Scale PSA Process Design for CO_2 Capture with O_2 Removal Capability, AIChE Annual Meeting, Boston, MA, November, 2021, contributed.
214. A Novel Kinetic Model for the Adsorption Dynamics in Carbon Molecular Sieve and Titanium Silicate Adsorbents, AIChE Annual Meeting, Boston, MA, November, 2021, presented.
213. The Diffusion of CO_2 and N_2 in 13X Zeolite Particles of Different Sizes Using a 100 Hz Volumetric Frequency Response System," AIChE Annual Meeting, Boston, MA, November, 2021, presented.
212. Fabrication and Testing of Expanded PTFE Structured Adsorbents with Parallel Channels, AIChE Annual Meeting, Boston, MA, November, 2021, contributed.
211. Parametric Study of a TVSA Cycle Designed for CO_2 Removal from Spacecraft Cabins Using an IntraMicron Structured Adsorbent, AIChE Annual Meeting, Boston, MA, November, 2021, contributed.
210. Development of Expanded PTFE Structured Adsorbents with Parallel Channels: CFD Modeling of Pressure Drop, AIChE Annual Meeting, Boston, MA, November, 2021, contributed.
209. New Pressure Drop Correlation for Structured Adsorbents with Parallel Triangular Channels, AIChE Annual Meeting, Boston, MA, November, 2021, contributed.
208. New 100 Hz Volumetric Frequency Response System: Design, Operation and Analysis, Virtual AIChE Annual Meeting, San Francisco, CA, November, 2020, contributed.

207. On the Use of the Absolute, Excess and Net Amounts Adsorbed in Dynamic Mass Balances, Virtual AIChE Annual Meeting, San Francisco, CA, November, 2020, invited.
206. New Carbon and Zeolite Structured Adsorbents Made from Expanded PTFE," Virtual AIChE Annual Meeting, San Francisco, CA, November, 2020, presented.
205. Single Gas Multi-Normal Energy Distribution Models for Predicting Mixed Gas Adsorption Equilibria from Non-Uniform Heterogeneous Extended Langmuir and HIAS Models, Virtual AIChE Annual Meeting, San Francisco, CA, November, 2020, contributed.
204. Multi-Normal Energy Distribution Model for Correlating Single Gas Adsorption Isotherms for Carbon Dioxide, Methane, Ethane, Ethylene, Propane and Propylene on 5A Zeolite, Virtual AIChE Annual Meeting, San Francisco, CA, November, 2020, contributed.
203. Design and Scale-Up of TVSA Cycle for CO_2 Removal from Spacecraft Cabins Using a Structured Adsorbent, Virtual AIChE Annual Meeting, San Francisco, CA, November, 2020, contributed.
202. Process Scaling and Design for Large Scale CO_2 Capture by PSA, Virtual AIChE Annual Meeting, San Francisco, CA, November, 2020, contributed.
201. Incorporating a Vacuum Pump Performance Curve in Cyclic Adsorption Process Simulation, AIChE Annual Meeting, Orlando, FL, November, 2019, contributed.
200. On the Use of Structured Adsorbents in PTSA Cycles for CO_2 Removal from Spacecraft Cabins, AIChE Annual Meeting, Orlando, FL, November, 2019, contributed.
199. Equilibrium Theory Analysis of Equalization Tanks in a PSA Process, AIChE Annual Meeting, Orlando, FL, November, 2019, contributed.
198. On the Use of Single, Dual and Three Process Langmuir Models for Gas Mixture Components that Exhibit Different Combinations of these Processes, AIChE Annual Meeting, Orlando, FL, November, 2019, contributed.
197. Exploiting Structured Bed Thermal Conductivity for Enhancing the Performance of Temperature Swing Adsorption Processes, AIChE Annual Meeting, Orlando, FL, November, 2019, contributed.
196. Structured Adsorbent Pressure Temperature Swing Adsorption Cycles for Metabolic CO2 Removal from Spacecraft Cabins, AIChE Annual Meeting, Pittsburgh, PA, October, 2018, contributed.
195. On the Use of the Dual Process Langmuir Model for Gas Mixture Components That Exhibit Single Process or Linear Isotherms , AIChE Annual Meeting, Pittsburgh, PA, October, 2018, contributed.
194. Role of Bed Design Characteristics on the Effective Thermal Conductivity of a Structured Adsorbent, AIChE Annual Meeting, Pittsburgh, PA, October, 2018, presented.
193. Separation of CO_2 and N_2 by Rapid PSA using 13X Zeolite and a Dual Reflux Cycle, AIChE Annual Meeting, Minneapolis, MN, October, 2017, contributed.
192. Thermogravimetric and Breakthrough Studies on the Adsorption Reversibility of SO_2, NO_2 and NO on Type A and X Zeolites, AIChE Annual Meeting, Minneapolis, MN, October, 2017, presented.
191. Development of a PTSA Process for Metabolic CO_2 Removal from Spacecraft Cabins Using a Structured 13X Adsorbent, AIChE Annual Meeting, Minneapolis, MN, October, 2017,

contributed.

190. On the Development of a PSA Process for Natural Gas Purification, AIChE Annual Meeting, Minneapolis, MN, October, 2017, contributed.
189. Simulation of Dynamic Magnetic Drug Carrier Particle Capture and Accumulation Around a Ferromagnetic Wire, AIChE Annual Meeting, San Francisco, CA, November, 2016, presented.
188. On the Limitations of Breakthrough Curve Analysis in Fixed-Bed Adsorption, AIChE Annual Meeting, San Francisco, CA, November, 2016, contributed.
187. Carbon Dioxide Capture from Flue Gas By a PSA Process Utilizing a Structured Adsorbent: Full Scale Simulation with Model Validated at the Bench Scale, AIChE Annual Meeting, San Francisco, CA, November, 2016, contributed.
186. Understanding the Transport of Gases in Carbon Molecular Sieve Using the Volumetric Frequency Response Technique, AIChE Annual Meeting, San Francisco, CA, November, 2016, presented.
185. Two-Stage PSA System for CO2 Removal during Closed-Loop Human Space Exploration Missions, AIChE Annual Meeting, San Francisco, CA, November, 2016, Contributed.
184. On the Use of a Novel Structured Adsorbent for CO_2 Capture from Flue Gas by PSA: Bench Scale Demonstration, Twelfth International Conference on Fundamentals of Adsorption (FOA12), Friedrichshafen, Germany, June, 2016, contributed.
183. Experimental Validation of High Throughput Separation by Rapid Pressure Swing Adsorption, Twelfth International Conference on Fundamentals of Adsorption (FOA12), Friedrichshafen, Germany, June, 2016, contributed.
182. New PSA Cycle for Removing and Concentrating Metabolic CO_2 Produced during Closed-Loop Human Space Exploration Missions, Twelfth International Conference on Fundamentals of Adsorption (FOA12), Friedrichshafen, Germany, June, 2016, presented.
181. High Throughput Separation by Rapid PSA: Bench Scale Demonstration of Model Binary Gas Mixture, AIChE Annual Meeting, Salt Lake City, UT, November, 2015, contributed.
180. CO_2 Capture from Flue Gas by PSA: Bench-Scale Demonstration of a Novel Structured Adsorbent," AIChE Annual Meeting, Salt Lake City, UT, November, 2015, contributed.
179. CO_2 Capture from Flue Gas By PSA: Comparison of Bench to Full Scale Process Simulation when Utilizing a Structured Adsorbent, AIChE Annual Meeting, Salt Lake City, UT, November, 2015, contributed.
178. New PSA Cycle for CO_2 Removal During Closed-Loop Human Space Exploration Missions," AIChE Annual Meeting, Salt Lake City, UT, November, 2015, contributed.
177. Dynamic Adsorption Process Simulator: Evolution of the Energy Balance on the Approach to Periodicity," AIChE Annual Meeting, Salt Lake City, UT, November, 2015, presented.
176. Understanding Complex Structured Adsorbent Contactors Via 3-D CFD Modeling, AIChE Annual Meeting, Atlanta, GA, November, 2014, contributed.
175. On the Use of Volumetric Frequency Response for Understanding the Transport of Gases in Commercial Adsorbents, AIChE Annual Meeting, Atlanta, GA, November, 2014, contributed.
174. Novel Structured Adsorbent and Flowsheet for CO_2 Capture from Flue Gas By PSA, AIChE

Annual Meeting, Atlanta, GA, November, 2014, contributed.

173. On the Development of a Novel Pressure Swing Reactor for the Production of Ammonia, AIChE Annual Meeting, Atlanta, GA, November, 2014, presented.
172. Single Bed Apparatus Designed for Studying Rapid Pressure Swing Adsorption Concepts, AIChE Annual Meeting, Atlanta, GA, November, 2014, contributed.
171. On the Variability and Reproducibility of Equilibrium Adsorption Isotherm Measurements From Different Laboratories, AIChE Annual Meeting, San Francisco, CA, November, 2013, presented.
170. Hybrid PSA-Distillation Process for Propane/Propylene Separation, AIChE Annual Meeting, San Francisco, CA, November, 2013, contributed.
169. Diffusion of N_2 and CO_2 in 13X Zeolite From Volumetric Frequency Response Measurements Up to 10 Hz, AIChE Annual Meeting, San Francisco, CA, November, 2013, presented.
168. Rapid Cycling of Pure Gases in a Single Bed PSA Apparatus, AIChE Annual Meeting, San Francisco, CA, November, 2013, invited.
167. CO_2 Capture From Flue Gas by PSA Utilizing a Structured Adsorbent, AIChE Annual Meeting, San Francisco, CA, November, 2013, contributed.
166. Adsorption and Diffusion of Gases in Microporous Adsorbents Using Volumetric Frequency Response, 246th ACS National Meeting, Indianapolis, IN, September, 2013, invited.
165. On the Use of Volumetric Frequency Response for Determining Mass Transfer Mechanisms in Microporous Adsorbents, Eleventh International Conference on Fundamentals of Adsorption (FOA11), Baltimore, MD, May 2013, contributed.
164. On the Use of Solid Amine Sorbents for CO_2 Capture by PSA, Eleventh International Conference on Fundamentals of Adsorption (FOA11), Baltimore, MD, May 2013, contributed.
163. A High Feed Throughput PSA Process for CO_2 Capture from Flue Gas, Eleventh International Conference on Fundamentals of Adsorption (FOA11), Baltimore, MD, May 2013, contributed.
162. Experimental Characterization of Adsorbents via Volumetric Frequency Response Analysis. AIChE Annual Meeting, Pittsburg, PA, November, 2012, contributed.
161. Carbon Dioxide Capture from Flue Gas by High- Feed Throughput Pressure Swing Adsorption Processes. AIChE Annual Meeting, Pittsburg, PA, November, 2012, contributed.
160. Post-Combustion Carbon Dioxide Capture Using Solid Amines in a Pressure Swing Adsorption Process. AIChE Annual Meeting, Pittsburg, PA, November, 2012, contributed.
159. Pressure Vacuum Swing Adsorption Cycles for Landfill Methane Purification. AIChE Annual Meeting, Pittsburg, PA, October, 2012, contributed.
158. Improved Pressure Swing Adsorption Cycles for Ethanol PSA-Distillation Systems. AIChE Annual Meeting, Pittsburg, PA, October, 2012, contributed.
157. CO_2 Capture from Flue Gas by Pressure Swing Adsorption, 243rd ACS National Meeting San Diego, CA, March, 2012, contributed.
156. A Low Energy Pressure Swing Adsorption Process for CO_2 Capture, AIChE Annual Meeting, Minneapolis, MN, October, 2011, contributed.

155. Deviations from Plug Flow and 1-D Thermal Behavior for Breakthrough Tests with Zeolite CaA and Water Vapor and Carbon Dioxide, AIChE Annual Meeting, Minneapolis, MN, October, 2011, contributed.
154. Development of PSA Technology for Spaceflight Medical Oxygen Concentrators, AIChE Annual Meeting, Minneapolis, MN, October, 2011, contributed.
153. On the Use of a Solid Amine Sorbent for CO_2 Capture by Pressure Swing Adsorption, AIChE Annual Meeting, Minneapolis, MN, October, 2011, contributed.
152. Development of New Adsorption Cycles for Xenon Concentration from Air AIChE, Annual Meeting, Salt Lake City, UT, November, 2010, contributed.
151. Simplified Graphical Approach for Complex PSA Cycle Scheduling, AIChE Annual Meeting, Salt Lake City, UT, November, 2010, contributed.
150. Design of Pressure Swing Adsorption Cycles for Carbon Dioxide Capture from Flue Gas, AIChE Annual Meeting, Salt Lake City, UT, November, 2010, contributed.
149. Holland High Temperature Pressure Swing Adsorption Process for the Production of Ammonia, AIChE Annual Meeting, Salt Lake City, UT, November, 2010, contributed.
148. New Approach for Modeling Hybrid PSA-Distillation Processes, AIChE Annual Meeting, Salt Lake City, UT, November, 2010, contributed.
147. Carbon Monoxide Isotope Separation by Pressure Swing Adsorption, AIChE Annual Meeting, Nashville, TN, November, 2009, contributed.
146. Influence of the PSA Cycle on CO_2 Capture from Flue Gas, AIChE Annual Meeting, Nashville, TN, November, 2009, contributed.
145. J. Overview of Hybrid PSA-Distillation Processes, AIChE Annual Meeting, Nashville, TN, November, 2009, contributed.
144. Biodegradable Magnetite Stent for Implant-Assisted Magnetic Drug Targeting, AIChE Annual Meeting, Nashville, TN, November, 2009, contributed.
143. Biodegradable Magnetite Stent for Implant-Assisted Magnetic Drug Targeting, AIChE Annual Meeting, Nashville, TN, November, 2009, contributed.
142. High temperature CO_2 Capture by PSA using K-Promoted HTlc: Performance Differences due to Different CO_2 Uptake and Release Models in the Literature, AIChE Annual Meeting, Nashville, TN, November, 2009, contributed.
141. Pressure Swing Adsorption Technology for Post and Pre-Combustion Carbon Dioxide Capture, 26th Annual International Pittsburgh Coal Conference, Pittsburgh, PA, September, 2009, contributed.
140. Unique regeneration Steps for the Sorbent-Based Atmosphere Revitalization System Designed for CO_2 and H_2O Removal from Spacecraft Cabins, International Conference on Environmental Systems, Savannah, GA, July 2009, contributed.
139. Application of Pressure Swing Adsorption in the Production of Ammonia, AIChE Spring National Meeting, Tampa, FL, April 2009, contributed.
138. Carbon Dioxide Capture by Pressure Swing Adsorption, AIChE Spring National Meeting, Tampa, FL, April, 2009, contributed.
137. Complexity of Cycle Scheduling in Pressure Swing Adsorption Processes, AIChE Annual Meeting, Philadelphia, PA, November, 2008, contributed.
136. Pressure Swing Adsorption Cycles for Carbon Dioxide Capture, AIChE Annual Meeting, Philadelphia, PA, November, 2008, contributed.
135. Production of Ammonia with Pressure Swing Adsorption Utilized in Key Separations Steps, AIChE Annual Meeting, Philadelphia, PA, November, 2008, contributed.
134. Implant-Assisted Magnetic Drug Targeting: Design of Stent Implants, AIChE Annual Meeting, Philadelphia, PA, November, 2008, contributed.

133. Adsorption of CO_2 in K-Promoted HTlc: Temperature and Pressure Dependent Non-Equilibrium Kinetic Model, AIChE Annual Meeting, Philadelphia, PA, November, 2008, contributed.
132. On the Design of Hydrogen Storage Vessels Utilizing a Complex Hydride Storage Material, AIChE Annual Meeting, Philadelphia, PA, November, 2008, contributed.
131. Pressure Swing Adsorption Technology for Carbon Dioxide Capture, 25th Annual International Pittsburgh Coal Conference, Pittsburgh, PA, October, 2008, contributed.
130. *In Vitro* Study of Magnetite Nanoparticles as the Implant for Implant-Assisted Magnetic Drug Targeting, 7th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Vancouver, Canada, May, 2008, contributed.
129. JIsolated Swine Heart Ventricle Perfusion Model for Implant-Assisted Magnetic Drug Targeting, 7th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Vancouver, Canada, May, 2008, contributed.
128. Ammonia by Pressure Swing Adsorption, AIChE Spring National Meeting, New Orleans, LA, April 2008, contributed.
127. Vacuum Swing Adsorption Cyucles for Carbon Dioxide Capture from Flue and Stack Gases, AIChE Spring National Meeting, New Orleans, LA, April 2008, contributed.
126. Simulation of Unique Pressure Changing Steps and Situations in PSA Processes, AIChE 2007 Annual Meeting, Salt Lake City, UT, November 2007, contributed.
125. Temperature Dependent Non-Equilibrium Kinetic Model that Describes the Reversible Adsorption and Desorption Behavior of CO_2 in a K-Promoted HTlc, AIChE 2007 Annual Meeting, Salt Lake City, UT, November 2007, contributed.
124. Complex Hydride Hydrogen Storage Vessel Design, AIChE 2007 Annual Meeting, Salt Lake City, UT, November 2007, contributed.
123. Implant Assisted Magnetic Drug Targeting: Ferromagnetic Nanoparticles for Enhancing the Retention of Magnetic Drug Carrier Particles, AIChE 2007 Annual Meeting, Salt Lake City, UT, November 2007, contributed.
122. Magnetic Nanoparticles for Magnetic Drug Targeting, AIChE 2007 Annual Meeting, Salt Lake City, UT, November 2007, contributed.
121. Extreme Configurations in Heavy Reflux PSA Cycles, AIChE 2007 Annual Meeting, Salt Lake City, UT, November 2007, contributed.
120. Ferromagnetic Nanoparticle Scaffold for Studying Seeds as an Implant for Magnetic Drug Targeting, BMES 2007 Annual Meeting, Los Angeles, CA, September 2007, contributed.
119. *In Vitro* and Theoretical Advances in the Study of Implant Assisted Magnetic Drug Targeting, BMES 2007 Annual Meeting, Los Angeles, CA, September 2007, contributed.
118. Design and Performance of the Sorbent-Based Atmosphere Revitalization System for the Orion, 37th International Conference on Environmental Systems, Chicago, IL, July 2007, contributed.
117. Simulation of Novel Pressure Changing Steps and Extreme Conditions in PSA Processes, Fundamentals of Adsorption FOA9, Giardini Naxos, Italy, May 2007, contributed.
116. Rapid Charging of a Metal Hydride Hydrogen Storage Bed: Two-Dimensional Model Validation and System Design, Fundamentals of Adsorption FOA9, Giardini Naxos, Italy, May 2007, contributed.
115. Novel Heavy Reflux Cycles in Pressure Swing Adsorption Processes, Fundamentals of Adsorption FOA9, Giardini Naxos, Italy, May 2007, contributed.
114. Hydrogen Storage in High Temperature Complex Hydrides, Fundamentals of Adsorption FOA9, Giardini Naxos, Italy, May 2007, plenary.
113. Two-Dimensional Model for Rapid Charging of a Metal Hydride Hydrogen Storage Bed, 2nd Annual Korean-USA Joint Symposium on Hydrogen and Fuel Cell Technologies, Columbia, SC, May 2007, contributed.

112. High Capacity and High Temperature Complex Hydrides for Reversible Hydrogen Storage, 2nd Annual Korean-USA Joint Symposium on Hydrogen and Fuel Cell Technologies, Columbia, SC, May 2007, contributed.
111. New Synthesis Route for Complex Hydride Hydrogen Storage Materials, AIChE 2007 Spring National Meeting, Houston, TX, April 2007, contributed.
110. Studies of Implant Assisted Magnetic Drug Targeting, AIChE 2006 Annual Meeting, San Francisco, CA, November 2006, contributed.
109. Non-Equilibrium Kinetic Model for the Reversible Adsorption of CO_2 on a K-Promoted HTlc, AIChE 2006 Annual Meeting, San Francisco, CA, November 2006, contributed.
108. High Capacity Reversible Hydrogen Storage Materials, AIChE 2006 Annual Meeting, San Francisco, CA, November 2006, contributed.
107. Bed PSA Cycle for the Atmosphere Revitalization System of the NASA Crew Exploration Vehicle, Orion, AIChE 2006 Annual Meeting, San Francisco, CA, November 2006, contributed.
105. On the Use of a Ferromagnetic Stent for Implant Assisted Magnetic Drug Targeting, AIChE 2006 Annual Meeting, San Francisco, CA, November 2006, contributed.
104. Novel Heavy Reflux PSA Cycles for the Recovery of Carbon Dioxide at High Temperature with K-Promoted HTlc, AIChE 2006 Annual Meeting, San Francisco, CA, November 2006, contributed.
103. Simulation of the Rapid Charging of a Metal Hydride Hydrogen Storage System, AIChE 2006 Annual Meeting, San Francisco, CA, November 2006, contributed.
102. Synthesis of Metal Complex Hydride Reversible Hydrogen Storage Materials, AIChE 2006 Annual Meeting, San Francisco, CA, November 2006, contributed.
101. Ferromagnetic Stents for Implant Assisted Magnetic Drug Targeting, BMES 2006 Annual Meeting, Chicago, IL, October 2006 contributed.
100. Simulation of Real-Time Dynamic Cabin Conditions in the Crew Exploration Vehicle to Determine the Effects on the Sorbent-Based Atmosphere Revitalization System, Norfolk, VA, July 2006, contributed.
99. Mathematical Simulation of the Sorbent-Based Atmosphere Revitalization System for the Crew Exploration Vehicle, 36th International Conference on Environmental Systems, Norfolk, VA, July 2006, contributed.
98. Adsorption and Desorption of Hydrogen in Sodium Aluminum Hydride Co-Doped with Zr and Ti, 4th Pacific Basin Conference on Adsorption Science and Technology, Tianjin, China, May 2006, contributed.
97. Non-Equilibrium Dynamic Adsorption and Desorption Isotherms of CO_2 on a K-Promoted HTlc, 4th Pacific Basin Conference on Adsorption Science and Technology, Tianjin, China, May 2006, contributed.
96. Capture of CO_2 from Flue gas by PSA using K-Promoted HTlc: Mass Transfer Effects, 4th Pacific Basin Conference on Adsorption Science and Technology, Tianjin, China, May 2006, contributed.
95. *In Vitro* and Theoretical Advances in the Study of Stents for Implant-Assisted Magnetic Drug Targeting, 6th International Conference of the Scientific Applications of Magnetic Carriers, Krems, Austria, May 2006, contributed.
94. *In Vitro* Studies of Implant-Assisted Magnetic Drug Targeting with a Single Ferromagnetic Wire as a First Step Toward *In Vivo* Studies with Animal Models, 6th International Conference of the Scientific Applications of Magnetic Carriers, Krems, Austria, May 2006, contributed.
93. Adsorption and Membrane Processes in Hydrogen Production, 2006 AIChE Spring National Meeting, Orlando, FL, April 2006, contributed.

92. State-of-the-Art Adsorption and Membrane Separation Processes for H_2 Production in the Chemical and Petrochemical Industries, 2006 AIChE Spring National Meeting, Orlando, FL, April 2006, contributed.
91. Physiochemical Pathway to reversible Hydrogen in Complex Hydrides, TMS 2006: 125th Annual Meeting and Exhibition, San Antonio, TX, March, 2006, contributed.
90. Implant-Assisted Magnetic Drug Targeting, International E-Symposium on Pharmaceutical Engineering, Video Conference, Broadcast Live from USC to Bharathidasan University, India, March 2006, contributed.
89. Magnetic Implants for Magnetic Drug Targeting, Pacific Polymer Federation IX Conference, Maui, Hawaii, December 2005, contributed.
88. In Vitro Studies of Implant Assisted Magnetic Drug Targeting, Pacific Polymer Federation IX Conference, Maui, Hawaii, December 2005, contributed.
87. Development of a Magnetic Separator for Sequestration of Magnetic Microspheres Designed for Ex-Vivo Blood Detoxification, AIChE 2005 Annual Meeting, Cincinnati, OH, November 2005, contributed.
86. In Vitro Studies of Ferromagnetic Coils for Implant Assisted Magnetic Drug Targeting, AIChE 2005 Annual Meeting, Cincinnati, OH, November 2005, contributed.
85. High Gradient Magnetic Implants: A More Effective Approach to Magnetic Drug Targeting, AIChE 2005 Annual Meeting, Cincinnati, OH, November 2005, contributed.
84. Hydrogen Storage in Complex Hydrides: Reversible Reaction that Mimics Adsorption Behavior, AIChE 2005 Annual Meeting, Cincinnati, OH, November 2005, contributed.
83. Concentration and Recovery of Carbon Dioxide at High Temperature with Heavy Reflux PSA Cycles, AIChE 2005 Annual Meeting, Cincinnati, OH, November 2005, contributed.
82. Dynamic Adsorption and Desorption of CO_2 in K-Promoted Hydrotalcite, AIChE 2005 Annual Meeting, Cincinnati, OH, November 2005, contributed.
81. Prototype Designs of Portable Magnetic Separators for Extracorporeal Detoxification, Biomedical Engineering Society 2005 Annual Fall Meeting, Baltimore, MD, September 2005, contributed.
80. Magnetizable Intravascular Stents for Sequestration of Systematically Circulating Magnetic Drug Carriers, 3rd International IEEE-EMBS Special Topic Conference of Microtechnologies in Medicine and Biology, Oahu, Hawaii, May 2005, contributed.
79. High Temperature Heavy Reflux PSA Cycles for Carbon Dioxide Concentration and Recovery from Stack Gases, AIChE 2004 Annual Meeting, Austin, TX, November 2004, contributed.
78. Transdermal Ferromagnetic Implants for Retention, Retrieval and Guidance of Magnetic Drug Carrier Particles, AIChE 2004 Annual Meeting, Austin, TX, November 2004, contributed.
77. Applicability of High Gradient Magnetic Separation Principles to Magnetic Drug Targeting, AIChE 2004 Annual Meeting, Austin, TX, November 2004, contributed.
76. Non-Invasive Magnetic Drug Targeting Based on Ferromagnetic Seeding, AIChE 2004 Annual Meeting, Austin, TX, November 2004, contributed.
75. Magnetizable Intravascular Stents for Retention of Blood Borne Magnetic Drug Carrier Particles, AIChE 2004 Annual Meeting, Austin, TX, November 2004, contributed.
74. Sequestration of Blood Borne Magnetic Drug Carrier Particles with Magnetizable Intravascular Stents, BMES 2004 Annual Fall Meeting, Philadelphia, PA, October 2004, contributed.
73. Separation and Capture of CO_2 using a High Temperature Pressure Swing Adsorption System, Third Annual Conference of Carbon Capture & Sequestration, Alexandria, VA, May 2004, contributed.
72. How to Achieve and Optimize Separation of Magnetic Carriers from Pulsatile Blood, 5th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Lyon, France, May 2004, contributed.

71. Feasibility of High gradient Magnetic Implants for Magnetic Drug Targeting, 5th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Lyon, France, May 2004, contributed.
70. Magnetizable Intraluminal Stent and Functionalized Magnetic Carriers: A Novel Approach for Noninvasive yet Targeted Drug Delivery, 5th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Lyon, France, May 2004, contributed.
69. Theoretical Analysis of Transdermal Ferromagnetic Implants for Retention, Retrieval and Guidance or Magnetic Drug Carrier Particles, 5th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Lyon, France, May 2004, contributed.
68. Analysis of High gradient Ferromagnetic Seeding for Targeted Drug Delivery, 5th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Lyon, France, May 2004, contributed.
67. Feasibility of Magnetizable Stents for Sequestering Blood Borne Magnetic Drug Carrier Particles, 5th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Lyon, France, May 2004, contributed.
66. Theoretical Analysis of Ferromagnetic Seeding for Magnetic Drug Targeting, 5th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Lyon, France, May 2004, contributed.
65. Magnetically Guided and Targeted Drug Delivery Utilizing a Novel Magnetizable Vascular Stent and Magnetic Nanospheres, European Stroke Conference, Mannhein-Heidelberg, Germany, May 2004, contributed.
64. New Adsorption Technology for Carbon Dioxide Sequestration, AIChE 2003 Annual Meeting, San Francisco, CA, November 2003, contributed.
63. Two-Dimensional Models for the Design of Metal Hydride Hydrogen Storage Systems, AIChE 2003 Annual Meeting, San Francisco, CA, November 2003, contributed.
62. On the Use of Magnetic Implants for Targeted Drug Delivery, AIChE 2003 Annual Meeting, San Francisco, CA, November 2003, contributed.
61. Buoyancy Correction Methodology to Account for Temperature Imbalances In High Pressure Gravimetric Microbalances, AIChE 2003 Annual Meeting, San Francisco, CA, November 2003, contributed.
60. Empirical Correlation for the Design of Dual Reflux Pressure Swing Adsorption Columns, AIChE 2003 Annual Meeting, San Francisco, CA, November 2003, contributed.
59. Multicomponent Fractionation by CasCade Dual Reflux Pressure Swing Adsorption, AIChE 2003 Annual Meeting, San Francisco, CA, November 2003, contributed.
58. Reversibility of Na, Li and Mg Complex Hydrides for Hydrogen Storage, AIChE 2003 Annual Meeting, San Francisco, CA, November 2003, contributed.
57. Reversible Chemical Hydrides for Solid Hydrogen Storage, AIChE 2003 Annual Meeting, San Francisco, CA, November 2003, contributed.
56. Hydrogen Purification by Dual Reflux Pressure Swing Adsorption, 13th Symposium on Separation Science and Technology for Energy Applications, Gatlinburg, Tennessee, October 2003, contributed.
55. New Adsorption Technology for Carbon Dioxide Sequestration, 13th Symposium on Separation Science and Technology for Energy Applications, Gatlinburg, Tennessee, October 2003, contributed.
54. Metal Doped Sodium Aluminum Hydride as a Reversible Hydrogen Storage Material, 3rd Pacific Basin Conference on Adsorption Science and Technology, Kyongju, Korea, May 2003, contributed.

53. Dual Reflux Pressure Swing Adsorption Cycle for Gas Separation and Purification, 3rd Pacific Basin Conference on Adsorption Science and Technology, Kyongju, Korea, May 2003, contributed.
52. Modeling the Discharge Behavior of Metal Hydride Hydrogen Storage Systems, 3rd Pacific Basin Conference on Adsorption Science and Technology, Kyongju, Korea, May 2003, contributed.
51. Performance of a Metal Hydride Hydrogen Storage System, 225th ACS National Meeting, New Orleans, LA, March 2003, contributed.
50. Performance of Metal Doped Sodium Aluminum Hydride for Reversible Hydrogen Storage, 225th ACS National Meeting, New Orleans, LA, March 2003, contributed.
49. Novel Permanent Magnet Configurations for Small-Scale HGMS, 225th ACS National Meeting, New Orleans, LA, March 2003, contributed.
48. High Gradient Magnetic Implants for Targeted Drug Delivery, 225th ACS National Meeting, New Orleans, LA, March 2003, contributed.
47. New Pressure Swing Adsorption Cycles for Gas Separation and Purification, 225th ACS National Meeting, New Orleans, LA, March 2003, contributed.
46. Metal Hydride Hydrogen Storage System Modeling, National Hydrogen Association's 14th Annual US Hydrogen Conference, Washington, DC, March 2003, contributed.
45. Metal Doped Sodium Aluminum Hydride as a Reversible Hydrogen Storage Material, National Hydrogen Association's 14th Annual US Hydrogen Conference, Washington, DC, March 2003, contributed.
44. Separation, Purification and Storage by Adsorption: Thoughts for the Next Decade, AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
43. Zeolite Parallel Passage Contactor, AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
42. Equilibrium Theory Analysis and Feasibility of New Rectifying PSA Cycles for Producing Pure Heavy Component, AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
41. Equilibrium Theory Analysis of the Effect of Langmuir-Type Isotherms on Rectifying PSA, AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
40. What Can Possibly be New and Exciting about Pressure Swing Adsorption? AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
39. Dual Reflux Pressure Swing Adsorption Process for Concentrating Dilute Feeds at High Recovery, AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
38. Adsorption of H_2 on Pd and Ti Doped Multiwalled Carbon Nanotubes, AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
37. Is the Magneto-Manipulation of Single Walled Nanotubes Feasible? AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
36. On the Synergistic Effects in the Retention of Paramagnetic Particles by Cluster of Equally Spaced Magnetite Particles, AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
35. Practical Modeling of Metal Hydride Hydrogen Storage Systems, AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
34. Study and Validation of a Virtual Single Wire HGMS Testing Unit, AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
33. Performance of Doped Chemical Hydrides For Reversible Hydrogen Storage, AIChE Annual Meeting, Indianapolis, IN, November 2002, contributed.
32. Modeling the Discharge Behavior of a Metal Hydride Hydrogen Storage System, 224th National Meeting of the American Chemical Society, Boston, MA, August 2002, contributed.

31. Development of a Reversible Hydrogen Storage Material from Metal Doped Sodium Aluminum Hydride, 224th National Meeting of the American Chemical Society, Boston, MA, August 2002, contributed.
30. Concentrating Dilute Hydrogen Streams with a Metal Hydride Based Pressure Swing Adsorption Process, 224th National Meeting of the American Chemical Society, Boston, MA, August 2002, contributed.
29. What Can Possibly Be New and Exciting about Pressure Swing Adsorption? 4th Brazilian Meeting on Adsorption, Rio de Janeiro, Brazil, May 2002, contributed.
28. Development of Simple and Complex Models for the Design of Hydrogen Storage Systems, 2001 AIChE Annual Meeting, Reno, NV, November 2001, contributed.
27. Carbon Nanotubes Doped with Catalyzed Chemical Hydrides for Reversible Hydrogen Storage, 2001 AIChE Annual Meeting, Reno, NV, November 2001, contributed.
26. Equilibrium Theory Analysis of a Rectifying PSA Process for Producing Pure Heavy Component, AIChE Annual Meeting, Reno, NV, November 2001, contributed.
25. Magnetite-Silica Composite as Alternative Magnetic Matrix in HGMS, 2001 ACS Annual Meeting, San Diego, CA, April 2001, contributed.
24. Concentration of Dilute Sludge Wastes with HGMS, 2001 ACS Annual Meeting San Diego, CA, April 2001, contributed.
23. Magnetic Hetero-Flocculation of Paramagnetic Colloidal Particles by a 3-D Array of Magnetite Particles: A Materials Design Issue, 2001 ACS Annual Meeting San Diego, CA, April 2001, contributed.
22. Equilibrium Theory Analysis of a Rectifying PSA Process for Producing Pure Heavy Component, Separations Research Program Meeting at the University of Texas at Austin, Austin, TX, April 2001, contributed.
21. Magnetic Hetero-Flocculation of Paramagnetic Colloidal Particles by a three Dimensional Array of Magnetite Particles, 1999 AIChE Annual Meeting, Los Angeles, CA, November 2000, contributed.
20. Experimental Studies on the Ultimate Retention of Fe_2O_3 in High Gradient Magnetic Separation, 1999 AIChE Annual Meeting, Los Angeles, CA, November 2000.
19. New Theoretical Correlations for The Capture Cross Section in High Gradient Magnetic Separation, 1999 AIChE Annual Meeting, Dallas, TX, October 1999, contributed.
18. Novel Applications and Theoretical Developments in the Removal of Heavy Metals by High Gradient Magnetic Separation, Graduate Student Seminar at North Carolina Agriculture and Technology State University, Greensboro, NC, October 1999, contributed.
17. On the Use of High Gradient Magnetic Separation for Concentrating Dilute Sludge Wastes, Eleventh Symposium on Separation Science and Technology for Energy Applications, Gatlinburg, TN, October 1999, contributed.
16. New Theoretical Correlations for The Capture Cross Section in High Gradient Magnetic Separation, Eleventh Symposium on Separation Science and Technology for Energy Applications, Gatlinburg, TN, October 1999, contributed.
15. Surface Groups of Carbon-Composite Adsorbents Characterized by Proton Affinity Distribution, 24th Biennial Conference on Carbon, Charleston, SC, July 1999, contributed.
14. Overview of the Research Effort on Magnetic Field Enhanced Separations for Aqueous Solutions, United Engineering Foundation Conference on metal Separation Technologies Beyond 2000: Integrating Novel Chemistry with Processing, Kahuku, Oahu, Hawaii, June 1999, contributed.
13. On the use of Composite Inorganic Oxide Materials for Magnetically Enhanced Separation Processes, 217th National meeting of the American Chemical Society, Anaheim, CA, March 1999, contributed.

12. Electrical Potential and Capacitance Profiles at a Graphite-Water Interface Calculated by Molecular Dynamics Simulations, AIChE Annual Meeting, Miami, FL, November 1998, contributed.
11. Nanolevel High Gradient Magnetic Separation for Wastewater Treatment, Emerging Technologies in Hazardous Waste Management X, Boston, MA, August, 1998, contributed.
10. Radioactive Wastewater Treatment using Nanolevel High Gradient Magnetic Separation, 22nd Annual Actinide Separations Conference, Chattanooga, TN, April 1998, contributed.
9. Potentially-Enhanced Complexation Model for the Determination of Isopotential Equilibrium Curves, AIChE Annual Meeting, Los Angeles, CA, November 1997, contributed.
8. High Gradient Magnetic Separation for the Pretreatment of Radioactive and Mixed Wastes, Tenth Symposium on Separation Science and Technology for Energy Applications, Gatlinburg, TN, October 1997, contributed.
7. New Magnetic Field-Enhanced Process for the Treatment of Aqueous Wastes, Tenth Symposium on Separation Science and Technology for Energy Applications, Gatlinburg, TN, October 1997, contributed.
6. Potentially-Enhanced Complexation Model for the Electrosorption of Metal Ions, 214th ACS National Meeting, Las Vegas, NV, September 1997, contributed.
5. Development of a Novel Magnetite-Silica Gel Composite Adsorbent for Metal Ion Adsorption, 214th ACS National Meeting, Las Vegas, NV, September 1997, contributed.
4. Some Recent Developments in Using Iron Oxide Adsorbents for Chemical Separations, 21st Annual Actinide Separations Conference, Charleston, SC, June 1997, contributed.
3. Feasibility and Limitations of Nanolevel High Gradient Magnetic Separation, Emerging Technologies in Hazardous Waste Management VIII, Birmingham, AL, September, 1996, contributed.
2. Magnetically-Enhanced Adsorption of Inorganic Pollutants from Water, 5th World Congress of Chemical Engineering, San Diego, CA, July, 1996, contributed.
1. Adsorption of Metals from Aqueous Solutions Using a Magnetic Adsorbent in the Presence of a Magnetic Field, 211th ACS National Meeting, New Orleans, LA, March 1996, contributed.

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1. Liu, Y.; Ritter, J. A.; Holland, C. E.; Al-Muhtaseb, S. A. "Pressure Swing Adsorption Simulator." © *The University of South Carolina*, **2000**.
2. Al-Muhtaseb, S. A.; Ritter, J. A.; Holland, C. E. "Pressure Swing Adsorption Performance and Training Calculator (PSACalc-1A)." © *The University of South Carolina*, **2000**.
3. Ritter, J. A.; McIntyre, J. A.; Ebner, A. D.; Al-Muhtaseb, S. A.; Holland, C. E. "Stripping and Enriching Reflux Pressure Swing Adsorption Process for High Enrichment and Recovery of Dilute Hydrocarbons." © *The University of South Carolina*, **2001**.
4. Al-Muhtaseb, S. A.; Ritter, J. A.; Holland, C. E. "PSA Performance and Operating Condition Calculator for Single Adsorbable Components Using the Equilibrium Theory Model." © *The University of South Carolina*, **2001**.
5. Al-Muhtaseb, S. A.; Danielle, K. D.; Ritter, J. A.; Holland, C. E. "Pressure Swing Adsorption Design and Training Calculator for Gas Purification Processes with Unfavorable Adsorption Isotherms." © *The University of South Carolina*, **2001**.
6. Ritter, J. A.; Holland, C. E.; White, R. E. "LabView Control Software for the Feedback Process Control Rig." © *The University of South Carolina*, **2001**.

7. Ritter, J. A.; Holland, C. E.; Ebner, A. D. "Custom LabView Software for Brinkman Auto Titration Systems." © *The University of South Carolina*, **2001**.
8. Ritter, J. A.; White, R. E., Weidner, J. W.; Holland, C. E.; "Pulsed Current Analysis Software for Hybrid Battery and Capacitor Systems." © *The University of South Carolina*, **2001**.
9. Ritter, J. A.; Gadre, S. A.; Ebner, A. D.; Holland, C. E. "Metal Hydride Hydrogen Storage System Performance Evaluator" © *The University of South Carolina*, **2003**.

PRESENT FUNDING

1. ColdStream Energy, "Fabrication of a 4-Bed PSA Pilot Plant with Bi-Directional Valves," $210,000, January 1, 2025 to December 31, 2025, J. A. Ritter (PI) and A. D. Ebner.
2. ColdStream Energy, "Evaluation of Carbons for Hydrocarbon Adsorption," $920,000, July 1, 2020 to December 31, 2025, J. A. Ritter (PI) and A. D. Ebner.

PAST FUNDING

1. Samsung Electronics America, Inc, "Development of a Desiccant Heat Recovery System for Combination Clothes Dryer and Washer," $142,609, December 15, 2022 to August 10, 2024, J. A. Ritter (PI) and A. D. Ebner.
2. Tetramer Technologies/DOE, "Development of a Continuous Cost Effective Kr Xe Capture Process for Nuclear Fuels Reprocessing," $206,500, July 10, 2023 to April 9, 2024, B. Zdyrko, J. A. Ritter and A. D. Ebner ($60,000 for JAR).
3. Samsung, "Technical Feasibility Evaluation of Adsorption Based Heat Pump Technology for Applications in Clothes Dryer and Air Conditioner," $63,352, August 1, 2020 to November 30, 2020, J. A. Ritter (PI) and A. D. Ebner.
4. NASA MSFC/Jacobs Engineering, "Development of a TSA Process for CO_2 Removal Using a Structured 13X Adsorbent," $492,269, November 29, 2016 to November 23, 2020, J. A. Ritter (PI) and A. D. Ebner.
5. Apache Corporation, "Carbon Adsorbent Material and PSA Cycle Testing for Natural Gas Processing," $170,000, January 1, 2019 to December 31, 2019, J. A. Ritter (PI) and A.D. Ebner.
6. W. L. Gore & Associates, "Structured Adsorbent Material Testing and Evaluation," $170,000, March 1, 2019 to February 28, 2020, J. A. Ritter (PI) and A. D. Ebner.
7. Swansea University/UK/Tata Steel, "Carbon Capture from the Steel Industries," 900,000, January 1, 2018 to February 28, 2021, J. A. Ritter (PI) and A. D. Ebner.
8. Apache Corporation, "PSA Cycle Testing for Natural Gas Processing," $200,000, September 1, 2017 to June 30, 2019, J. A. Ritter (PI) and A.D. Ebner.
9. Apache Corporation, "Carbon Adsorbent Material Testing for Natural Gas Processing," $60,000, September 1, 2017 to December 31, 2018, J. A. Ritter (PI) and A. D. Ebner.
10. NASA MSFC/Jacobs Engineering, "Development of a TSA Process for CO_2 Removal Using a Structured 13X Adsorbent," $342,269, November 29, 2016 to November 23, 2019, J. A. Ritter (PI) and A. D. Ebner.
11. Apache Corporation, "Characterization of Carbon Adsorbent Materials," $100,000, April 1, 2017 to December 31, 2017, J. A. Ritter (PI) and A. D. Ebner.

12. Shell, "Separation Process Proof-of-Concept: Experimental Campaign in Six-Bed PSA Unit," $120,000, April 1, 2017 to October 31, 2017, J. A. Ritter (PI) and Armin D. Ebner.Shell, Evaluation of Na-ETS-10 using Dynamic and Equilibrium Adsorption and Desorption Techniques," $60,000, July 1, 2016 to December 31, 2016, J. A. Ritter (PI) and Armin D. Ebner.
13. Apache Corporation, "Evaluation of CH_4 and CO_2 Separation in a Multi-Bed Pressure Swing Adsorption System," $85,000, December 1, 2014 to December 31, 2015, J. A. Ritter (PI) and Armin D. Ebner.
14. Apache Corporation, "Evaluation of CO_2 Adsorbents using Gravimetric and Volumetric Adsorption Techniques," $80,000, May 15, 2014 to December 31, 2015, J. A. Ritter (PI) and Armin D. Ebner.
15. NASA MSFC/Jacobs Engineering, "Novel Pressure Swing Adsorption (PSA) Cycle to Facilitate Heavy Component (CO_2) Enrichment and Recovery," $175,000, March 15, 2015 to September 30, 2015, J. A. Ritter (PI) and A. D. Ebner.
16. NASA MSFC, "New PSA Cycle for CO_2 Removal and Concentration During Closed-Loop Human Space Exploration Missions," $150,000, October 15, 2015 to September 30, 2016, J. A. Ritter (PI) and A. D. Ebner.
17. Apache Corporation, "Construction and Testing of Pressure Swing Adsorption Systems and Materials Characterization for CH_4 and CO_2 Separation," $90,000, October 1, 2015 to December 31, 2016, J. A. Ritter (PI) and Armin D. Ebner.
18. Center for Strategic Approaches to the Generation of Electricity (SAGE) at USC, "New Pressure Swing Adsorption Cycles for CO_2 Capture from Coal Fired Power Plants," $291,636, September 1, 2008 to February 28, 2016, J. A. Ritter (PI) and A. D. Ebner.
19. Shell Global Solutions International, "Pressure Swing Adsorption Process Validation: Fixed Bed Experimentation," $50,000, June 1, 2015 to June 31, 2016, J. A. Ritter (PI) and A. D. Ebner.
20. NASA MSFC, "Demonstration of a Spacecraft Carbon Dioxide Removal System via Pressure Swing Adsorption," $175,000, March 15, 2015 to September 30, 2015, J. A. Ritter (PI) and A. D. Ebner.
21. Apache Corporation, "Evaluation of CH_4 and CO_2 Separation in a Multi-Bed Pressure Swing Adsorption System," $85,000, December 1, 2014 to May 31, 2015, J. A. Ritter (PI) and Armin D. Ebner.
22. Apache Corporation, "Evaluation of CO_2 Adsorbents using Gravimetric and Volumetric Adsorption Techniques," $80,000, May 15, 2014 to May 31, 2015, J. A. Ritter (PI) and Armin D. Ebner.
23. Process Science and Technology Center/Chevron, University of Texas at Austin, "Fundamental Study of a Rapid Pressure Swing Adsorption Process," $75,000, January 1, 2012 to December 31, 2015, J. A. Ritter (PI).
24. Center for Strategic Approaches to the Generation of Electricity (SAGE) at USC, "New Pressure Swing Adsorption Cycles for CO_2 Capture from Coal Fired Power Plants," $291,636, September 1, 2008 to February 28, 2016, J. A. Ritter (PI) and A. D. Ebner.
25. W. R. Grace, "Adsorbent Evaluation with Volumetric Frequency Response," $189,666, J. A.

Ritter (PI) and Armin D. Ebner, September 1, 2010 to May 31, 2012.

26. SmartKoncept Technology Inc. and DOE, "Ammonia Process by Pressure Swing Adsorption, $895,309, October 1, 2010 to September 30, 2013, J. A. Ritter (PI) and A. D. Ebner.
27. W. R. Grace, Adsorbent Evaluation with Volumetric Frequency Response, $189,666, J. A. Ritter (PI) and Armin D. Ebner, September 1, 2010 to November 30, 2010.
28. National Science Foundation, "Complex Hydrides of Lithium, Aluminum and Boron for Hydrogen Storage," $300,000, September 1, 2009 to August 31, 2012, J. A. Ritter (PI) and Armin D. Ebner.
29. SeQual Technologies and DARPA, "Pressure Swing Adsorption Cycle Modeling for Medical Oxygen Concentrators" $290,000, April 28, 2009 to January 1, 2011, J. A. Ritter (PI) and A. D. Ebner.
30. Center for Clean Coal at USC, "New Pressure Swing Adsorption Cycles for CO_2 Capture from Coal Fired Power Plants," $291,636, September 1, 2008 to February 28, 2011, J. A. Ritter (PI) and A. D. Ebner.
31. SmartKoncept Technology Inc. and DOE, "Ammonia Process by Pressure Swing Adsorption, $341,570, October 1, 2007 to September 30, 2010, J. A. Ritter (PI) and A. D. Ebner.
32. Pacific Northwest National Laboratory, "Development of New Adsorption Cycles for Xenon Concentration from Air," $50,000, June 2, 2009 to November 30, 2009, J. A. Ritter (PI) and A. D. Ebner.
33. NASA MSFC, "Analysis of Engineered Structured Sorbent Systems for the Next Generation Atmosphere Revitalization System," $60,000, March 15, 2009 to March 14, 2010, J. A. Ritter (PI) and A. D. Ebner.
34. Studsvik Development, Inc., "Carbon Monoxide Isotope Separation by Pressure Swing Adsorption," $65,000, August 1, 2008 to January 31, 2009, J. A. Ritter (PI) and A. D. Ebner.
35. NASA MSFC, "Evaluation of Medical Oxygen PSA Technology for International Space Station Applications," February 4, 2008 to February 3, 2009, $150,000, J. A. Ritter (PI) and A. D. Ebner.
36. Intelligent Energy Inc. and DOE, "Development of a Process Simulator for Adsorption Enhanced Reforming/Pressure Swing Reformer," $75,000, October 15, 2007 to July 31, 2008, J. A. Ritter (PI) and A. D. Ebner.
37. DOE NETL, "New Adsorption Cycles for Carbon Dioxide Capture and Concentration," $200,000, August 1, 2005 to July 31, 2008, J. A. Ritter (PI) and A. D. Ebner.
38. DOE/WSRC/SCUREF, "Heat Transfer and Modeling of Next Generation Metal Hydride Beds," $70,000, July 1, 2004 to September 30, 2004, J. A. Ritter (PI) and A. D. Ebner.
39. NASA MSFC, "Design of an Adsorption-Based Carbon Dioxide, Humidity and Trace Contaminant Removal System," June 3, 2005 to August 31, 2006, $322,747, J. A. Ritter (PI) and A. D. Ebner.
40. NSF, "NER: Ferromagnetic Seeding for Noninvasive Magnetic Drug Targeting," $121,550, June 15, 2005, May 31, 2007, J. A. Ritter (PI) and A. D. Ebner.
41. DOE/WSRC/SCUREF, "High Capacity Complexes for Hydrogen Storage II," $22,710, July 12, 2003 to September 30, 2003, J. A. Ritter (PI), A. D. Ebner and C. T. Williams.
    DOE, "Radically New Adsorption Cycles for Carbon Dioxide Sequestration," $50,000, September 1, 2003 to February 28, 2005, J. A. Ritter (PI) and A. D. Ebner.
42. DOE/WSRC/SCUREF, "Heat Transfer and Modeling of Next Generation Metal Hydride Beds,"

$35,129, August 12, 2003 to September 30, 2003, J. A. Ritter (PI) and A. D. Ebner.

43. NSF, "SGER: Feasibility of High Gradient Magnetic Implants for Targeted Drug Delivery," $72,500, April 1, 2003 to December 31, 2004, J. A. Ritter (PI) and A. D. Ebner.
44. DOE/WSRC/SCUREF, "High Capacity Complexes for Hydrogen Storage," $34,057, July 12, 2002 to September 30, 2002, J. A. Ritter (PI), A. D. Ebner and C. T. Williams.

TECHNICAL REVIEWER: JOURNALS, PROCEEDINGS, PANELS, AGENCIES

Petroleum Research Fund Qatar
SBIR/STTR National Science Foundation
Catalysis Communications
Industrial and Engineering Chemistry Research
Journal of Magnetism and Magnetic Materials
Magnetism & Magnetic Materials Annual Conference
Separations Science and Technology
Brazilian Journal of Chemical Engineering

THESIS ADVISOR

PhD

1. Steven P. Reynolds, Heavy and Dual Reflux Pressure Swing Adsorption Cycles: Carbon Dioxide Capture and Concentration at High Temperature using K-promoted Hydrotalcite, May 2007.
2. Jun Wang, Synthesis, Development of Metal Complex Hydrides as Reversible Hydrogen Storage Materials, June 2007.
3. Misael O. Aviles, Theoretical and Experimental Studies of Implant Assisted Magnetic Drug Targeting, February 2008.
4. Hai Du, Carbon Dioxide Capture with K-Promoted HTlc at High Temperature, March 2010.
5. Jan O. Mangual, Novel Implant Designs in Magnetic Drug Targeting, September 2010. 13.
6. Amal Mehrotra, Cycling Scheduling and Design of Pressure Swing Adsorption Cycles for Carbon Dioxide Capture from Flue Gas, March 2011.
7. Shubhra Bhadra, Purification of Ammonia by Pressure Swing Adsorption, February 2012.
8. Fan Wu, New Approach for Modeling Hybrid Pressure Swing Adsorption-Distillation Processes, August 2013.
9. Anahita Abdollahi Govar, Development of a Pressure Swing Adsorption Process for CO_2 Capture from Flue Gas Using Solid Amine Sorbents, February 2014.
10. Mohammad Iftekhar Hossain, Volume Swing Frequency Response Method for Determining Mass Transfer Mechanisms in Microporous Adsorbents, February 2014.
11. Atikur Rahman, Development of a Pressure Swing Adsorption (PSA) Process For CO_2 Capture From Flue Gas, February 2016
12. Lutfi Erden, Methane Separation and Purification via Pressure Swing Adsorption, June 2016.
13. Hanife Erden, Two-State PSA System for CO2 Removal and Concentration During Closed-Loop Human Space Exploration Missions, November, 2016

14. Nima Mohammadi, CO_2 Capture from Flue Gas by PSA Using a Novel Structured Adsorbent, December, 2016.
15. Seyyedali Mirshahghassemi, Deployment of Synthesized Iron Oxide Nanoparticles for Oil Absorption from Aquatic Systems, Environmental Health Sciences Department, 2018.
16. Huan Jiang, Large Scale PSA Process Design for CO_2 Capture with O_2 Removal Capability, March, 2021.
17. Pravin B. C. A. Amalraj, Design of a TVSA Cycle for CO_2 Removal from Spacecraft Cabins using a Structured Adsorbent, January 2023.
18. Sulaimon A. Adegunju, Development and the Use of a Kinetically Limited Linear Driving Force Model for Diffusion-Based Adsorptive Separation, February 2023.
19. Behnam Fakhari Kisomi, The Impact of Using Tanks for the Equalization Step on the Performance of a PSA Process, February 2023.
20. Ryan T. Sanders, New Analytic Correlation for Pressure Drop in Parallel Channel Structured Adsorbents and Effect of Adsorption Azeotropy on Gas Separation by PSA, March 2024.

MS

1. Yongfeng Wang, Two Dimensional Simulations of the Charge and Discharge of a Metal Hydride Hydrogen Storage Bed, 2007.
2. Dongxiang Yang, Development of a Cascade Adsorption Process for Rapid Xenon Concentration from Air for Nuclear Proliferation Monitoring, 2010.
3. Joshua P. White, Development of a Pressure Swing Adsorption (PSA) Process for CO_2 Capture from Flue Gas, 2016.
4. Peter A. Fairchild, Adsorption Reversibility of SO_2, NO_2 and NO on 13X and 5A Zeolites, 2016.
5. Hind Shabbani, Characterization of Novel Carbon Materials, August, 2017
6. Pravin B. C. A. Amalraj, Role of Bed Design Characteristics on The Effective Thermal Conductivity of a Structured Adsorbent, April 2018.
7. Olivia Smithson, On the Use of Volumetric Frequency Response for Measuring Mass Transfer Coefficients in Microporous Adsorbents, August 2020.
8. Tyler Hemingway, Department of Chemistry and Biochemistry, December 2020.
9. Sofia Tosso, Heterogeneous Extended Langmuir Model with a Truncated Multi-Normal Energy Distribution For fitting Unary Data and Predicting Mixed-Gas Adsorption Equilibria, Jan 2021.
10. Amin Nemati Tamar, Experimental and Numerical Analysis of Fluidization of Pelletized Activated Carbon Columns: Effects of Glass Bead Retention Layer, March 2025

PhD Students

Chemical Engineering:

Amin Nemati Tamar, April 2025 to present.
Miguel Ticona, August 2023 to present.
Shaghayegh Alborzi, August 2023 to present.
Qasem Delavar, Jan 2025 to present.

Environmental Health Sciences Department:
Hamid Zand, October 2023 to present

Undergraduate Students

James P. Ledbetter
Michael B. Schmithorst
Parker Thompson
Kathryn Bumiller
Kyle Tynan
Sarah Gustafson
Jacklyn Couch
Adam Burke
Jarret Turner
Kay Harper

Visiting Scholars

1. Yan Sun (China), Adsorbent Modification for Terrestrial and Extraterrestrial Applications, September 2014 to August 2015.
2. Natthaphon Choomphon-anomakhun (Thailand), CFD Modeling of Magnetic Particle Collection on a Surface, February 2015 to January 2016.

EXTRACURRICULAR ACTIVITIES

Swimming (1978-1988)
National champion swimmer (1983-1986)
Tae kwon do; black belt-2 dan (2011-Present)

LANGUAGES

English, Spanish