

## **SCHOLAR/INDUSTRIAL EXPERIENCE**

Teaching / Research & Development / Engineering / Process Safety

Passionate teacher and outstanding researcher. Uniquely qualified scholar with 20+ years of experience in research and development and engineering in the materials, chemical and energy industries in North America, Europe, Australia and Asia. Fluent in English, Portuguese, Spanish, French, and Russian.

### ***Current Position:***

**Michigan Technological University**, Houghton, MI

2017 - Present

**Professor of Chemical Engineering and Herbert H. Dow Chair in Chemical Process Safety**

- › Teaching Chemical Engineering Courses
- › Research in membrane separation: water treatment and gas separation
- › Developing and promoting through curricular materials, graduates with technical competence and appropriate culture in Process Safety
- › Promoting dissemination of Process Safety in academia

### ***Education:***

**Ph.D., Chemical Engineering** – University of New South Wales, Australia

**BSc/MSc, Chemical Engineering** – DI Mendeleev University of Chem Technology of Russia

**Basic Petroleum Engineering** - Petroskills Houston

**Fundamentals of LNG Technology** - Chevron, Richmond, CA

**Fundamentals of Glass Technology** - Corning Incorporated, Corning, NY

**Fundamentals of Ceramic Manufacturing Technology** - Corning Incorporated, Corning, NY

**Executive Program** – Stanford University, Graduate School of Business

### ***Awards & Honors:***

AIChE George Lappin Program Committee Service Award (2016)

PG&E Shermer L. Sibley Safety and Health Award Champion (the highest safety honor bestowed at PG&E) (2015)

AIChE Pioneers of Diversity Award (2015)

AIChE Separations Division Founders Award for Outstanding Service to the Division (2014)

AIChE Van Antwerpen Award for Service to the Institute (2009)

Professional Progress Award of the Northern California Section of AIChE – the highest honor of the section – for significant achievements in chemical engineering and outstanding service to the section (2006)

Chevron President's Award for co-chairing the largest chemical engineering conference in the world (2006)

AIChE Gary Leach Award given to the Education Services Subcommittee of CEOC for outstanding services in the development and oversight of AIChE professional training programs (2004)

AIChE Gary Leach Award for fundraising and arrangements for the 2003 San Francisco Annual Meeting (2004)

AIChE John C. Heiman Impact Award for Excellence in Educational Support (on behalf of NorCal AIChE) (2003)

AIChE Marx Isaacs Award for Outstanding Newsletter (on behalf of NorCal AIChE) (2002)

Fellow - American Institute of Chemical Engineers (AIChE)

Fellow – Institute of Chemical Engineers (IChemE, UK)

Fellow Chartered Professional Engineer – Institution of Engineers, Australia (IEAust)

Commonwealth Postgraduate Research Award to undertake Ph.D. studies in Chemical Engineering at the University of New South Wales in Australia (1989)

**Research Interests:**

My approach is to establish a compelling need for the research, based on business and societal drivers. The ultimate goal of my research is to contribute to addressing the grand societal challenges: Energy, Water, Food, Health, and Climate Change, i.e. sustainability.

**Membrane Technology/Nanotechnology:**

- Water treatment and development of economic processes for sustainable water use
- Membrane Integrity: Water Treatment and bio/pharma processes
- Membrane Fouling and Module Design: hydrodynamics strategies to enhance mass transfer and optimize capital cost of membrane processes
- Membranes and processes for carbon dioxide capture
- Organic/organic separations (e.g., olefin/paraffin separation)
- Membrane structure/permeability relationships for challenging separations (polymer membranes, inorganic membranes and mixed-matrix membranes)

**Process Intensification:**

- Integration of membrane technology with chemical processes to recover valuable products from waste streams. This includes adding value to a product by recovering it for chemical feedstock value instead of using it as fuel; pollution control and less capital and energy intensive processes, i.e. process intensification

**Water-Energy-Food Nexus:**

- Development of processes to optimize water consumption and recycle associated with energy generation and food production

**Teaching Experience and curriculum development activities:**

Michigan Tech: developed and taught new course for seniors and graduate students: “Membrane Separation Fundamentals and Applications”; developed materials and taught a Unit Operations Lab; revamped the curricula and teaching “Process Safety” (seniors) and Lab Safety (graduate students). (2017-)

San Jose State University: Guest Lecturer: Mass Transfer and Separations/Membrane Processes. (1999-2003)

University of New South Wales: Tutor (Teaching Assistant): Mass Transfer Fundamentals; Mass Transfer and Separations; Fluid Flow; supervised 3 Bachelor research projects. (1989 – 1992)

Hosted MIT Chemical Engineering Practice School at Corning Incorporated - general arrangements and technical guidance on 12 graduate research projects (2011/2012)

Member of AIChE Careers and Education Operating Council Education Services Subcommittee, development and oversight of Chemical Engineering professional training programs – (2004 -2006)

**Professional Society Affiliations:**

Fellow of the American Institute of Chemical Engineers (AIChE)  
 Fellow of the Institution of Chemical Engineers (IChemE, UK)  
 Fellow Chartered Professional Engineer (Engineers Australia)  
 Member – North American Membrane Society (NAMS)  
 APEC (Asia-Pacific Economic Cooperation) Engineer (registered by Engineers Australia)  
 International Professional Engineer (registered by Engineers Australia)  
 Registered Professional Engineer – Australia  
 Registered Chartered Engineer – European Engineering Council, UK

**Boards and Committees**

American Gas Association, Process Safety Sub-Committee, Chair (2016-2017)

AIChE Treasurer and Member of the Board of Directors (2011-2013)

AIChE Board of Directors Member (2005-2007)

Member of the Managing Board of CCPS (Center for Chemical Process Safety) (2011-2013)

AICHE Executive Board of the National Program Committee (EBPC), 1st Vice-Chair, 2nd Vice-Chair, Chair (2008-2010)  
 Member of the American Gas Association (AGA) Safety and Occupational Health Committee & Process Safety Sub-committee (2013-2017)  
 Member of the Technical Steering Committee of CCPS (Center for Chemical Process Safety) (2013-2017)  
 AIChE Board of Directors Finance Committee, Chair (2011-2013)  
 AIChE Key Industry and Government Leaders Board of Directors Task Force Chair (2004-2005; 2011-2012)  
 AIChE Energy Programming Board of Directors Task Force, Chair (2007)  
 AIChE Board of Directors Membership Committee, Member (2005-2007)  
 AIChE Career and Education Operating Council Member (2004-2006)  
 Vice-Chair of the General Arrangements Committee for the 2003 AIChE Meeting in San Francisco (2003)  
 AIChE Separations Division, Director, 1st Vice-Chair, 2nd Vice Chair, Chair, Past Chair (2002-2008)  
 The Northern California (NorCal) Section of AIChE, Director, Vice-Chair, Chair (2000-2003)  
 Joint Victorian Chemical Engineering Committee (Australia) (JV of IEAust & IChemE), Member, Chairman, Past Chairman (1994-1998)

### ***Editorial and Review Boards:***

Member of the Editorial Board of CEP (Chemical Engineering Progress) (2008-2013)  
 Referee of the Journal of Membrane Science (1992-2006; 2018-)  
 Member of the National Science Foundation (NSF) Research Proposal Review Panel (2002)

### ***Organization of Scientific Meetings***

Co-Chair of the Program Committee for the 2006 AIChE Meeting in San Francisco (the largest ChemE Conference until 2006)  
 Member of the Scientific Committee of the 7<sup>th</sup> World Congress of Chemical Engineering, Glasgow, Scotland (2005)  
 Member of the Scientific Committee of the International Membrane Science & Technology Conference (IMSTEC), Sydney, Australia (2003)  
 Chair, NorCal AIChE 2001 Symposium: Semiconductors: The New Frontier of Chemical Engineering (2001)  
 Chair, NorCal AIChE 2000 Symposium: Challenges and Solutions for the 21st Century in the Semiconductor Industry (semiconductors topic offered for the first time by NorCal AIChE) (2000)  
 Chaired and helped organize several technical sessions for conferences of the North American Membrane Society and AIChE (2000-2006; 2018-)

### ***Industrial Experience:***

**Pacific Gas & Electric Company**, San Francisco, CA 2013 - 2017

#### **Director & Chief Engineer**

- Created and led a team of engineers to develop and implement Process Safety practices across Gas Operations, including PHA, PSSR, MOC and Quantitative Risk Assessment.
- Led Gas Operations to certification to chemical industry international management systems standard RC14001 - includes Occupational Health & Safety, Process Safety, Product Safety, Environmental Management, Security, Emergency Management and Communications. PG&E became the first Gas Utility in the world certified to RC14001.

**Corning Incorporated**, Corning, NY 2011 - 2013

#### **Chemical Engineering Manager**

- Led a chemical engineering team to develop and deliver solutions across corporate businesses through Research & Development, Capital Engineering projects and troubleshooting and optimization of plants. Scope: Glass Display Technologies (glass substrates for LCD flat panels), Environmental Technologies (ceramic substrates and filters for mobile emission control systems), Telecommunications (optical fibers), and Life Sciences (optical biosensors for drug discovery,

labware and manufacture of cell culture media and molecular biology reagents related to tissue and cell culture applications).

**Chevron Corporation**, Richmond, CA / Houston, TX / Bakersfield, CA 2004 - 2011

#### Senior Staff Engineer/Engineering Manager

- Staff Engineer with Chevron Energy Technology Company conducting research and development for upstream and downstream applications, including gas processing and heavy oil upgrade.
- Led multidisciplinary teams of engineers and designers on a \$350M+ produced water capital project in the San Joaquin Valley Chevron Exploration and Production Oil & Gas Operations.

**Membrane Technology & Research, Inc.**, Newark, CA 1999 - 2004

#### Process Development Manager/Principal Investigator

- Developed research proposals and served as PI on membrane separation research projects sponsored by DOE, EPA, NSF and industrial clients, to develop technologies from lab bench scale to pilot scale leading to commercialization. Applications included Natural Gas processing, Refining, and Petrochemicals.

**Fluor Daniel Engineering Corporation**, Australia / Europe / United States 1994 - 1999

#### Process & Project Engineer

*Multibillion-dollar capital projects in Australia, Europe, and North America spanning engineering studies and plant revamps as well as grass-roots mineral and oil and gas projects for Fortune 500 clients. Clients included: ExxonMobil, Shell, Phillips Petroleum, BHP Petroleum, Murrin Murrin, and Kodak. Projects included:*

- Front-End-Engineering Design of \$1.5B project for an industrial complex to produce nickel and cobalt in Western Australia.
- \$1.9B off-shore grass-roots oil & gas project in the North West Shelf of Western Australia.
- Led numerous process hazard and operability studies (HAZOPs) for new designs and existing plants.

#### Water Treatment Experience

Membrane Separation Technology Expert (Ph.D.). Processes include: Reverse Osmosis, Microfiltration, Nanofiltration (and Gas Separation).

Engineering Manager with **Chevron** North America Exploration & Production on a \$350 mil. Capital Project to develop a strategy to manage (utilize or dispose) over 600,000 barrel of produced water from oil production in the San Joaquin Valley operations.

At the **Sydney Water Board/Pollution Abatement Group** provided engineering expertise to develop and implement new processes and technologies for sewage, sludge and stormwater and by-products disposal. Projects ranged from concept design to operation and optimization:

- Operation and optimization of a microfiltration unit for processing anaerobic digester supernatant at Bondi Sewage Treatment Plant.
- Development of a research program and project outline to assess the performance of a UF unit for processing conventionally primary treated sewage subjected to secondary biological treatment (Biological Aerated Submerged Filter (BASF) at Malabar Sewage Treatment Plant.
- Design of a high recovery reverse osmosis/nanofiltration system for processing sewage subjected to primary and secondary treatment.

#### Prior professional experience:

**Development Engineer**, CSR Ltd. (Australia)

**Process Engineer**, Incitec Ltd. (Australia)

**Consultant**, Sydney Water Board/Pollution Abatement Group (Australia)

#### Patents

**A.R. Da Costa**, C.A. Powers, B.E. Reynolds, O.A. Odueyungbo, "Heavy oil upgrade process including recovery of spent catalyst", U.S. Patent 9,290,826, Mar. 22, 2016

- L.S. Shah**, C.A. Powers, J.R. Stoy, F.D. Brent, B.E. Reynolds, A.R. Da Costa, "Recovery of slurry unsupported catalyst", U.S. Patent 8,765,622, 2014, Jul. 1, 2014
- A.R. Da Costa**, C.A. Powers, B.E. Reynolds, S.A. Odueyungbo, "Heavy oil upgrade process including recovery of spent catalyst", U.S. Patent 8,080,155, Dec. 20, 2011
- A.R. Da Costa**, R. Daniels and A.D. Jariwala, "Liquid-Phase Separation of Low Molecular Weight Organic Compounds", U.S. Patent 7,479,227 B2, Jan. 20, 2009
- R. W. Baker**, A.R. Da Costa, and K. A. Lokhandwala "Carbon Dioxide Removal Process", U.S. Patent 6,648,944 B1 Nov. 18, 2003
- R. W. Baker**, K. A. Lokhandwala, J. G. Wijmans, and A.R. Da Costa, "Nitrogen Removal from Natural Gas Using Two Types of Membranes", U.S. Patent 6,630,011 B1, Oct. 7, 2003
- I. Pinnau**, Z. He, A.R. Da Costa, K. D. Amo, and R. Daniels, "Gas Separation Using Organic-Vapor-Resistant Membranes and PSA", U.S. Patent 6,592,650, July 15, 2003
- R.W. Baker**, I. Pinnau, Z. He, K. D. Amo, A.R. Da Costa, and R. Daniels, "Nitrogen Gas Separation Using Organic-Vapor-Resistant Membranes", U.S. Patent 6,579,341, June 17, 2003
- R.W. Baker**, I. Pinnau, Z. He, K. D. Amo, A.R. Da Costa, and R. Daniels, "Carbon Dioxide Gas Separation Using Organic-Vapor-Resistant Membranes", U.S. Patent 6,572,680, June 3, 2003
- R.W. Baker**, I. Pinnau, Z. He, A.R. Da Costa, R. Daniels, and K. D. Amo, "Gas Separation Using Organic-Vapor-Resistant Membranes in Conjunction with Organic-Vapor-Selective Membranes", U.S. Patent 6,572,679, June 3, 2003
- R.W. Baker**, I. Pinnau, Z. He, K. D. Amo, A.R. Da Costa, and R. Daniels, "Hydrogen Gas Separation Using Organic-Vapor-Resistant Membranes", U.S. Patent 6,544,316, April 8, 2003
- R.W. Baker**, A.R. Da Costa, and R. Daniels, "Membrane-Augmented Manufacture of Cumene", U.S. Patent 6,525,236, Feb 25, 2003
- R. W. Baker**, K. A. Lokhandwala, J. G. Wijmans, and A.R. Da Costa, "Two-Step Process for Nitrogen Removal from Natural Gas", U.S. Patent 6,425,267, July 30, 2002
- R.W. Baker**, A.R. Da Costa, and R. Daniels, "Membrane-Augmented Manufacture of Propylene Derivatives", U.S. Patent 6,414,202 B1, July 2, 2002
- I. Pinnau**, Z. He, A.R. Da Costa, K. D. Amo, and R. Daniels, "Gas Separation Using Organic-Vapor-Resistant Membranes", U.S. Patent 6,361,583 B1, March 26, 2002
- I. Pinnau**, Z. He, A.R. Da Costa, K. D. Amo, and R. Daniels, "Gas Separation Using C3+ Hydrocarbon-Resistant Membranes", U.S. Patent 6,361,582 B1, March 26, 2002
- R.W. Baker**, A.R. Da Costa, R. Daniels, I. Pinnau, and Z. He, "Membrane-Augmented Polypropylene Manufacturing", U.S. Patent 6,271,319 B1, August 7, 2001

### ***Refereed Journal Publications***

- K.A. Lokhandwala**, I. Pinnau, Z. He, K.D. Amo, A.R. Da Costa, J.G. Wijmans, R.W. Baker, "Membrane Separation of Nitrogen from Natural gas: A Case Study from Membrane Synthesis to Commercial Deployment", J. Memb. Sci. **346** (2010) 270-279.
- A.G. Fane**, A.R. Da Costa, Z. Cao, and D. Wiley, "Factors affecting performance of membrane processes - the spiral wound element design and operation," Australian J. Dairy Tech. **52**, 1 (1997).
- A. R. Da Costa** and A.G. Fane, "Net-Type Spacers: The Effect of Configuration on Fluid Flow Path and Ultrafiltration Flux," Ind. Eng. Chem. Res. **Vol. 33**, No. 7 (1994).
- A.R. Da Costa**, A.G. Fane and D. Wiley, "Spacer Characterization and Pressure Drop Modeling in Spacer-Filled Channels," J. Memb. Sci. **87**, 79 (1994).
- A.R. Da Costa**, A.G. Fane and D. Wiley, "Ultrafiltration of Whey Protein Solutions in Spacer-Filled Channels," J. Memb. Sci. **76**, 245 (1993).
- A.R. Da Costa**, "Fluid flow and mass transfer in spacer-filled channels for ultrafiltration", Ph.D. Thesis, University of New South Wales, Sydney, Australia, 1993

**A.R. Da Costa**, A.G. Fane, C.J.D. Fell and A. Franken, "Optimal Channel Spacer Design for Ultrafiltration," J. Memb. Sci. **62**, (1991).

### **Conference Presentations**

**A.R. Da Costa**, "The Development and Implementation of a Risk-Based Process Safety Management System in the Gas Industry", AGA Operations Conference, Phoenix, AZ (April 19-22, 2016).

**A.R. Da Costa**, A.G. Fane, D.E. Wiley, "State of the Art of Transport Phenomena in Channels with Turbulence Promoters", AIChE Annual Meeting, Salt Lake City, UT (November 7-12, 2010).

**A.R. Da Costa**, K. Amo, A. Jariwala, Z. He, I. Pinnau and J.G. Wijmans, "A Membrane Process for Carbon Dioxide Recovery in Oil Field Flood Operations", AIChE Annual Meeting, Austin, Texas (November 7-12, 2004).

**A.R. Da Costa** and K.A. Lokhandwala, "Membrane Technology for the Natural Gas Processing Industry Needs", Separations Technology VI: New Perspectives on Very Large Scale Operations, Fraser Island, Australia (October 3-8, 2004).

**A.R. Da Costa**, R. Daniels, A. Jariwala, Z. He, I. Pinnau, J.G. Wijmans and R.W. Baker, "Addressing the Challenges of Propylene/Propane Separation", Fifteenth National Meeting of the North American Membrane Society (NAMS), Honolulu, Hawaii (June 27-30, 2004).

**A.R. Da Costa**, I. Pinnau, J.G. Wijmans and R.W. Baker "Hydrogen Recovery Process Using New Membrane Materials", AIChE Spring National Meeting, New Orleans LA (April 25-29, 2004).

**A.R. Da Costa**, K.D. Amo, A. Jariwala, R. Daniels, Z. He, R. Blanc, I. Pinnau, J.G. Wijmans and R.W. Baker "Novel Membranes and Membrane Processes for Industrial Separations, Part II", AIChE Spring National Meeting, New Orleans LA (April 25-29, 2004).

**A.R. Da Costa**, K.D. Amo, A. Jariwala, Z. He, I. Pinnau and J.G. Wijmans "The Effect of Gas Activity and Hydrocarbon Type on Membrane Hydrogen/Methane Separation Performance", Intl. Memb. Science & Tech. Conf. (IMSTEC'03), Sydney, Australia (2003).

**A.R. Da Costa**, R. Daniels, A. Jariwala, Z. He, A. Morisato, I. Pinnau, J.G. Wijmans and R.W. Baker "Plasticization-Resistant Membranes for Propylene/Propane Separation", AIChE Annual Meeting, Indianapolis, Indiana (November 3-8, 2002).

**M. Jacobs**, K.A. Lokhandwala and A.R. Da Costa, "Membrane Systems for Nitrogen Rejection", 81st Annual GPA Convention, Dallas TX (March 11-13, 2002).

**A.R. Da Costa**, J.G. Wijmans, I. Pinnau and K. Amo, "Separation of Hydrogen/Light Hydrocarbon Gas Mixtures", AIChE Spring National Meeting, New Orleans LA (March 10-14, 2002).

**A.R. Da Costa**, J.G. Wijmans, I. Pinnau and R. Daniels, "Membranes for Olefins Recovery", AIChE Spring National Meeting, New Orleans LA (March 10-14, 2002).

**J.G. Wijmans**, I. Pinnau, A.R. Da Costa and R.W. Baker, "Membrane Reactor Designs for the Production of Olefins", AIChE Spring National Meeting, New Orleans LA (March 10-14, 2002).

**A.R. Da Costa**, J.G. Wijmans and R.W. Baker, "Ethylene Recovery by Membrane Technology", AIChE Spring National Meeting, Houston TX (April 22-26, 2001).

**A.R. Da Costa**, R. Daniels, Z. He, A. Morisato and I. Pinnau, "Membrane Process for the Recovery of Propylene from Chemical Industry Waste Streams", World Congress of Chemical Engineering, Melbourne, Australia (September 23-27 2001).

**A.R. Da Costa**, "Update Olefin Recovery from Process Streams", Eighteenth Annual Membrane Technology/Separations Planning Conference, Newton, MA, (2000).

**K. Amo**, R. Baker, A. Da Costa, R. Daniels, K. Lokhandwala, M. Ringer, T. Su and J.G. Wijmans, "Membrane Process for Nitrogen Removal from Natural Gas", 11th National Meeting of the North American Membrane Society (NAMS), Boulder, Co, (2000).

**A.R. Da Costa**, K.A. Lokhandwala, J.G. Wijmans and R.W. Baker, "Natural Gas Processing by Membranes", presented at the DOE Fossil Energy Fuels Program Review: Energy Products for the 21<sup>st</sup> Century, Cincinnati, OH (September 21-23, 1999).

**A.R. Da Costa**, A.G. Fane, T. McDermott, M. Mudge and M. Roos, "Analysis of the Performance of Ultrafiltration Spiral-Wound Modules," Intl. Memb. Science & Tech. Conf. (IMSTEC'92), Sydney, Australia (1992).

**A.R. Da Costa**, P. Sun, K. Kim, V. Chen, D. Wiley and A.G. Fane, "Aspects of Fouling and Cleaning in Ultrafiltration Systems," 20th Australasian Chem. Eng. Conf., CHEMECA 92, Canberra ACT, Australia (1992).

**A.R. Da Costa** and A.G. Fane, "The Effect of Spacer Design on Ultrafiltration Performance," Fifth National Meeting of the North American Membrane Society (NAMS), Lexington, KY, (1992).

**A.G. Fane**, A.R. Da Costa and C.J.D. Fell, "Optimal Spacers for Ultrafiltration," Fourth National Meeting of the North American Membrane Society (NAMS), San Diego, CA (1991).

**A.R. Da Costa**, M. Costello, A.G. Fane and C.J.D. Fell, "Mass Transfer and Flow Distribution Studies for Improved Membrane Performance," 18th Australasian Chem. Eng. Conf., CHEMECA 90, Auckland, NZ (August 1990).

### ***Invited University Presentations***

Seminar, Chemical Engineering Department, Clemson University, SC (2018)

Process Safety Lecture, Chemical Engineering Department, San Jose State University (2015)

Seminar, Chemical Engineering Department, University of Utah, Salt Lake City (2006)

Seminar, Chemical Engineering Department, Purdue University, West Lafayette, IN (2005)

Keynote Address, AIChE Student Regional Conference, UC, Berkeley, California (2005)

Seminar, Chemical Engineering Department, Stanford University, California (2001 & 2004)

Seminar, Chemical Engineering Department, University of Nevada, Reno (2003)

Keynote Address, "Membrane Olefins Recovery: Challenges and Solutions", Russian Scientific Conference – Membranes-2001, Moscow, Russia, October 2-5, 2001.

### ***Competitive Research Grants and Research Reports***

**Multilayer** Composite Membranes for Upgrading Acid-Rich Natural Gas Awarded by the U.S. Dept. of Energy Small Business Innovation Research Program, USD OE - Office of Energy Research (ER), April 25, 2013, I. Pinnau (Principal Investigator) A.R. Da Costa (Project Manager), A. Jariwala, K. Amo, Z. He, J.G. Wijmans

**Hydrogen** Recovery and Carbon Dioxide Separation In Steam Methane Reformers, Awarded by the U.S. Dept. of Energy Small Business Innovation Research Program in 2004, A.R. Da Costa (Principal Investigator)

**Dehydration** of Natural Gas, Awarded by the U.S. Dept. of Energy Small Business Innovation Research Program in 2004, A.R. Da Costa (Principal Investigator)

**Olefin** Recovery from Chemical Industry Waste Streams, submitted to U.S. Dept. of Energy, Office of Industrial Technology, 50 pages, Nov. 2003, A.R. Da Costa (Principal Investigator), R. Daniels, A. Jariwala, Z. He, A. Morisato, I. Pinnau and J.G. Wijmans

**Hydrogen** Recovery Process Using New Membrane Materials, submitted to U.S. Dept. of Energy, Small Business Innovation Research Program, 43 pages, Sept. 2003, A.R. Da Costa (Principal Investigator), K. Amo, Z. He, I. Pinnau and J.G. Wijmans

**Separation** of Light Hydrocarbon Mixtures by Pervaporation, submitted to National Science Foundation, Small Business Innovation Research Program, 36 pages, July 2003, A.R. Da Costa (Principal Investigator), R. Daniels and J.G. Wijmans

**Composite** Membranes for Upgrading Acid-Rich Natural Gas Awarded by the U.S. Dept. of Energy Small Business Innovation Research Program, USD OE National Nuclear Security Administration (NNSA), July 23, 2003, Z. He (Principal Investigator), K. Amo, A.R. Da Costa (Project Manager), R.W. Baker and I. Pinnau

**NGL** Recovery in Carbon Dioxide Oil-Field Flood Operations, submitted to U.S. Dept. of Energy, Small Business Innovation Research Program, 52 pages, Jun 13, 2003, A.R. Da Costa (Project Manager), K. Amo, Z. He, I. Pinnau and J.G. Wijmans (Principal Investigator)

**Separation** of Hydrogen/Light Hydrocarbon Gas Mixtures, submitted to U.S. Dept. of Energy, Small Business Innovation Research Program, 69 pages, July 2002, A.R. Da Costa (Principal Investigator), K. Amo, T. Hofman, I. Pinnau and J.G. Wijmans

**Integrated** Membrane System for Upgrading Nitrogen-Rich Natural Gas, submitted to the U.S. Dept. of Energy, USD OE Office of Science (SC), Jul. 9, 2002, K. Amo, R.W. Baker, R. Blanc, A. Da Costa (Project Manager), A. He, I. Pinnau, and J. G. Wijmans (Principal Investigator)

**A Membrane** Process to Recover and Use Methane Emissions, submitted to U.S. EPA, Small Business Innovation Research Program, 32 pages, Oct. 2001, A.R. Da Costa (Principal Investigator), K. Amo, J.G. Wijmans and R.W. Baker

**Novel** Membranes for In-Process Recycling of Hydrocarbon Feedstocks in Oxygen-Oxidation Processes, submitted to U.S. EPA, Small Business Innovation Research Program, 38 pages, Sep. 2001, A.R. Da Costa (Project Manager), K. Amo, Z. He, I. Pinnau and J.G. Wijmans (Principal Investigator)

**A Membrane** Process to Recover Hydrogen from Waste Gas Streams, Awarded by the National Science Foundation Small Business Innovation Research Program in 2001, A.R. Da Costa (Principal Investigator)

**Isobutane** Isomerization Membrane Reactor, Awarded by the U.S. Dept. of Energy Small Business Innovation Research Program in 2001, Project: 2002-2004, A.R. Da Costa (Project Manager), R. Daniels, Z. He, I. Pinnau and J.G. Wijmans (Principal Investigator)

**Nitrogen** Removal from Natural Gas, submitted to U.S. Dept. of Energy, Small Business Innovation Research Program, 45 pages, June 2000, K.A. Lokhandwala (Project Manager), J.G. Wijmans (Principal Investigator), M.B. Ringer, T.T. Su, Z. He, I. Pinnau, A. Morisato, K. Amo, A.R. Da Costa, R.W. Baker, R. Olsen, H. Hassani and T. Rathkamp

### ***Other Research Projects Reports***

Optimization of a microfiltration unit for processing anaerobic digester supernatant at Bondi (Australia) Sewage Treatment Plant (1992)

Research program to assess the performance of a UF unit for processing conventionally primary treated sewage subjected to secondary biological treatment (Biological Aerated Submerged Filter (BASF) at Malabar (Australia) Sewage Treatment Plant (1992)

Design of a high recovery Reverse Osmosis/Nanofiltration system for processing sewage subjected to primary and secondary treatment. (Sydney Water/Australia) (1992)

### ***Professional Service: Volunteer Leadership***

More than 20 leadership roles with the American Institute of Chemical Engineers (AIChE). Received several awards for fundraising, organizational and leadership skills, including leading the development of the technical program of one of the largest chemical engineering conferences in the world - the 2006 Annual Meeting in San Francisco. Led or contributed to symposia on semiconductors, biotechnology and energy with the participation of academia, industry and government. As a member of the Education Services Task Force of the AIChE Career and Education Operating Council, contributed to the development and oversight of professional training programs and was recognized with the AIChE Gary Leach Award in 2004. As Chair of the AIChE Executive Board of the Program Committee, worked with hundreds of academics to influence the direction of Chemical Engineering research. As Treasurer and member of the Executive Committee of the AIChE Board of Directors, was involved in all strategy development and decisions for the Institute, with fiduciary responsibility to oversee the development and management of the multi-million-dollar budget. Served as a Member of the Managing Board of the Center for Chemical Process Safety (CCPS). As co-founder and chair of the Process Safety Subcommittee of the American Gas Association (AGA) and member of the CCPS Technical Steering Committee initiated the transformation and creation of the Process Safety culture in the gas utility and pipeline industries in North America.