

Curriculum Vitae

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Work Address: Department of Chemical Engineering
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Citizenship: Canadian
Languages: French, English, Arabic

EDUCATION

1987 Post-doc. University of British Columbia, Chemical Engineering Dept.
Title: *Combustion of Waste and Coal in a Circulating Fluidized Bed*

1985 Ph.D. Ecole Polytechnique de Montréal, Department of Chemical Engineering
Title of thesis : *The Role of Interparticle Forces in Fluidized Beds*

1981 M.Sc.A. Ecole Polytechnique de Montréal, Department of Chemical Engineering
Title of thesis: *Modelling Catalytic Fixed Beds in the Presence of a Heat Pipe*

1980 Engineer École Nationale Supérieure des Industries Chimiques (ENSIC)
Nancy, France.

1974-1976 Math. Sup. et Math. Spé
Lycée Lyautey, Casablanca, Morocco

EXPERTISE

- Process extrapolation
- Development of high temperature and high pressure processes
- Process simulation and optimization
- Technico-economic study of processes
- Chemical reactor simulation and optimization
- Catalytic reactions
- Heat transfer
- Combustion, incineration, pyrolysis and gasification
- Biorefinery
- Hydrodynamics of chemical reactors (diphasic, biphasic and triphasic, fixed bed, fluidized bed, rotating...)
- Powder technology (mixing...)
- Technological innovations

ACADEMIC & INDUSTRY EXPERIENCE

- 2015-2017 Member of the 10th World Conference of Chemical Engineering in Barcelona (WCCE10)
- 2014-2016 Chairman of Int. Conf. Fluidization XV
- 2010-2015 Chair, CRSNG-Total for “the development of new high temperature and pressure processes”
- 2014-2015 Sabbatical year
R&D Center
Total Inc.
Le Havre, France
- 2013-2014 Member of Program Planning and Research at the University Mohammed VI Polytechnique (4 engineering planning programs and R & D development including the preparation of 10 Chairs)
- 2012- Head of Innovation Workshop for all Ph.D. Students
- 2012-2013 Chairman of the Committee for Evaluation, Improvement and Enhancement of Education (Président du comité Comité pour l'évaluation, l'amélioration et la valorisation de l'enseignement) (CÉAVE)
- 2010-2017 Member of the Board of Directors of École Polytechnique de Montréal (Conseil d'Administration)
- 2010-2013 Member of the Grant Evaluation Committee for the Natural Sciences and Engineering Research Council of Canada (NSERC). Discovery Grants
- 2009-2012 Member of the Grant Evaluation Committee for the Natural Sciences and Engineering Research Council of Canada (NSERC). Strategic Grants
- 2013- Executive member of Chemical Eng. Dept
- 2008- Member of the *Canadian Academy of Engineering*
- 2005- 2014 Chairman of the Communication Committee of the Department of Chemical Engineering
- 1998-2003 Member of the Academic Council of École Polytechnique (Conseil Académique)
- 2008-2013 Member of the Academic Council of École Polytechnique (Conseil Académique)
- 2009-2012 Member of the Enrichment Workshops skills Committee (Comité Ateliers d'enrichissement des compétences)
- 2007-2009 Technical Director of the 8th World Conference of Chemical Engineering (WCCE8)
- 2007- Member of the Board of Directors of Ecolomondo
- 2006- Member of the Board of Directors of ShopMedia
- 2006- Director
Research Center in Process Engineering: Biorefinery (GRIP)
9 professors, 100 researchers and graduate students
Budget : approximately \$3,000,000 per year
Department of Chemical Engineering
École Polytechnique de Montréal.
<http://www.biorefinery.ws>
- 2006- Editor of the international scientific journal “Chemical Product and Process Modeling”
<http://www.bepress.com/cppm>.
- 2006- Executive Vice President
ShopMedia
- 2005-2006 Sabbatical year
R&D Center
Total Inc.
Bruxelles, Belgium
- 2004-2006 Director
Research Group on Chemical Reactors (GRC)

3 professors, 30 researchers and graduate students
 Budget : approximately \$1,000,000 per year
 Department of Chemical Engineering
 École Polytechnique de Montréal.

2000, 2001, 2009 Member of the doctorate Honoris Causa Committee

1994- Full Professor
 Chemical Engineering
 École Polytechnique de Montréal

1995- President (part-time)
 Auditpro Technologies Inc.
 Consulting company for process development

2002-2005 President (part-time)
 Formmat Technologies Inc.
 Company with 6 employees specializing in the development of composite materials

1996-2001 Director
 Centre Biopro : *Engineering research center for biotechnological processes*
 13 multidisciplinary professors
 100 researchers and graduate students
 Budget : approximately \$3,000,000 per year
 Ecole Polytechnique de Montréal.

2000-2002 Associate Professeur
 Chemical Engineering Department
 Université Laval, Canada.

2000-2001 Unpaid year
 First vice president of technology (CTO) full-time position
 Cynovad Technologies Inc.
 A company with about one hundred employees specializing in dental CAO
 Budget : \$50,000,000 per year

1998-2000 Associate Professor
 Department of Chemical Engineering
 Université Laval, Québec, Canada.

1996-1997 Sabbatical Year
 Course, R&D and design of mining processes
 Groupe ONA, Managem
 Morocco

1991-1994 Professor
 Chemical Engineering
 École Polytechnique de Montréal.

1988-1991 Adjunct Professor
 Chemical Engineering
 École Polytechnique de Montréal.

1986-1987 Researcher
 Chemical Engineering
 École Polytechnique

INDUSTRY CONSULTATIONS

The most important ones:

- 2016-2019 APT, “*Potassium from Feldspar*”, US-Bresil
- 2018-2019 Total, “*Reactor design for OCM*”, France
- 2011-2019 Groupe OCP, *Thermal Decomposition of Phosphogypsum*, Morocco
- 2015-2018 Total, “*Modeling of Slurry Bubble Column Reactor*”, France
- 2014 JDSU, *CVD Fluidized Bed of Nano-Particles*, US
- 2011-2014 ReCommunity, *Co-combustion*, US
- 2013-2015 Hutchinson, *Gel Pyrolysis*, France
- 2012-2015 Ecolosol, *Decontaminated soil by melats and heavy hydrocarbon*, Canada
- 2007-2015 Ecolomondo, *Fluf Pyrolysis*, Canada
- 2008-2011 Agriculture Canada, *Development of biorefinery processes*, Canada
- 2007-2012 Ecolomondo, *Pyrolysis of fluf*, Canada
- 2007-2009 Sasol-Grace-KBR, *Combustion of natural gas in a fluidized bed*, South Africa-USA
- 2007-2009 Total, *Development of catalytic processes*, Belgium
- 2007-2008 Cintec, *Soil Decontamination*, Canada
- 2006-2009 Total, *Selective Hydrogenation of C3/C2 in liquid and gas phases*, France
- 2006 Total, *Hydrodynamics of a cyclonic fluidized reactor*, France
- 2006-2007 OCP, *Combustion of natural gas in a fluidized bed of phosphate particules*, Morocco
- 2005-2008 Harder Topsoe, *Methanol to olefins*, Denmark
- 2005-2007 ONA, *Roasting cobalt ore*, Morocco
- 2004-2008 Ratiopharm, *Mixing cohesive particles*, Canada
- 2004 Rolls Royce, *Combustion* Canada
- 2003-2005 Exxon, *Hydrodynamics of bubble columns*, United States
- 2003-2005 Institut Français du Pétrole (IFP), *Hydrodynamics of fluidized beds in the presence of jets*, France
- 2002- 2003 Cynovad, *Organization of R&D*, Canada
- 2002- 2005 Saint-Laurent Cement, *Combustion of hazardous waste in cement works and energy balance*, Canada
- 2002 Ecolomondo, *Tire pyrolysis*, Canada
- 1992- 2002 Centre de Technologies du Gaz Naturel, *Use of natural gas in chemical processes: incineration, ethylene production, catalytic combustion...*, Canada
- 2000- 2001 Alcan, *Development of a treatment process for potlining*, Canada
- 2000- 2004 Dupont, *Development of catalytic fluidized reactors*, United States
- 1999- 2001 Cintec-Trédi , *Incineration of cyanide in fluidized beds*, Canada
- 2000- 2002 Enviromondial, *Pyrolysis of solid waste*, Canada
- 1996- 2000 ONA, Managem et Cosumar, *Roasting ore in fluidized beds and energy balance in sugar refineries*, Morocco
- 1997 OCP, *Analysis of dust emissions*, Morocco
- 1999 ABB, *Combustion of household waste and electricity production*, Canada
- 1994- 1996 ACIDI, *Incineration of phosphates in a fluidized bed*, Canada
- 1993- 1995 City of Montréal, *Risks associated with landfill sites*, Canada
- 1992- 1994 Tourbières Premier, *Biofiltration Water treatment*, Canada
- 1990- 1994 Gaz de France, *Development of gas ignition for the regeneration of foundry sands*, France
- 1990- 1993 SNC-Lavallin, *Development of a reactor for the pyrolysis of biomass*, Canada
- 1992 Nova Pb, *Incineration and recycling of lead waste*, Canada
- 1988 Ozonics, *Catalytic oxidation of ethylene at low temperatures using ozone*, Canada
- 1988- 1990 Hydro-Québec, *Production and storage of hydrogen*, Canada

AWARDS AND EXCELLENCE GRANTS

- 2004 Best paper in the prestigious journal « Chem. Eng. Sci. ».
- 2002 Best Teacher in Chem. Eng. Dept.
- 2000 1st prize for the development of technologies for radioactive tracking, 8th International Conference on Fluidized Beds
- 1998 & 2000 Best Teacher in Chem. Eng. Dept.
- 1997 1st prize for the use of natural gas, *Catalytic combustion of natural gas*, International Gathering of gas companies.
- 1996 Best paper on the combustion of waste, International Conference on Combustion, Florida, United States, 1996
- 1986-87 Post-doc Canadian Grant, University of British Columbia
- 1985 Award for the best thesis
- 1980-1985 Excellence grant from the Department of Chemical Engineering at École Polytechnique de Montréal
- 1976-79 Excellence grant from the French government
- 1974-76 Excellence grant for Moroccans in Morocco from the French government

TEACHING

Ecole Polytechnique:

Engineer level courses

- Thermodynamics
- Chemical Thermodynamics
- Heat and mass balance in continuous and transient operation
- Waste treatment (gas, liquid and solid)
- Designing chemical reactors
- Technico-economic analysis of industrial processes
- Designing industrial processes (development of processes, flowsheet, thermal pinching analysis, Hazop, optimization...)

Graduate level courses

- Heterogeneous catalysis
- Designing gas-solid reactors
- Designing multiphasic reactors
- Fluidization
- New design tools for processes and products
- Powder technology
- Combustion and incineration
- Industrial statistics and experiment planning
- Innovate : yes you can

Specialized courses already taught for practicing engineers:

- Process extrapolation
- Technico-economic analysis of processes
- Dynamics of cohesive powders
- Thermal waste treatment
- Heat transfer
- Experiment planning and analysis
- Separation techniques (gas-liquid-solid)
- Process extrapolation: from the laboratory to the industrial scale
- Designing multiphasic reactors
- Energy savings in processes: analysis of thermal pinching
- Fluidization and its numerous industrial applications
- Treatment of gaseous emissions
- Technological innovations

GRADUATE STUDENTS

Already graduated

M.Sc.A.

- M.Sc.A. 38 N. Elahipanah, "Hydrodynamics of high pressure and high temperature fluidized bed reactor", (2017).
- M.Sc.A. 37 S. Aghaee Sarbarze, «Carbon coating of lithium iron phosphate nano-particles as a cathode materials of Li-ion batteries», (2017).
- M.Sc.A. 36 Mariam Abdollahhineisi, «NAA Rare Elements Analysis», (2017).
- M.Sc.A. 35 S. Marty, «Production d'oxyde de calcium et de dioxyde de soufre a partir de la decomposition du phosphogypse », (2014).
- M.Sc.A. 34 A. Cabana, « Modélisation numérique de particules cohésives par la méthode des éléments discrets », (2013).
- M.Sc.A. 33 Mania Abdollahhineisi, « Sawdust Gasification in FB », (2013).
- M.Sc.A. 32 A. Borhan, "Design of a high-temperature and high-pressure gas/solid fluidized bed reactor", (2013)
- M.Sc.A. 31 O. Gaboune, "Control and optimization of a pyrolysis reactor for tires", (2012)
- M.Sc.A. 30 Joel Lavoie, "Gasification of household waste in a fluidized bed", (2009)
- M.Sc.A. 29 Marine Keraron, "MTO", (2009)
- M.Sc.A. 28 M. Pérreault, "Study of the MgSt behaviour in powder blends", (2009)
- M.Sc.A. 27 G. Mary, "Selective hydrogenation of C2/C3", (2008)
- M.Sc.A. 26 M. Lemieux, "Mixing of fine powders", (2006)
- M.Sc.A. 25 G. Léonard, "Mixing of non-spherical powders" (2005)
- M.Sc.A. 24 Y. Gaboune, "Development of a tomograph", (2005)
- M.Sc.A. 23 Y. Qu, "Determination of Bubble size and Velocity in a Bubble Column", (2004).
- M.Sc.A. 22 V. Béchard, "Optimization of a process for potliner treatment", (2004).
- M.Sc.A. 21 R. Jafari, "Modelling bubble columns" (2002).
- M.Sc.A. 20 R. Mortazavi, "Simulation of Fine Powder Suspensions", (2000).
- M.Sc.A. 19 K. Lussier, "Balance and kinetics of hydrocarbons at high temperatures in contaminated soil", (1998).
- M.Sc.A. 18 F. Lepage "Design and realization of a gamma ray transmitting tomograph", (1997).
- M.Sc.A. 17 A. Macchi, "Heat transfer in a bed with jets", (1997).
- M.Sc.A. 16 C. Duphily, "Characterization of mass and heat transfer in a direct contact exchanger", (1996).
- M.Sc.A. 15 D. Roy, "Study of the circulation of solids in a bed with jets by tracking radioactive tracers", (1996).
- M.Sc.A. 14 J. Delval, "Kinetics of deactivating perovskites during the catalytic combustion of natural gas", (1995).
- M.Sc.A. 13 K. Chekkouri, "Kinetics of the catalytic oxidation of COV", (1995).
- M.Sc.A. 12 B. Zhang, " Oxy-gaz incineration of foundry sands", (1995).
- M.Sc.A. 11 D. Ramachandran, "Hydrogenation of methyl benzene in a conic fluidized bed", (1995).
- M.Sc.A. 10 Y. Bloise, "Applications of molecular dynamics in particle fluidization by vibration", (1995).
- M.Sc.A. 9 A. Meghari, "Incineration of foundry sands in a gas-contact", (1995).
- M.Sc.A. 8 P. Gauthier, "Shaping a perovskite combustion catalyst for fixed and fluidized bed reactors and radiant panels", (1994).
- M.Sc.A. 7 P. Ruetter, " Physico-chemical aspects of peat treatment for reactive dyes in the textile industry", (1994).
- M.Sc.A. 6 R. BenMahfoud, "Modelling fluidized beds in the presence of interparticle forces (1993).
- M.Sc.A. 5 T. Pontier, "Modelling the deactivation of the Pt-Sn/Al₂O₃ catalyst during methylcyclohexane dehydrogenation", (1991).
- M.Sc.A. 4 Z.N. Mao, "Foundry Sand Recycling using the Gas-Contact Incineration Process", (1991).

- M.Sc.A. 3 C. Fall, "Incineration of contaminated soil", (1991).
 M.Sc.A. 2 C. Lauga, "Modelling the hydrogenation of methyl benzene on the fluidized Ni/SiO₂ aerogel", (1989).
 M.Sc.A. 1 D. Kusohorsky, "Kinetics of the hydrogenation of methyl benzene on Ni/SiO₂ aerogel ", (1989).

Doctorates

- Ph.D. 42 Soumaya Benzennou, "Amélioration de la qualité des huiles issues de la pyrolyse-microondes des déchets ménagers ", (2018).
 Ph.D. 41 Philippe Leclerc, " Décomposition du polystyrène par pyrolyse micro-ondes ", (2018).
 Ph.D. 40 Sepher Hamzehlouia, "Development of a Microwave Heating-Assisted Catalytic Reaction Process: Application for Dry Reforming of Methane", (2017).
 Ph.D. 39 Said Samih, "Développement d'un analyseur TGA à Lit Fluidisé: application à la gazéification catalytique du charbon", (2016).
 Ph.D. 38 Francois Picard, "Traitement des sols contaminés aux hydrocarbures C10-C50 et aux métaux lourds Cu Pb Zn" (2015).
 Ph.D. 37 Majid Rasouli, " Dynamics of cylindrical particles in a rotating drum using multiple radioactive particle tracking"(2015).
 Ph.D. 36 Jaber Shabanian, "hydrodynamics of a gas-solid fluidized bed at high temperature in the presence of interparticle forces"(2015).
 Ph.D. 35 Hamed Bashisi, "numerical and experimental investigation of liquid and Gas/liquid flows in stirred tank reactors", (2015).
 Ph.D. 34 Amin Esmaeili, " Hydrodynamics of bubble column reactors operating with non-newtonian liquids "(2015).
 Ph.D. 33 Odile Vekemans, "améliorer les performances environnementales des centrales à charbon pulvérisé via la co-combustion de combustible dérivé de déchets", (2015).
 Ph.D. 32 Milad Aghabarnejad, " Chemical looping gasification of biomass", (2014).
 Ph.D. 31 Jean-Rémi Lanteigne, "Modélisation et simulation de pyrolyse de pneus usagés dans des réacteurs de laboratoire et industriel", (2014).
 Ph.D. 30 Farag Sherif, "Pyrolyse microonde de la lignine pour la production de composés chimiques aromatiques", (2013)
 Ph.D. 29 Omid Ebrahimpour, "Développement d'un filtre céramique", (2013)
 Ph.D. 28 Fotovat Farzam, "Pyrolyse de la biomasse", (2013)
 Ph.D. 27 Laurent Spreutels, "Séchage d'aliments dans un lit à jet", (2013)
 Ph.D. 26 Olivier Dubé, "Dynamique particulaire dans des lits fixes et rotatifs" (2013)
 Ph.D. 25 Ebrahim Alizadé, "Numerical and experimental investigation of solid mixing and segregation in tumbling blenders", (2013)
 Ph.D. 24 Jonathan bouffard, «Dynamique d'écoulement et pelletisation dans un granulateur à rotor », (2013)
 Ph.D. 23 Pierre Sauriol, "Hydrodynamique des jets de gaz orientés vers le haut et vers le bas dans les lits fluidisés gaz-solide », (2011)
 Ph.D. 22 Jean-Philippe Laviollette, "Réactions homogènes en phase gazeuse dans les lits fluidisés", (2010).
 Ph.D. 21 Rouzbeh Jafari, " Solid Suspension and Gas Dispersion In Mechanically Agitated Vessels," (2010)
 Ph.D. 20 M.K. Kaarsholm, "Design of Fluid Bed-Process for Converting Methanol into More Valuable Products," (2009)
 Ph.D.19 J. Doucet, "Blends of non-cohesive powders," (2008)
 Ph.D. 18 B. Esmaeli, "Fluidization of nanoparticles," (2008)

- Ph.D. 17 J. Doucet, "Powder blends: DEM-Validation," (2008)
 Ph.D. 16 M. Zanoletti, "Catalytic combustion," (2007)
 Ph.D. 15 R. Mabrouk, "Modelling a circulating fluidized bed," (2006)
 Ph.D. 14 S. Lefebvre, "Triphasic fluidization", (2006)
 Ph.D. 13 R. Radmanesh, "Waste gasification", (2005)
 Ph.D. 12 Y. Coubariaux, "Study and development of a potliner treatment process for the aluminium industry", (2004).
 Ph.D. 11 C. Tofan, "Direct decomposition of NO on perovskite-type catalysts", (2002).
 Ph.D. 10 D. Venkatesh Ramachandran, "Simulations of Fluidized Fine Powders", (1999).
 Ph.D. 9 N. Mostoufi, "Solids behavior in Fluidized Beds", (1999).
 Ph.D. 8 R. Sodudeh-Gharebaagh, "Methane combustion in a turbulent fluidized bed reactor", (1999).
 Ph.D. 7 L. Godfoy, "Hydrodynamics of circulating fluidized beds" (1997)
 Ph.D. 6 A. Gonzalez, "Conversion of methane into ethylene in a turbulent fluidized bed reactor", (1995).
 Ph.D. 5 C. Fall, "Balance and kinetics of PCP and phenanthrene sorption in contaminated soil", (1995).
 Ph.D. 4 M. Foka, "Clean Combustion of Natural Gas in a Turbulent Fluidized Bed Reactor", (1994).
 Ph.D. 3 A. Chehbouni, "Borders and structure of a turbulent fluidized bed", (1993).
 Ph.D. 2 H. Aoufoussi, "Non-linear control of a fluidized bed reactor", (1991).
 Ph.D. 1 G. S. Patience, "Circulating Fluidized Beds: Hydrodynamics and Reactor Modelling", (1991).

Post-doc.

- Post-doc.42 J. Dupuy, "Lotus Bioreactor Design for CO₂ Absorption", (2017).
 Post-doc.41 D. Ubersfeld, "Decomposition of Phosphogypsum at High Temperature in FB", (2017).
 Post-doc.40 J. Shabanian, "Hydrodynamics of gas-solid fluidized bed at high temperature in presence of interparticle forces", (2017).
 Post-doc.39 M. Rasouli, "Carbon coating of lithium iron phosphate nano-particles as a cathode materials of Li-ion batteries", (2017).
 Post-doc.38 M. Latifi, "Development of a process for recovery of rare earth elements from bastnasite and monazite minerals", (2016).
 Post-doc.37 S. Habibzadeh, "Fluidization of Nano-particles and Fluidized Bed CVD", (2016).
 Post-doc.36 S. Farag, "Hydrodynamics of bubble column reactors at high temperature and high pressure", (2016).
 Post-doc.35 A. Esmaeli, "Hydrodynamics of bubble column reactors operated with non-newtonian liquids", (2016).
 Post-doc.34 A. Mohaddespour, "Phosphogypsum decomposition using coal oxidation", (2015).
 Post-doc.33 O. Ebrahimpour, "Carbon coating of lithium iron phosphate nano-particles as a cathode materials of Li-ion batteries", (2015)
 Post-doc.32 A. Rakib, "Co-combustion in Fluidized Bed", (2014)
 Post-doc.31 O. Oebrahimpour, "Développement d'un filtre céramique", (2014)
 Post-doc.30 F. Farzam, "Hydrodynamique d'un mélange sable-biomasse dans un lit fluidisé", (2013-2014)
 Post-doc.29 J.P. Laviolette, "Hydrodynamique des lits fluidisés à hautes pressions et températures", (2012-2013)
 Post-doc.28 P. Sauriol, "Co-Combustion déchets-charbon", (2012-2013)
 Post-doc.27 K. Varma, "Gazéification in PP", (2010-2012)
 Post-doc.26 Amr Sobhy, "Gazéification/Pyrolyse par micro-ondes", (2010-2012)
 Post-doc.24 Rouzbeh Jafari, "Solid Suspension and Gas Dispersion In Mechanically Agitated Vessels," (2011)
 Post-doc.24 Zhiwei Chen, "Développement de procédés catalytiques", (2008-2010)
 Post-doc.23 Bonniol Florian, "Technologie des poudres", (2008-2010).

- Post-doc.22 S. Sarkar, "Powder mixing", (2007-2008)
- Post-doc.21 A. Kundu, "Development of a catalytic process", (2007-2008)
- Post-doc.20 R. Mabrouk, "Natural gas combustion in a fluidized bed", (2006-2007)
- Post-doc.19 Y. Coubariaux, "Study and development of a potliner treatment process for the aluminium industry", (2004).
- Post-doc.18 R. Radmanesh, "Waste gasification", (2005)
- Post-doc.17 B. Abismail, "Phosphorus removal of liquid effluents", (2004-2006)
- Post-doc.16 S. Xu, "Waste gasification", (2004-2006)
- Post-doc.15 A. Kasseh, "Self-Foamable Organoclay/Novolak Nanocomposites and Process thereof ", (2003-2004)
- Post-doc.14 R. Andreux, "CFD & the hydrodynamics of fluidized beds" (2002-2003).
- Post-doc.13 N. Mostoufi, "RPT applications on fluidized beds" (2000-2001).
- Post-doc.12 H. Cui, "Fiber optic development" (2001-2003).
- Post-doc.11 K. Kiared, "Hydrodynamics of triphasic fluidized beds" (1999-2001).
- Post-doc.10 T. Djeridane, "Hydrodynamics of beds with jets and drying" (1998-2000).
- Post-doc.9 F. Larachi, "Development of the radioactive particle tracking method" (1996-1999)
- Post-doc.8 X. Bi, "Treatment of hog manure" (1997-1999).
- Post-doc.7 L. Godfoy, "Hydrodynamics of circulating fluidized beds" (1997)
- Post-doc.6 M. Cassalleno, "Development of the radioactive particle tracking method" (1997-1998).
- Post-doc.5 C. Sapundzhiev, "Catalytic combustion of natural gas in a cycle power bed" (1994-1996).
- Post-doc.4 D.G. Karamanev, "Inverse fluidization" (1993-1995)
- Post-doc.3 A. Chebouni, "Turbulent fluidized beds", (1993-1995).
- Post-doc.2 H. Aoufoussi, , "Non-linear control of a fluidized bed reactor", (1991).
- Post-doc.1 M. Benali, "Development of gas contact : applications for waste thermal treatment", (1990-1992).

TRAINING OF HIGHLY QUALIFIED PERSONNEL: MY VISION

New technologies are generally created by symbiotic research: basic research, applied research and product development, and most of the greatest conceptual advances are interdisciplinary and involve synergies of different specializations. In the past, I have found that our students are “**diving**” **too fast** into the specific project actions. To push students toward more innovations, I now envision the doctoral research journey as a **3 stage project**:

Climbing the Hill and Gaining Altitude

The aim of this first stage is to help PhD students understand that doubt is a key element in breakthrough innovation research. In this phase, students could choose to study one or more breakthrough innovation stories to grasp this fundamental element and to develop better understanding of the existing literature, experimental methods/tools/ equipment and knowledge from industry.

On Top of the Hill

Standing on top of the hill, students should conceive or dream up what they consider to be the best scheme. It is important for the PhD student in this step to build a broad vision of the research scenery. Students take the time to examine the different research paths to make their choice and to develop their experimental program that uniquely adds to the academic community.

Descending the Hill

After examining the different research paths that go down the hill, students finally make the decision to take one specific path to carry out their research and determine their research topic. They now focus on trying to make their project become a reality and to execute it with excellence.

This vision has resulted in graduated students that become autonomous and inquisitive researchers, with advanced scientific knowledge. This approach helps develop their maturity and gives them the space creative and potentially “patentable” new ideas regularly.

All HQP in my lab have to take a workshop on Innovation. This workshop is based on many articles including my article entitled “Innovate: Yes You Can” (Chaouki, 2013). The main objective of this workshop is to sing the praises of innovation and creativity while exposing how to dream up ideas and develop them and of course to train them on methodology of innovation.

My vision to apply "the doctoral research journey as a 3 stage project" explains why our graduated students are extremely autonomous researchers, with advanced scientific knowledge, and a fully developed maturity, and why most of my students are highly creative. For every PhD thesis or even Master project there is something extremely new with the potential to be an innovation. Therefore, it is not surprising that many industries, universities and research centers are looking to hire our graduate students. All supervised students have excellent employment as can be seeing in my résumé. They are working with large industrial groups (Dupond, Total, Halder Topsoe, Shell, SNC-Lavallin, Hydro-Québec, Praxair, UOP, BP, Hatch, IamGold,...) mid-industrial groups (Orbite Aluminae, Enerkem, Maya Technologies, Accordant Energy, Ecolomondo...), in academia as Professors or Researchers (UBC, U. Laval, U. of Cairo, U. of Marrakech, U. Tehran...). They are having real impact and contributing to the evolution of our society in many part of the world.

They also have the opportunity to interact directly or indirectly with my industrial partners, either during progress meetings or when they spend internship time at the facilities of these partners in order to learn about practical aspects related to their project and acquire “hands-on” experience with various processes. Moreover, I consider it very important for my students to write papers and give talks at conferences; my HQPs appear in almost all the journal articles listed in my Common CV, and all my PhD students and most of my MSc students have given a talk at at least one conference.

LIST OF STUDENTS Presently (5 M.Sc.A., 12 Ph.D. 5 Post doc., 4 Research Associates and 1 Resercher)

Name	1st Name	Situation	Title	Co-supervisors
Abdelrahman	Hussain	Ph.D.	Solar energy as source or catalytic Reactor	S. Farag
Achouri	Ines	Post-doc	Catlytic Reaction	N. Abatzoglou
Fallahi	Afshin	M.Sc.A.	Mass transfer in BC at HT and HP	
Avazpour	Rahi	Ph.D.	Separating of REE bearing minerals selectively by pickering emulsion (SEE or solid stabilized emulsion) and comparing with other alternatives processes	Louis Fradette
Beaulieu	Christine	Ph.D.	Solid-solid particles mixing	
Carrillo	Adrian	Ph.D.	Separation of radioactive elements from rare earth elements	Mohammad Latifi
Houriez	Gautier	M.Sc.A.	Development of a Microwave Heating-Assisted Catalytic Reaction Process: Application for Dry Reforming of Methane	S. Leplat
Soleimani	Iman	Ph.D.	High Temperature and High Pressure Fluidized Bed	M. Yadanpanah
Lakhdiissi	El Mahdi	Ph.D.	Hydrodynamics of bubble column reactors at high temperature and high pressure	
Mai	Attia	Ph.D.	Microwaves-assisted demetallization and desulfurization of heavy petroleum oil using a developed demetalization agent	S. Jaffer
Khalil	Mohamed	Ph.D.	e-Waste Pyrolysis	
Monzavi	Mohamed	Ph.D.	REE from phosphate	
Mokhtari	Mojtaba	Ph.D.	High Temperature and High Pressure Bubble Column Hydrodynamic	M.Nemri
Nasri	Hamed	Ph.D	Fragmentation of nano-agglomerates and preventing from reagglomeration	Jason Tavares
Demol	Rémi	M.Sc.A.	CFD in Bubble Column	F. Bertrand
Bukhari	Salman	Post-doc	Process Simulation	
Samih	Said	Post-doc	Development of a fluidized bed thermogravimetric analyzer: application on catalytic coal gasification	

Shu	Shuli	Post-doc	CFD in Buble Column	F. Bertrand
Tao	Ling	M.Sc.A.	The large-scale production and catalytic properties of nanocrystalline cerium oxide particles in a fluidized-bed reactor.	Pierre Sauriol
Roy	William	M.Sc.A.	High Temperature and High Pressure Bubble Column Hydrodynamic	
Yari	Bahman	Ph.D	Solid degassing of reactants in a novel melt synthesis process for the manufacture of C-LiFePO ₄	
Zhou	Yefeng	Post-doc	Design, optimization & process intensification of internally illuminating bubble column photobioreactor	

Research Associate:

- Dr. L. Jin: Potassium from Feldspar: Thermodynamic;
- Dr. M. Latifi: Potassium from Feldspar: Process Design;
- Dr. M. Mirnezami: Potassium from Feldspar at High Temperature.
- Dr. R. Jafari: Decomposition of Phosphogypsum at High Temperature;

Researcher:

- Dr. S. Farag: High Temperature and High Pressure for Bubble Column and for Fluidized Bed & Catalytic reactions by using microwaves.

Students at the engineer level

Since 1990, on average 4 students are hired each summer for four months.

MEMBER OF PROFESSIONAL SOCIETIES

1. Order of Engineers of Quebec (OIQ)
2. Canadian Society of Chemical Engineering
3. American Society of Chemical Engineering

MEMBER OF COMMITTEES

1. Chairman of Int. Fluidization, Montreal (2016)
2. Chairman of:
 - 2nd International Conference on Mining, Material and Metallurgical Engineering
 - 2nd International Conference on Heat Transfer and Fluid Flow
 - 4th International Conference on Mechanics and Industrial Engineering
 - International Conference on Chemical and Polymer Engineering (Spain 2015)
3. Member of the Organizing Committee of the IX^{ème} Congrès International sur les Énergies Renouvelables et l'Environnement, Tunisia (2015).
4. Member of the Organizing Committee of the conference: "Biorefinery I: Chemicals and Materials From Thermo-Chemical Biomass Conversion and Related Processes", Greece (2015).
5. Member of the Organizing Committee "International Forest Biorefinery Symposium", PaperWeek Canada (2014).
6. Member of the Organizing Committee of the 9th CFGP (2014).
7. Member of the Organizing Committee 2014, Brasil (2014)
8. Chairman "Trends in Numerical and Physical Modeling for Industrial Multiphase Flows", Corcica(2012)
9. Member of the Organizing Committee of the 6th Journées Francophones sur les Réacteurs Gaz-Liquide et Gaz-Liquide-Solide (GLS F6),Marrakech, Maroc (2012).
10. Member of the Organizing Committee "Symphos I and II", Marrakech, Agadir Morocco (2011, and 13).
11. Member of the Organizing Committee "Bioenergy III", Canary Islands, Spain, (2010).
12. Technical Director of the 8th WCCE, Montréal (2009)
13. Organizer of the International Conference on Fluidized Beds (1996, 2000 and 2008, 2010)
14. Organizer of the International Conference on chemical reactors (2003 and 2005)
15. Organizer of the International Conference on tracers in chemical reactors (2004)
16. Evaluator of the graduate studies program in the Chemical Engineering Dept. at Université Laval (2004)
17. Member of the Academic Council (CA), École Polytechnique de Montréal (depuis 2003)
18. President of the scientific committee at Cynovad (2003-2004)
19. Organizer of the sessions "Visualization at the service of Man" J. Cartier Conferences(2003)
20. Organizer of the European conference of visualization in chemical engineering (2002)
21. Committee of exams for the Order of Engineers of Québec (from 1996 to 2006)
22. International conference on gaseous emissions (1998 and 2000)
23. Grants Committee for graduate students at École Polytechnique de Montréal (2000, 2001 and 2002)
24. Committee for the selection of director for the department of chemical engineering (2003)
25. Committee for the evaluation and promotion of professors (1996-2000)

EVALUATOR

Scientific journals (the most important ones):

1. Editeur associé Env. Sci., Stud. in Environm. Sci. (1991-1995);
2. Can. J. Chem. Eng. J.
3. Chem. Eng. Sci.
4. Powder Technology
5. A.I.Ch.E J.
6. I&EC
7. Fuel
8. ...

Theses

123 doctorate theses as president or member in Europe and North America

Master's

142 theses as president or member in North America

INVITED CONFERENCE SPEAKER

Conference: 25 plenary sessions. The most important are:

- J. Chaouki, "Yesterday, Waste was a Problem. Today, it is a Valuable Resource", 66th Canadian Chemical Engineering Conference, Plenary (2016).
- J. Chaouki "Biomimicry and reduction of greenhouse gases", COP22, Marrakech, Morocco, Plenary (2016).
- J. Chaouki, "Improving resource efficiency to address climate change by observing Nature", Green Processes, Canada, Plenary (2016).
- J. Chaouki, "Les défis du génie des procédés dans les pays en voie de développement", Plenary, 10^{ème} Congrès Int. sur les énergies renouvelables et l'environnement", Sousse, Tunisia (2016).
- J. Chaouki, "Les nombreux procédés industriels infructueux: Une réalité cachée aux étudiants enfin révélée !", Plenary, 10^{ème} Congrès Francophone de Génie Chimique, Maroc (2016).
- J. Chaouki, "Thermal Chemical Engineering Kinetics and Reactor Design: New Tools, Plenary", Algeria (2016).
- J. Chaouki, "Les technologies de réduction des gaz à effet de serre", Plenary (2016).
- J. Chaouki, "Distributed Microwave Pyrolysis of Solid Waste", Iran Conf. CH. En., Plenary (2015).
- J. Chaouki, "RPT Technique: New Developments", Plenary, 14th International Conference on Modern Trends in Activation Analysis, The Netherlands (2015).
- J. Chaouki, "Hier, les déchets étaient de sérieux problèmes. Demain, ils seront de précieuses ressources. Nos procédés doivent donc changer en conséquence », Plenary Lecture 9^{ème} CFGP, Agadir, Maroc (2014).
- J. Chaouki, "Distributed Microwave Pyrolysis of Solid Waste", Iran Conf. CH. En., Plenary (2015).
- J. Chaouki, "RPT Technique: New Developments", Plenary, 14th International Conference on Modern Trends in Activation Analysis, The Netherlands (2015).
- J. Chaouki, "Hier, les déchets étaient de sérieux problèmes. Demain, ils seront de précieuses ressources. Nos procédés doivent donc changer en conséquence », Plenary Lecture 9^{ème} CFGP, Agadir, Maroc (2014).
- J. Chaouki, "A Review of Microwave Pyrolysis of Biomass and Waste for the Production of Energy and Fuels", C. BioEnergy IV: Innovations in Biomass Conversion for Heat & Power, Fuels and Chemicals, Otranto, Italy, Plenary Lecture (2013).
- J. Chaouki, "Innovate: yes you can", Symphos II, Plenary Lecture, Agadir, Morocco (2013).

- H. Bashiri, E. Alizadeh, F. Bertrand and J. Chaouki, 2012. Radioactive Particle Tracking (RPT) Technique for the Validation of Models for Multiphase Reactors, Trends in Numerical and Physical Modeling for Industrial Multiphase Flows, Corcica (2012)
- Alizadeh, H. Bashiri, J. Chaouki and F. Bertrand, “Characterization of mixing processes by radioactive particle tracking”, NAMF, Cancun (2012).
- J. Chaouki, “The Future of G/S Fluidized Beds”, GLS, Marrakech, Morocco (2012)
- J. Chaouki, “Gasification & Combustion of Biomass and waste”, in Green Technologies for the Production and the Sustainable use of Energy, Celaya, Mexico (2009);
- J. Chaouki, “The Industrial Benefits of Current Researches in Fluidized Bed Technology”, PIChE, Davao, Philippines (2009).
- J. Chaouki, “La troisième génération des procédés thermiques de bioraffinage : état de l’art et futurs challenges”, 9th Mechanical Congress Marrakech –Morocco (2009).
- J. Chaouki "Bioraffinage de 3ème génération", Congrès Int. Génie mécanique (2009);
- J. Chaouki, "New Challenges in Fluidized Beds Technology", Congrès Int. (2008);
- J. Chaouki, "Innovations Technologiques", (2007, 2008 et 2009);
- R. Contractor et J. Chaouki, "CFB as catalytic reactors", International. Congress Circulatif Fluidized Bed III, Japon (1990).
- J. Chaouki, "Catalytic Combustion of Natural Gas" Int. Congress Reactor Eng. (1997).
- J. Chaouki, "Radioactive Particle Tracking in Fluidized Beds", Int. Congress Multiphase Reactors, Belgique (2000).
- J. Chaouki, "La visualisation des écoulements multiphasiques grâce à de nouvelles méthodes expérimentales", Congrès Int. Sur la visualisation, France (2002).

Industries: 155 conferences

Universities and research centers: 265 conferences

TECHNOLOGY TRANSFER:

He has developed many technologies which were transferred to different companies including:

- Development of pyrolysis process for used tires for **Ecolomondo**. This company is being introduced to **TSX**;
- Development of microwave pyrolysis for waste for **Pyrowave**;
- Gypsum Decomposition to recycle SO₂ for **OCP Group**;
- Development of new injectors in fluidized beds for **Dupont**;
- Development of new types of bubble columns for **EXXON**;
- Design of a fluidized bed for roasting ore for **MANAGEM**;
- Development of a new olfactometer based on the Pelletier effect for **Meteoglobe**;
- Development of a new type of dryer for **Recypro**;
- Development of two technologies (a power cycle catalytic reactor and an auto cycle fixed bed) for the catalytic combustion of natural gas for **CTGN**;
- Development of a gas contact and an oxygas burner for **Gaz de France**.

FOUNDER & CO-FOUNDER :

- Cofounder of Formmat Technologies Inc. and technological transfer for composites (1999);
- Cofounder of Virtual Artifact (2010);
- Scientific Director of Ecolomondo (2010);
- Cofounder of Pyrowave (2013).

INTERVIEWS AND MEDIA RELATIONS (last 3years)

- 05-03 - TED Conference: Déchets - <http://tedxhecmontreal.com/fr/conferenciers/>
- 2014-04-26 - 45' of Success Story Telling avec le Pr Jamal CHAOUKI - http://www.jcirabat.org/index.php/evenement/29-45-of-success-story-telling-avec-lepr-jamal-chaouki/event_details.html
- 2014-02-12 - mémoire sur le projet sur les appareils a combustibles solides - <http://www.poeslesfoyers.ca/Cours/Ville%20de%20Montreal%20-%20Polytechnique%20-%20Fev%202014.pdf>
- 2013-05-16 - Déchets :Le professeur Jamal Chaouki prône le traitement thermique - http://www.aufaitmaroc.com/actualites/science--environnement/2013/5/16/le-professeur-jamal-chaouki-prone-le-traitementthermique_212303.html#.U9qHMj9UpLc
- 2013-05-15 - Un éminent chercheur à l'UIC Le Pr Jamal Chaouki traite la question des déchets - <http://www.uic.ac.ma/actualites/un-eminent-chercheur-a-l-uic>
- 2012-11-02 - Recherche & développement au Maroc: il faut cibler! Par le Pr. Jamal CHAOUKI - - <http://www.leconomiste.com/article/900151-recherche-d-veloppement-aumaroc-il-faut-ciblerpar-le-pr-jamal-chaouki>
- 2012-06-26 - Jamal Chaouki, un homme inspiré et inspirant Entrevue. Professeur au département de génie chimique à l'École Polytechnique, Jamal Chaouki est quelqu'un de bien occupé. - <http://journalmetro.com/plus/carrieres/111774/jamal-chaouki-un-homme-inspire-et-inspirant/>
- 2011-12-02 - Helping transform today's waste into tomorrow's resources - <http://www.newswire.ca/en/story/889091/helping-transform-today-s-waste-intotomorrow-resources>
- 2012 – J. Chaouki, “ La R&D au Maroc : une nouvelle opportunité“, Published in “L'Économiste“, Morocco, <http://www.leconomiste.com/article/900151-recherche-d-veloppement-au-maroc-il-faut-ciblerpar-le-pr-jamal-chaouki>
- 2011 - J. Chaouki, “ Les ingénieurs marocains semblent être moins performants que leurs confrères dans les pays développés : éléments de réponse”, published in many news papers <http://forum.erableatlas.ca/t16848-les-ingenieurs-marocains-linnovation-technologique-et-la-memoire-collective>
- 2011- J. Chaouki, “L'avenir du Québec : le tout électrique“

MOST PAST IMPORTANT CONTRIBUTIONS TO RESEARCH

Development of new measurement methods for multiphase flows

Radioactive particle tracking (RPT) and Bulk Radioactive Particle Tracking (BRPT)

Important progress has been made in the last decade in the development of advanced non-invasive radioactive particle tracking (RPT) techniques specifically suited for the characterization of three-dimensional flow fields in multiphase reactors. In the RPT facility, a single radioactive particle, which is dynamically similar to the moving phase, is introduced in the reactor. The instantaneous position of the tracer is then calculated at every 1 millisecond. We have also introduced a new bulk radioactive particle tracking method (BRPT) applied to the characterization of flow of powder in mixers or in reactors. The use of BRPT enables the investigation of mixing of many radioactive particle tracers flowing among other particles for a long period of time and in a non-intrusive manner. This unique technique could be applied to very fine powder or even to nanoparticles. In particular, we demonstrate that this method is very precise and is sensitive to tracer concentrations as low as 0.1% in weight. Lately, we have introduced a multiple radioactive particle tracking technique (MRPT) that can determine the trajectory of two free or restricted (attached to the same non-spherical particle) moving tracers in a system. Therefore, we can now determine, for example, two sticking tracers at the two ends of a cylindrical particle which determine the rotation of that cylinder.

Tomography

Thanks to the experience acquired during the development of RPT, we have developed a third generation tomography technique based on gamma rays. This technique is now operational.

Simultaneous Measurement of Gaseous Species Composition and Solids Volume Fraction

A novel spectroscopic method was developed to measure quantitatively and simultaneously solids volume fraction and gaseous species composition in multiphase systems. The method is comprised of a spectroscopic system coupled to a fibre-optic probe (which can operate from 25 to 500°C) that can perform real-time and in-situ measurements of absorbance. A US patent is currently pending for this technology and its commercialization is currently underway with the Montreal-based company Genia Photonics.

Application of the RPT and the BRPT techniques along with gammaray tomography and an optical fibre probe for high temperatures with FT-IR has put our laboratory at the forefront of multiphase reactor research, enabling us to measure internal reactor parameters that have not been available up to.

Fluidization of very fine and nano powder

For the past years, I was one of the first researchers who have highlighted the role of interparticle forces on the fluidisability fine particles including nanoparticles. Currently, there is a general consensus on their importance. Because of these forces, these fine particles usually do not allow a good quality of fluidization. Despite this, I have developed several methods to their fluidization by modification of these forces, original design of the bed ... We recently succeeded in coating nanoscale particles in a gas-solid fluidized reactor for many applications.

Combustion, gasification and pyrolysis at high temperatures

I have conducted investigations of waste and biomass pyrolysis, gasification and combustion for the past 20 years in various types of reactors (rotary kilns, fluidized beds, etc) and at various operating condition. For pyrolysis, the studies were conducted by using conventional and microwave heating. Some of these studies were performed in partnership with industrial partners. One application for waste tire pyrolysis is currently being commercialized by the company Ecolomondo. Another application based on the distributed microwave pyrolysis of waste is being commercialized by the start-up company Pyrowave. A third application on co-combustion of coal and municipal solid waste is used by Accordant Energy.

New Chemical Reactors for kinetics

Thermogravimetric analyzers (TGA) are small reactors that are widely used to characterize the kinetics of thermochemical reactions. However, reaction conditions in commercial TGA are not representative of multiphase thermochemical processes due to limited heating rates ($\leq 800^{\circ}\text{C}/\text{min}$), low solid/solid mixing and nonrepresentative small samples. To better characterize the reaction kinetics, my work has led to the development of four novel reactors: a fluidized bed TG reactor (Samih and Chaouki (2014)), an induction heating TG reactor (Latifi and Chaouki (2014)), a Vblender TG reactor and a microwave TG reactor (Farag et al. (2014a)), which more closely represent the conditions inside the industrial reactors.

Powder technology

My works, with the collaboration of Prof. Francois Bertrand, allowed the development of one of the only parallel DEM (Discrete Element Method) codes in the world capable of simulating the flow of more than one million particles over large spans of time. This code has enabled the investigation of granular flow in blenders used in the pharmaceutical industry and in chemical reactors. The development of a unique Radioactive Particle Tracking (RPT) method has also contributed to locally validate the DEM simulations.

Production of composites by the polymerization method by compounding

With several colleagues (internal: Prof. A. Ait Kadi and Prof. C. Dubois), our work allowed a more profound understanding of the synthesis and the implementation of some hybrid composite materials in the liquid or the gas phases. Our work led to three patents:

- Method for preparing zirconia ceramics using hybrid composites as precursor materials;
- SelfFoamable Organoclay/Novolak Nanocomposites; Process thereof;
- Method to Produce Graphite/Polymer Composites and Encapsulation of Nanoparticles by Polymerization Compounding in a Gas/Solid Fluidized Bed Reactor.

Furthermore, we recently patented a new fabrication route to produce mullite-bonded porous SiC ceramics with enhanced mechanical and physical properties compared with the conventional fabrication process (Ebrahimpour et al. (2014)).

BOOKS AND BOOK CHAPTERS :

- B.13 M. Foroughi-Dahr, N. Mostoufi, R. Sotudeh-Gharebagh and J. Chaouki, "Particle Coating in Fluidized Beds", Chemistry Reference Module, Elsevier (2017).
- B.12 M. Attia, S. Farag, S. Habibzadeh, S. Hamzehlouia and J. Chaouki, "Fast Pyrolysis of Lignocellulosic Biomass for the Production of Energy and Chemicals: A Critical Review", (2016).
- B.11 O. Vekermans and J. Chaouki, "Municipal Solid Waste co-firing in coal power plants – combustion performance", in the Combustion Processes book (2016).
- B.10 S, Farag and J. Chaouki, "Microwave Heating Assisted Biorefinery of Biomass", Handbook of Biorefinery, accepted (2014).
- B.9 J-R Lanteigne, J-P Laviolette, J. Chaouki. Biomass pre-treatments for biorefinery applications : pyrolysis, Pretreatment techniques for biofuels and biorefineries, Springer-Verlag Berlin Heidelberg, (2013).
- B.8 M. Abdollahi Neisiani, J-P Laviolette, R. Jafari, J. Chaouki. Biomass pre-treatments for biorefinery applications : gasification, Pretreatment techniques for biofuels and biorefineries, Springer-Verlag Berlin Heidelberg, (2013).
- B.7 R. Sodudeh et J. Chaouki, "Natural Gas Combustion in Fluidized Beds", LAP Publisher (2009).
- B.6 J.P. Laviolette, G.S. Gregory, J. Chaouki, "Combustion des hydrocarbures dans les lits fluidisés", Handbook of Combustion (2010);
- B.5 J.R. Grace, J. Chaouki et T. Pugsley, "Fluidized Bed Reactors" Chapitre de livre, Encyclopedia of Chemical Processing, Dekker, (2005).

- B.4 J. Chaouki, M. Dudukovic et F. Larachi, "Tomography and Velocimetry Techniques for non-Invasive Flow Mapping in Multiphase Flows in Process Industry" editors, Elsevier Science B.V., (1998).
- B.3 F. Larachi, J. Chaouki, G. Kennedy, M.P. Dudukovic, "Radioactive Particle Tracking in Multiphase Reactors: Principles and Applications", In "Tomography and Velocimetry Techniques for non-Invasive Flow Mapping in Multiphase Flows in Process Industry" eds J. Chaouki, M. Dudukovic et F. Larachi, Chap 11, 335-406 (1997).
- B.2 G.S. Patience, J. Chaouki et F. Berruti, "Gas Phase Hydrodynamics in Circulating Fluidized Bed Risers", Chapitre du livre "Multiphase Flows" édité par Chemerinoff (1997).
- B.1 S. Vigneron, J. Hermia et J. Chaouki, "2nd International Symposium on Characterization and Control of Odours and VOC in the Process Industries", Elsevier 61 (1994).

Another new book is in preparation. Its title is "Unsuccessful Industrial Chemical Processes: Teaching the realities to students and Practitioners". While, most industrial processes are failing at the early stage of operation, limited information are available for students and designers regarding the failure modes of industrial processes. Normally, we, at the universities, teach the design elements that fully work by paper and do not normally provide the students the feelings that the industrial processes are mostly failing at the first start-up. The in-complete process design training to undergraduate and graduate students make then suffering from the lack of confidence which consequently leads to the lack of innovation. The emphasis of most books is on classical design of chemical process/equipment and product design, too little space is given to show the students why the industrial processes are failing at first attempts. Normally, academia does not leave the chance to students to make errors and teach the strategy to correct them. The students and engineers at the early stage of their professions have the full right to make error and mistakes and to learn ways to correct them. Teaching the unsuccessful case would allow students to approach to existing realities in process design. This subject is of prime importance in training the next generation of engineers and researchers.

INVENTION PATENTS (23 patents)

- P.23 A. Mohaddespour and J. Chaouki, "Calcium sulfide decomposition by carbon oxidation", submitted (2018) Application 17203183.3-1106.
- P.22 J. Chaouki and A. Mohaddespour, "Phosphogypsum decomposition by carbon oxidation", submitted (2018) 17203182.5-1106.
- P.21 S. Hamzehlouia, D. C. Boffito, J. Chaouki (2017). Ultrasound-assisted deposition of a metal-containing active phase over a non-porous support for production of a catalyst (Application Number: 62552063)
- P.20 S. Hamzehlouia, D. C. Boffito, J. Chaouki (2017). Microwave-assisted catalytic reactions using catalytic and dielectric bed particles (Application Number: 62552074)
- P.19 S. Farag, J. Chaouki (2017). Methodology to recover the inorganic chemicals of the pulp and paper industry (Application Number: 62576738)
- P.18 B. Sels, J. Chaouki, P. V. Wouwe and M. Yazdanpanah, "Single step lactide production process with recovering water by decantation", submitted (with Total) (2016).
- P.17 B. Sels, J. Chaouki, P. V. Wouwe and M. Yazdanpanah "Single step lactide production process with heat recovery", submitted (with Total) (2016).
- P.16 B. Sels, J. Chaouki, P. V. Wouwe and M. Yazdanpanah "Single step lactide production process with hydrolysis of oligomers and catalyst by recovered water", submitted (with total) (2016).
- P.15 B. Sels, J. Chaouki, P. V. Wouwe and M. Yazdanpanah "single step lactide production process with separate entry for Solvent", submitted (with Total) (2016).
- P.14 F. Picard and J. Chaouki, "Selective extraction of copper, lead and zinc from a calcium-rich contaminated soil by a modified NTA", submitted (2015).
- P.13 F. Picard and J. Chaouki, "Remediation of contaminated soils by CO₂-assisted hypochlorite oxidation", submitted (2015).

- P12 J. Chaouki, O. Ebrahimpour and C. Dubois, "fabrication of porous ceramic from multilayer-coated SiC particles through sol gel followed by in-situ polymerization" WO 2013/026168 (2013).
- P11 J. Doucet, J. Chaouki and A. Sobhi, "Catalyst For Domestic Batch Microwave Pyrolysis, System And Process Thereof", WO/2012/097448 (2012).
- P.10 J. Chaouki, J.-P. Laviolette, G.S. Patience. Simultaneous measurement of volume solids fraction and chemical composition by FT-IR US20120182546 (2012).
- P.9 A. Kasseh; J. Chaouki; et E. Ennajimi "Method to Produce Graphite/Polymer Composites", demandes de brevets US et Can. déposées en décembre (2005) PCT/CA2003/001731.
- P.8 A. Kasseh; J. Chaouki; et E. Ennajimi "Self-Foamable Organoclay/Novolak Nanocomposites and Process thereof ", demandes de brevets US et Can. déposées en novembre (2003) PCT/CA2004/000066.
- P.7 E. Ennajimi, A. Kasseh et J. Chaouki, Provisional Application for Patent #60530756, " Method for Preparing Zirconia Ceramics Using Hybrid Composites as Precursor Materials Shaped By CAD\CAM Process", (19/12/2003).
- P.6 E. Ennajimi, A. Kasseh et J. Chaouki, "Composite Abutment and Implant System", PCT/US/2004/0740050 Provisional Application for Patent #60530756 (2003).
- P.5 D. Klvana, J. Kirchnerova, J. Chaouki, C. Guy, "Appareillage et procédé pour les réactions catalytiques exothermiques" Brevet US 2273761 (2000).
- P.4 C. Guy, J. Chaouki et J.G. Chouinard, "Oxygen-enriched gas burner for incinerating waste materials", brevet US #5724901 (1998).
- P.3 C. Guy, R. Legros, J. Chaouki, R.L. Lavalée, L. Bussac, L. Mauillon et L. Mukadi, "Fluidized Bed Process and Apparatus for Thermally Treating Solid Wastes", brevet US 6119607 (2000).
- P.2 J. Chaouki, C. Sapundziev, C. Guy, D. Klvana, K. Ratnani, "Process and Apparatus for Gas phase Exothermic Reactions", PCT/CA97/00958, (1997).
- P.1 R. Legros, J. Chaouki, X. Bi et A. Macchi, "Spout-Fluid Bed Dryer and Granular for the Treatment of Animal Manure and Sludge", PCT/CA96/0357, (1996).

PEER-REVIEWED PAPERS

PEER-REVIEWED PAPERS IN SCIENTIFIC JOURNALS

- A.235 S. Benzennou, M. A. Attia, JP Laviollette, and Jamal Chaouki, "Pyrolytic oil upgrading by means of calcium oxide in a microwave oven", J. Analytical and Applied Pyrolysis, in press (2018).
- A.234 S. Samih, J. Chaouki, "Coal Pyrolysis and Gasification in a Fluidized Bed Thermogravimetric Analyzer", Can. J. Chem. Eng. in press (2018).
- A.233 S. Habiboallah, O. Zabeida, A. Argoitia, R. Sargent, J. Klemberg-Sapieha, J. Chaouki, L. Martinu "Conformal multilayer thin film on fine particles by atmospheric fluidized bed chemical vapor deposition", Chem. Eng. J. in press (2018).
- A.232 P. Leclerc, J. Doucet and J. Chaouki, "Development of a microwave thermogravimetric analyzer and its application on polystyrene microwave pyrolysis kinetics", Journal of Analytical and Applied Pyrolysis, 130, p. 209-215 (2018).
- A.231 M. Abdollahi Neisiani, M. Latifi, J. Chaouki, C. Chilian, "Novel approach in k0-NAA for highly concentrated REE Samples", Talanta, 180, p. 403-409 (2018).
- A.230 H. Nasri Lari, Farhanian, D., Boffito, D.C., Patience, G.S., De Crescenzo, G., Chaouki, J. & Tavares, J.R., "Shedding light on iron pentacarbonyl photochemistry through a CVD case study", Catalysis Communications, 2017. 100: p. 19-23 (2017).
- A.229 F. Picard, J. Chaouki, "NaClO/NaOH soil oxidation for the remediation of two real heavy-metal and petroleum contaminated soils", J. Env. Chem. Eng., Vol. 5, Issue 3, p. 2691-2698 (2017).

- A.228 J. Shabanian, J. Chaouki, "Similarities between gas-solid fluidization in the presence of interparticle Forces at high temperature and induced by a polymer coating approach". *Powder Technology*, 320 p.155-160 (2017).
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