

## CURRICULUM VITA

**Abdulrahman Abdulaziz Al-Rabiah , Ph.D.**

**Professor of Chemical Engineering**

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### EDUCATION

**Ph.D.** Chemical Engineering, University of Colorado, Boulder, USA, 2001 (GPA 3.96/4.0),  
*supervised by Prof. Klaus D. Timmerhaus.*

**M.Sc.** Chemical Engineering, University of Colorado, Boulder, USA, 1993 (*Ambassador's Honor Award*).

**B.Sc.** Chemical Engineering, King Saud University, KSA, 1990, (*First Class Honor*), *Ranked first in the batch.*

### CURRENT POSITION

Professor (Full) of Chemical Engineering at King Saud University, Riyadh

### ACADEMIC EXPERIENCE AND CONSULTATIONS

2001-present **Faculty Member**, Chemical Engineering Department, College of Engineering, King Saud University (KSU).

2023(spring) **Visiting Professor**, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany.

2023-2027 **Board Member**, ALITCO (Aldrees Industrial and Trading Co.).

2022-present **Fellow**, *Distinguished Scientist Fellowship Program*, King Saud University (KSU).

2021-present **Board Member**, Center of Carbon Capture, Utilization, and Storage, KACST & Ministry of Energy.

2020-2023 **Board Member**, ALITCO (Aldrees Industrial and Trading Co.).

2020-2022 **Founder and Vice-Chairman**, Renewable Energy Society.

2018-2019 **Visiting Professor**, Lund University, Sweden.

2017-2020 **Board Member**, ALITCO (Aldrees Industrial and Trading Co.).

2014-2017 **Board Member**, ALITCO (Aldrees Industrial and Trading Co.).

2011-2014 **Board member**, Saudi Chemical Engineering Society (SCES).

2008-2011 **Board member**, Saudi Chemical Engineering Society (SCES).

2008-2014 **Consultant**, King Abdulaziz City for Science & Technology (KACST).

### RESEARCH INTERESTS

Fossil Energy, Renewable Energy, Energy Integration, Hydrogen Production, Petrochemicals, Biofuel, Water Desalination, Carbon Capturing and Utilization, Process Synthesis, Process Design, Simulation and Optimization, Process Separation, Membrane Reactors, Hybrid Systems, Plant Economics and Profitability Analysis.

## HONORS AND AWARDS

- ❖ **Distinguished Award** from Riyadh Techno Valley (RTV) for the best design project, College of Engineering, KSU, Spring Semester 2023.
- ❖ **Distinguished Award** from BAE Systems for the best design project, College of Engineering, KSU, Spring Semester 2022.
- ❖ **Distinguished Award** from BAE Systems for the best design project, College of Engineering, KSU, Spring Semester 2016. (Achieved the first rank for the SABIC Award at the level of Saudi universities.)
- ❖ **Distinguished Award** from BAE Systems for the best design project, College of Engineering, KSU, Fall Semester 2015. (Achieved the first rank for the SABIC Award at the level of Saudi universities.)
- ❖ **Gold Medal**, 41st International Exhibition of Inventions, Geneva, Switzerland, 2013.
- ❖ **Gold Medal** for scientific innovation, King Saud University, 2012.
- ❖ **Gold Medal**, 40th International Exhibition of Inventions, Geneva, Switzerland, 2012.
- ❖ **Ambassador's Honor Award**, Master's Degree, University of Colorado, 1993.
- ❖ **First Class Honor**, B.Sc. degree, King Saud University, 1990.

## PATENTS

### EUROPEAN PATENTS

- Synthesis and Use of a Nano-Crystalline Zinc Chromite Catalyst, Compromising Nano-Palladium, EP Patent No. 2418017B1, Nov. 21, 2018.
- Synthesizing and utilizing novel ruthenium nanoparticle-activated charcoal-nano-zinc oxide composite catalyst, EP 2517788 B1, Nov. 11, 2017
- Low Pressure One-Step Gas-Phase Process for Production of Methyl Isobutyl Ketone, EP Patent EP 2532642 B1, Jan. 25, 2017.

### US PATENTS

- Composite Catalyst and Using the Same for Making Isoropyl Alcohol, US Patent No. 8,362,302, Jan. 29, 2013.
- Synthesizing and Utilizing Novel Ruthenium Nanoparticle-Activated Charcoal-Nano-Zinc Oxide Composite Catalyst, US Patent No. 8,110,708, Feb 07, 2012.
- Low Pressure One-Step Gas-Phase Process for Production of Methyl Isobutyl Ketone, US Patent No. 8,101,805, Jan. 24, 2012.
- Synthesizing and Utilizing Novel Nano Crystalline Zinc Chromite Supported Nano Palladium Catalyst, US Patent No. 7,951,976, May 31, 2011.

### SAUDI PATENTS

- Synthesizing and utilizing novel nano-crystalline zinc chromite supported nano palladium catalyst, Saudi Patent No. 4950, July 24, 2016
- Isobutyl methyl ketone production process at low pressure in a single step in the gas phase, Saudi Patent Office, Patent No. 4119 , 7/7/2015

### CHINESE PATENTS

- Low Pressure One-Step Gas-Phase Process for Production of Methyl Isobutyl Ketone, No. 1770244, Aug 26, 2015
- Synthesizing and utilizing novel ruthenium nanoparticle-activated charcoal-nano-zinc oxide composite catalyst, No. 1906856, Jan 20, 2016

### GRANTS

- Utilizing Nanoporous Membrane Technology for Nitrogen Removal from Saudi Natural Gas, King Abdullah Institute for Nanotechnology, 2008-2010, S.R. 227,000
- Optical media storage made of polycarbonate, SABIC, 2007-2008, S.R. 125,000
- Manufacturing of foodstuff containers packaging, drinking water bottles, and other commodities from polycarbonate, SABIC, 2007-2008, S.R. 125,000
- Performance of Polymer Modified Bitumen (PMB) Based on Local Bituminous Materials, Ministry of Transport, 2007-2008, S.R. 75,000
- Production of Detergent Alcohols in Saudi Arabia from Linear Alpha Olefins (LAO), SABIC, 2005-2006, S.R. 120,000
- Production of Plasticizer Alcohols in Saudi Arabia from Linear Alpha Olefins (LAO) SABIC, 2004-2005, S.R. 120,000
- Production of ADA in Saudi Arabia Using C12 and C14-C18 Alpha Olefins, SABIC, 2004-2005, S.R. 125,000
- Production of Alkenyl Succinic Anhydride in Saudi Arabia Using C12 and C14-C18 Alpha Olefins, SABIC, 2004-2005, S.R. 125,000
- Membrane Technology for Hydrogen Separation in Ethylene Plants, SABIC, 2003-2005, S.R. 50,000
- Separation of Propane/Propylene Using Membrane/Distillation Hybrid Systems, Eng. Research Center, KSU, 2001-2003, S.R. 48,000

### ACADEMIC EXPERIENCE AND ACTIVITIES

- Post-Graduate Supervision: five master's theses
- Invited Speaker, Saudi International Conference for Water Technology, Riyadh, 21 Nov., 2011.
- Principal Investigator of KSU team, Joint Research with Nanyang University, Singapore, 2009-2011.
- Distinguished Invited Speaker, 7th International Conference on Membrane Science and Technology (MST 2009), Utilization & Applications of Membrane Technology in Saudi Arabia, 12-15 May, 2009, Kuala Lumpur, Malaysia.
- Scientific Committee Member, 7th International Conference on Membrane Science and Technology (MST 2009), 12-15 May, 2009, Kuala Lumpur, Malaysia.
- Scientific Committee Member, 1st International Laboratory Technology Conference & Exhibition (LABTECH 2008), October 20-22, 2008, Bahrain.
- Peer Reviewing of several conferences and Journals including Chemical Engineering & Processing: Process Intensification (ISI journal) and Construction & Building Materials (ISI journal).

## INSTITUTIONAL & PROFESSIONAL SERVICES

2019-present	Committee Member, Academic Advising, Chemical Engineering Dept.
2016-present	Committee Member – Annual Reports, Chemical Engineering Dept.
2014-2015	Committee Member – Graduation Projects, Chemical Engineering Dept.
2010-2012	Committee Member – Scholarship Program, College of Engineering
2008-2013	Committee Coordinator – Scholarship & Teaching Assistants
2008-2010	Committee Member, Chemical Engineering Labs
2003-2008	Committee Coordinator – Graduation Projects, Chemical Engineering
2003-2006	Committee Member – Students’ Problems, College of Engineering
2002-2005	Coordinator, Computer Lab of Chemical Engineering

## TECHNO-ECONOMIC STUDIES

- *Performance of Polymer Modified Bitumen (PMB) Based on Local Bituminous Materials, for Ministry of Transport, 2007-2008*
- *Manufacturing of foodstuff containers packaging, drinking water bottles, and other commodities from polycarbonate, for SABIC, 2007-2008*
- *Production of Detergent Alcohols in Saudi Arabia from Linear Alpha Olefins (LAO), for SABIC, 2005-2006*
- *Production of Plasticizer Alcohols in Saudi Arabia from Linear Alpha Olefins (LAO), for SABIC, 2004-2005*
- *Production of ADA in Saudi Arabia using C12 Alpha Olefins, for SABIC, 2004-2005*
- *Production of ADA in Saudi Arabia using C14-C18 Alpha Olefins, for SABIC, 2004-2005*
- *Production of Alkenyl Succinic Anhydride (ASA) in Saudi Arabia using C12 Alpha Olefins, for SABIC, 2004-2005*
- *Production of Alkenyl Succinic Anhydride (ASA) in Saudi Arabia using C14-C18 Alpha Olefins, for SABIC, 2004-2005*

## SELECTED PUBLICATIONS

- 1- Saleh J, Al-Fatesh AS, Ibrahim AA, Frusteri F, Abasaeed AE, Fakeeha AH, Albaqi F, Anojaidi K, Alreshaidan SB, Albinali I, Al-Rabiah AA. Stability and Activity of Rhodium Promoted Nickel-Based Catalysts in Dry Reforming of Methane. *Nanomaterials*. 2023 Jan 29;13(3):547.
- 2- Mahmoud B. Elsheniti, Saad Zaheer, Obida Zeitoun, Hassan Alshehri, Abdulrahman AlRabiah, Zeyad Almutairi. “Experimental Evaluation of a Solar Low-Concentration Photovoltaic/Thermal System Combined with a Phase-Change Material Cooling Technique.” *Applied Sciences* 1.13 (2023): 25.
- 3- Al-Rabiah, Abdulrahman A., et al. "Production of Biofuel Additives Using Catalytic Bioglycerol Etherification: Kinetic Modelling and Reactive Distillation Design." *Catalysts* 12.11 (2022): 1332.
- 4- Al-Rabiah, Abdulrahman A., et al. "Development of a Biomass Gasification Process for the Coproduction of Methanol and Power from Red Sea Microalgae." *Energies* 15.21 (2022): 7890.

- 5- Al-Rabiah, Abdulrahman A., et al. "Highly Selective Gas-Phase Catalytic Hydrogenation of Acetone to Isopropyl Alcohol." *Catalysts* 12.10 (2022): 1251.
- 6- Al-Rabiah, Abdulrahman A., et al. "An Intensified Green Process for the Coproduction of DMC and DMO by the Oxidative Carbonylation of Methanol." *Processes* 10.10 (2022): 2094.
- 7- Al-Rabiah, Abdulrahman A., Raed R. Alkathiri, and Abdulaziz A. Bagabas. "Process Development for Methyl Isobutyl Ketone Production Using the Low-Pressure One-Step Gas-Phase Selective Hydrogenation of Acetone." *Processes* 10.10 (2022): 1992.
- 8- Alessi, Yasser M., and Abdulrahman A. Al-Rabiah. "A Feasibility Study of Utilizing Nuclear Energy for an Existing MED-TVC Desalination Plant." *Applied Sciences* 12.19 (2022): 9506.
- 9- Bin Naqyah, Abdulaziz S., and Abdulrahman A. Al-Rabiah. "Development and Intensification of the Ethylene Process Utilizing a Catalytic Membrane Reactor." *ACS omega* 7.32 (2022): 28445-28458.
- 10- Al-Rabiah, Abdulrahman A., et al. "Novel Process for Butyl Acetate Production via Membrane Reactor: A Comparative Study with the Conventional and Reactive Distillation Processes." *Processes* 10.9 (2022): 1801.
- 11- Bessadok-Jemai, Abdelbasset, and Abdulrahman A. Al-Rabiah. "Predictive approach of COVID-19 propagation via multiple-terms sigmoidal transition model." *Infectious Disease Modelling* 7.3 (2022): 387-399.
- 12- Al-Rabiah, Abdulrahman A., et al. "Comparative Kinetic Analysis and Process Optimization for the Production of Dimethyl Ether via Methanol Dehydration over a  $\gamma$ -Alumina Catalyst." *Chemical Engineering & Technology* 45.2 (2022): 319-328.
- 13- da Silva MJ, Chaves DM, da Silva RC, Gabriel Filho JB, Bruziquesi CG, Al-Rabiah AA. Impacts of Sn (II) doping on the Keggin heteropolyacid-catalyzed etherification of glycerol with tert-butyl alcohol. *Chemical Engineering Science*. 2022 Jan 16;247:116913.
- 14- Abashar, M. E. E., and A. A. Al-Rabiah. "Highly efficient CO<sub>2</sub> hydrogenation to methanol via in-situ condensation and sorption in a novel multi-stage circulating fast fluidized bed reactor." *Chemical Engineering Journal* 439 (2022): 135628.
- 15- Abdulrahman A. Al-Rabiah, A Novel Process for Dimethyl Ether Synthesis Using Inter-Stage Ceramic Membrane for Water Removal, *Computer Aided Chemical Engineering*, Sep 25, 2020, Vol. 47, 643-648.
- 16- Abdelaziz, Omar Y., Abdulrahman A. Al-Rabiah, Mahmoud M. El-Halwagi, and Christian P. Hulteberg. "Conceptual design of a kraft lignin biorefinery for the production of valuable chemicals via oxidative depolymerization." *ACS Sustainable Chemistry & Engineering* 8, no. 23 (2020): 8823-8829.
- 17- Abashar, M. E. E. and Al-Rabiah, A. A., "Investigation of the efficiency of sorption-enhanced methanol synthesis process in circulating fast fluidized bed reactors", *Fuel Processing Technology*, Volume: 179, pp. 387-39, 8 Oct 2018
- 18- Abdulrahman A. Al-Rabiah, Abdelhamid M. Ajbar, Moustafa A. Soliman, and Omar Y. Abdelaziz, "Performance of Nanoporous Carbon Membrane for Hydrogen Recovery", *Journal of the Chemical Society of Pakistan (JCSP)*, Vol. 40, No. 01, pp. 43-51, Feb. 2018
- 19- Elizabeth Arkhangelsky, Filicia Wicaksana, Abdulrahman A. Al-Rabiah, Saeed M. Al-Zahrani and Rong Wang, "Understanding the interaction between biomacromolecules

- and their influence on forward osmosis process”, *Desalination*, Vol. 385 pp. 12–23, May 2016.
- 20-Abdulrahman A. Al-Rabiah, Omar Y. Abdelaziz, Enrique M. Montero and Mohamed S. Aazam, “Effect of styrene–butadiene–styrene copolymer modification on properties of Saudi bitumen”, *Petroleum Science and Technology*, Vol. 34, No. 4, , pp. 321-327, 20 March 2016.
  - 21-Abdulrahman A. Al-Rabiah, Abdelhamid M. Ajbar, Moustafa A. Soliman, Fahad A. Almalki, and Omar Y. Abdelaziz, “Modeling of nitrogen separation from natural gas through nanoporous carbon membranes”, *Journal of Natural Gas Science and Engineering* , 26, pp. 1278-1284, August 2015.
  - 22-Abdulaziz A. Bagabas, Mohamed Mokhtar, Vagif M. Akhmedov, Katabathini Narasimharao, Sulaiman N. Basahel and Abdulrahman Al-Rabiah, “ Ru–C–ZnO Composite Catalysts for the Synthesis of Methyl Isobutyl Ketone via Single Step Gas Phase Acetone Self-Condensation”, *Catalysis Letters*, Volume 144, Issue 7, pp. 1278-1288, July 2014.
  - 23-M. Naem, A. A. Al-Rabiah and W. Mughees, “Process Simulation of 1-Butene and N-Butane Separation By Extractive Distillation”, *International Journal of Engineering Research & Technology*, Vol. 3, Issue 6, pp. 747-750, June 2014.
  - 24-Elizabeth Arkhangelsky, Susan Sulaiman Lay, Filicia Wicaksana, Abdulrahman A. Al-Rabiah ,Saeed M. Al-Zahrani and Rong Wang, “ Impact of intrinsic properties of foulants on membrane performance in osmotic desalination applications”, *Separation and Purification Technology*, Volume 123, pp. 87-95, 26 February 2014.
  - 25-Arkhangelsky, E., Wicaksana, F., Tang, C., Al-Rabiah, A., Al-Zahrani, S. and Wang, R., “Combined organic–inorganic fouling of forward osmosis hollow fiber membranes”, *Water Research*, Vo. 46, Issue 19, pp. 6329-6338, 1 Dec 2012.
  - 26-Arkhangelsky, E., Wicaksana, F., Chou, S., Al-Rabiah, A., Al-Zahrani, S. and Wang, R, “Effects of Scaling and Cleaning on the Performance of Forward Osmosis Hollow Fiber Membranes”, *Journal of Membrane Science*, Vo. 415-416, pp. 101-108, 1 Oct. 2012.
  - 27-Al-Rabiah, A. A. and A. Ajbar, "Study of the Operability of a Continuous Bioreactor for the Pre-Fermentation of Cheese Culture", *Engineering in Life Sciences*, 2008, 8, No. 2, 157-166.
  - 28-Abashar, M.E.E.; Al-Rabiah, A.A. “Production of Ethylene and Cyclohexane in a Catalytic Membrane Reactor”, *Chemical Engineering and Processing*, Vo. 44, Issue 11, pp. 1188-1196, 1 November 2005.
  - 29-Abashar, M.E.E.; Al-Rabiah, A.A., “Novel Multi-shell Membrane Reactors for Efficient Dehydrogenation of Ethylbenzene”, *Engineering Sciences, Journal of KSU*, Vo. 18, No.1, pp. 117-137, 2005.
  - 30-W.A. Al-Masry, N.M. Ghasem, K.A. Al-Sugair, A.A. Ibrahim and Al-Rabiah A. A. ,“Effect of Increasing Temperatures on the Viscosity of Xanthan Gam Solutions”, *Journal of Saudi Chemical Society*, Vo. 9, No. 1, pp. 197-202, 2005.

## **SELECTED PROCEEDINGS AND CONFERENCES**

1. Abdulrahman A. AL-Rabiah, ” Integrated Dual Process for the Production of Methyl Isobutyl Ketone and Isopropyl Alcohol”, International Conference on Chemical and Biochemical Engineering, Paris, France, July, 2015.

2. Al-Rabiah, A. A., "Modeling and Simulation of n-Butane/1-Butene Separation Using Facilitated Transport Membranes", International Congress on Membranes and Membrane Processes (ICOM 2011), Amsterdam, Netherlands, July 23-29, 2011
3. Al-Rabiah, A. A., Ajbar, A. and Soliman, M. "Mathematical Modeling of Gas Permeation in Nanoporous Carbon Membranes" International Congress on Membranes and Membrane Processes, Amsterdam, Netherlands, July 23-29, 2011
4. Al-Rabiah, A. A. and Ajbar A. , "Dusty Gas Model for Nanoporous Carbon Membrane Used for Nitrogen Removal from Natural Gas", The 7th International Conference on Membrane Science & Technology (MST2009), Kuala Lumpur, Malaysia, 12-15 May 2009.
5. Al-Rabiah, A. A., Al-Malki, F. A., and Ajbar, A. "Removal of Nitrogen from Saudi Natural Gas Utilizing Nanoporous Carbon membrane", The International Conference on Nanotechnology: Opportunities and Challenges" (ICON008), Jaddah, Saudi Arabia, 17-19 June 2008.
6. Al-Rabiah, A. A., "Optimization of a Commercial Olefin Plant Using Pinch Analysis," CHISA 2004, Session H1, Paper 6, 22-26 August 2004, Prague - Czech Republic.
7. Al-Rabiah, A. A., "Membrane Technology for Hydrogen Separation in Ethylene Plants," 4th Ibero-American Congress on Membrane Science and Technology (CITEM), Brazil, July 16-18, 2003.
8. Al-Rabiah, A. A., "The Use of Hybrid Membrane/Distillation System for the Ethane/Ethylene Separation in Olefin Plants," 4th Ibero-American Congress on Membrane Science and Technology (CITEM), Brazil, July 16-18, 2003.
9. Al-Rabiah, A. A., "Membrane Technology for Hydrogen Separation in Ethylene Plants," 4th European Congress of Chemical Engineering, Spain, September 21-24, 2003.
10. Al-Rabiah, A. A., "The Use of Hybrid Membrane/Distillation System for the Ethane/Ethylene Separation in Olefin Plants," 4th European Congress of Chemical Engineering, Spain, September 21-24, 2003.
11. Al-Rabiah, A. A., "Heat Integration of the Commercial Ethylene Process," 4th European Congress of Chemical Engineering, Spain, September 21-24, 2003.
12. Al-Rabiah, A. A., Timmerhaus, K. D., and Noble, R. D., "Membrane Technology Use in Low-Temperature Hydrogen Recovery Section of the Ethylene Process," ICR0433, XXI IIR International Congress of Refrigeration, Washington, DC, USA, August 17-22, 2003.
13. Al-Rabiah, A. A., Timmerhaus, K. D., and Noble, R. D., "Design and Retrofit of the Refrigerated C2 Splitter in an Ethylene Plant with a New Hybrid Separation System," 6th World Congress of Chemical Engineering, Melbourne, Australia, September 23-27, 2001.
14. Al-Rabiah, A. A., Timmerhaus, K. D., and Noble, R. D., "Membrane Technology for Hydrogen Separation in Ethylene Plants," 6th World Congress of Chemical Engineering, Melbourne, Australia, September 23-27, 2001.
15. Al-Rabiah, A. A., Timmerhaus, K. D., and Noble, R. D., "Retrofit Analysis of Replacing the C2 Splitter in an Existing Ethylene Plant with a Hybrid Separation System," 76th Annual Meeting of American Association for Advancement of Science, Physical Sciences Session, Paper No.5, Las Cruces, New Mexico, April 9-12, 2000.
16. Al-Rabiah, A. A., Timmerhaus, K. D., and Noble, R. D., "Retrofit of the Refrigerated C2 Splitter in an Ethylene Plant with a New Separation System," AIChE 2000 Spring National Meeting, Paper 55e, Atlanta, GA, March 5-9, 2000.

17. Al-Rabiah, A. A., Timmerhaus, K. D., and Noble, R. D., "Modeling and Simulation of Several Hybrid Distillation Systems for the Ethane/Ethylene Separation," AIChE Annual Meeting, Paper 221j, Dallas, Texas, November 1-5, 1999.
18. A. A. Al-Rabiah, K. D. Timmerhaus, and R. D. Noble, "Modeling and Simulation of Several Hybrid Distillation Systems for the Ethane/Ethylene Separation," Proceedings of 20th International Congress of Refrigeration, Session T1.5, Paper No. 070, Sydney, Australia, September 19-24, 1999.
19. A. A. Al-Rabiah, K. D. Timmerhaus, and R. D. Noble, "Investigation of Several Hybrid Distillation Systems for the Ethane/Ethylene Separation," The International Congress on Membranes and Membrane Processes (Icom99), Session P5 (Hybrid Processes), Paper No. 2, Toronto, Canada, June 12-18, 1999.
20. A. A. Al-Rabiah, K. D. Timmerhaus, and R. D. Noble, "The Use of Hybrid Distillation for the Ethane/Ethylene Separation," 75th Annual Meeting of American Association for Advancement of Science, Paper No. 128, Santa Fe, New Mexico, April 11-15, 1999.
21. Al-Rabiah, A. A., Timmerhaus, K. D., and Noble, R. D., "Investigation of Several Hybrid Distillation Systems for the Ethane/Ethylene Separation," AIChE Spring National Meeting, Paper 93b, Houston, Texas, March 14-18, 1999.
22. A. A. Al-Rabiah and K. D. Timmerhaus, "Development of a Hybrid Propane/Propylene Splitter in the Ethylene Process," 74th Annual Meeting of American Association for Advancement of Science, Physical, Engineering and Information Sciences Session, Paper No. 2, Grand Junction, Colorado, May 17- 21, 1998.
23. A. A. Al-Rabiah, K. D. Timmerhaus, and R. D. Noble, "Utilization of a Hybrid Membrane System in Ethylene Production," Presented at the Tenth Annual Meeting of the North American Membrane Society (NAMS 98), Hybrid Processes Session, Paper No.3, Cleveland, May 16-20, 1998.
24. Al-Rabiah, A. A., Timmerhaus, K. D., and Noble, R. D., "Utilization of a Hybrid Membrane System in Olefin Production," Proceedings of the 8th Ethylene Producers' Conference, Vol. 5, 619-624, AIChE, New York, NY, 1996.
25. Al-Rabiah, A. A., Timmerhaus, K. D., and Noble, R. D., "Utilization of a Hybrid Membrane System in Olefin Production," Proceedings of 5th World Congress of Chemical Engineering, Vol. 4, 335-340, San Diego, CA, July 1996.
26. Al-Rabiah, A. A., Timmerhaus, K. D., and Noble, R. D., "Membrane/Distillation Hybrid Design for Propane/Propylene Separation," AIChE Spring National Meeting, Paper 63e, New Orleans, February 25-29, 1996.