April 2023

Curriculum Vitae

Name:	Jamal Chaouki, Eng., Ph.D., FCAE
Address:	180 de la Présentation Avenue Dorval (Québec), Canada, H9S 3L4 Tel.: + 1 514 631 5337. Cell: +1 514 231 7125
Work Address:	Department of Chemical Engineering Ecole Polytechnique of Montréal P.O. Box 6079, Station Centre-ville Montréal (Québec), Canada H3C 3A7 Tel: +1 514 340 4711 ext. 4034; Fax: + 1 514 340 4611 Cell: + 1 514 231 7125 E-mail: jamal.chaouki@polymtl.ca
Citizenship:	Canadian Moroccan
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

2019-	Member of the Total's Disruptive CO_2 Capture-Scientific Advisory Committee.
2018-	Member of the Board of Directors of École Polytechnique de Montréal (Conseil d'Administation).
2018-	Adjunct Professor, University Mohamed VI Polytechnique, Morocco.
2015-2017	Member of the 10th World Conference of Chemical Engineering in Barcelona (WCCE10)
2014-2016	Chairman of Int. Conf. Fluidization XV
2010-2020	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'Administation)
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 : approximatley $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

INDUSTRIAL PROJECTS

The most important ones:

2020-2021	OCP Group, *"CFD simulation of top submerged lance reactor for phosphorus from Phosphate Rocks at high Temperature*", Morocco
2019-2022	Total, "*Rotating Packed Bed Design Tool for Acid Gas Removal",* France
2019	Nova Chemicals, "*MW Plastic Decomposition*", USA
2018-2023	Joint Laboratory, "*Phosphate*", OCP Group-UM6P-PM, Morocco
2018-2020	OCP Group, "*Cd removal from Phosphate Rocks*", Morocco
2018-2020	OCP Group, "*Phosphorus from Phosphate Rocks at high Temperature*", Morocco
2018-2020	OCP Group, "*Phosphorus from Phosphate Rocks at high Temperature*", Morocco
2016-2019	APT, "*Hydro-Potasium from Feldspar*", US-Brazil
2017-2019	APT, "*Potasium from Feldspar at high Temperature*", US-Brazil
2018-2019	Total, "*Reactor design for OCM*", France
2017-2020	Syctom and Setec, "*Carbon Capture and Recovery from the Incineration Steams through a high energy efficient Bioremediation Industrial Process*", France
2012-2022	Total Chaire, 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, C*ombustion 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	ACDI, *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

RESEARCH BUDGET

- Last 10 years:
  Grants and Contracts: 18 Millions $
  FCI: 3 Millions $
- Next 5 years:
  Grants and Contracts: 12 Millions $ (already confirmed)
  FCI: 5 Millions $ (asked for)

AWARDS AND EXCELLENCE GRANTS

2021	Technological innovation award, Ordre des Ingénieurs Du Quebec (OIQ)- “Plan” magazine
2020	Kalev Pugi Award; Society of Chemical Industries; To an individual or team for R&D projects performed during the past 10-15 years, which had a significant beneficial impact on the sponsoring company or on society
2019	The Best Research at Polytechnique
2018	R.S. Jane Memorial Award, Canadian Society of Chemical Engineering (most prestigious price in Chemical Eng. In Canada).
2018	Wissam Royal “ Royal Decoration of King Mohamed VI of Morocco”.
2018	Professor-Researcher of the Year from Congrès Maghrébin au Québec
2017	TOP 20 of Diversity. Among the personalities who made Quebec move in 2016
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

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 acdemia 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.

HIGH QUALITY PERSONNEL (HQP)

Already graduated

M.Sc.A.

M.Sc.A 43 H. Gezzaz. “Kinetics of de-carbonization of phosphate ore”, (2021)
M.Sc.A 42 M. Hassan, “Method of complex treatment of phosphogypsum”, (2020)
M.Sc.A 41 G. Houriez, “Development of microwave receptor catalysts”, (2019)
M.Sc.A 40 A. Fallahi, “Experimental Study of Volumetric Gas-Liquid Mass Transfer Coefficient in Slurry Bubble Columns”, (2019)
M.Sc.A 39 R. Bemol, “Bubble column CFD”, (2018).
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 hygrogenation 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. Ruette, " 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/Al_20_3 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/$Si0_2$ aerogel", (1989).

M.Sc.A. 1 D. Kusohorsky, "Kinetics of the hydrogenation of methyl benzene on Ni/$Si0_2$ aerogel ", (1989).

Doctorates

Ph.D. 49 Hamed Nasri Lari, "De-agglomerating and coating metal oxide nanoparticles: toward stable nano powders" (2020)

Ph.D. 48 Beaulieu Christine, "DEM Simulation for non spherical Particles", (2020)

Ph.D. 47 El Mahdi Lakhdissi, "Hydrodynamics andmass transfer of slurry bubble column reactors at ambient and extremeconditions", (2020)

Ph.D. 46 Adrian Carrillo Garcia, "Calcination of rare earth elements bearing ore in fluidized bed reactors", (2019)

Ph.D. 45 Mai Attia, Catalytic pyrolysis of biomass and waste for the production of valueadded chemicals", (2019)

Ph.D. 44 Rahi Avazpour, "Development of a Process for Recovery of Rare Earth Elements from Bastnasite and Monazite Minerals", (2019)

Ph.D. 43 Bahman Yari, "Scale-Up of A Novel Melt Synthesis Process for the Manufacturing of C-$LiFePO_4$ for Automotive Applications", (2019)

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 Aghabararnejad, " 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 dela 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.53 R. Avazpour, “Cadmium removal from Phosphate ore with Pickering Emulsification”, (2021)
Post-doc.52 A. Shams, “Rotating packed bed design tool for acid gas removal”, (2021)
Post-doc.51 Z. Chen, “Microwave heating assisted upgrading of waste plastics”, (2021)
Post-doc.50 S. Shu, “CFD simulation of multiphase contactors”, (2020)
Post-doc.49 A.M. Nazari, “High temperature treatment of potassium feldspar”, (2020)
Post-doc.48 L. Charbonneau, “Catalytic dry reforming of methane”, (2020)
Post-doc.47 M.R. Gholipour, “Synthesis of metallic ion-exchange-base catalyst for wastewater treatment”, (2019)
Post-doc.46 Y. Yefeng, “CO_2 capturing with UV light”, (2018)

Post-doc.45 M. Javeed, “Hydropotash from potassium feldspar”, (2018)
Post-doc.44 S. Bukhari, “Decomposition of Phosphogypsum”, (2018).
Post-doc.43 B. Hadi, “Scale-up of hydropotash from potassium feldspar”, (2017)
Post-doc.42 J. Dupuy, “ Lotus Bioreactor Design for CO2 Absortion”, (2017).
Post-doc.41 D. Ubersfeld,” Decomposition of Phosphogypsium 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”, (2014).
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 mélanfe 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 Florien, "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).

Reserach Associate

R.A.5 R. Jafari, “Scale-up of phosphogypsum upgrading process”, and “leading contracted projects with TOTAL”, (2020)
R.A.4 Z. Chen, “Development of bifunctional catalysts for microwave heating assisted processes”, (2021)
R.A.3 J. Shabanian, “Scale-up of microwave heating assisted dry reforming of methane”, (2021)
R.A.2 M. Mirnezami, “Hydropotash from potassium feldspar”, (2020)
R.A.1 M. Latifi, “Leading mineral processing projects”, and “Developmnet of induction heating assisted technologies”, (2019)
R.A.1. P. Sauriol, “Development of a melt casting process to produce lithium iron phosphate”, (2018)

Faculty reseracher

Reseracher 1 S. Farag, “Microve heating assisted processes” and “TOTAL Chair”, (2019)
Reseracher 2 J.P. Lavoilette, “Co-combustion of coal and re-engineered feedstock to reduce SOx emissions”, (2015)

Current HQP

	Last name	First name	Position	Title	Co-supervisors
1	Latifi	Mohammad	Faculty researcher	TOTAl Chair, phosphate ore treatments, metal recycling	
2	Shabanian	Jaber	Faculty researcher	Dry reforming of methane, rotating packed beds	
3	Carrillo Garcia	Adrian	Reserach associate	Boost, Innovation and Collaboration-removal of heavy metals from phosphate ore	
4	Chidami	Saad	Reserach associate	Control of microwave generatros, biochemistry	
5	Fallahi	Afshin	Research associate	Cadmium removal by acid leaching	
6	Ahmadi	Eltefat	Postdoc	Rare earth metals from rare earth oxides	Mohammad Latifi
7	Golshan	Shahab	Postdoc	A multi-scalefeasibility analysis, design and optimization tool for rotating packed beds	
8	Afzal	Raja Muhammad	Postdoc	Simulation and teach-economic assessment of cadmium removal processes	Adrian Carrillo
9	Zhang	Chengouang	Postdoc	Numerical modeling ofthe heap leaching process	
10	Lakhdissi	El Mahdi	Postdoc	Boost, innovation and collaboration of heavy metals removal technologies	
11	Kumar Singh	Brajesh	Postdoc	Development of phosphate ore smelting process and CFD simulation of TSL reactor	Mohammad Latifi
12	Rabiee	Roshanak	Postdoc	CFD simulation of rotary packed bed and TSL reactor	Jaber Shabanian Mohammad Latifi
13	Amini	Ahmadreza	Postdoc	High temperature removal of cadmium from phosphate ore. Microwave heating	Mohammad Latifi Adrian Carrillo
14	Khajouei	Mohammad	Ph.D.	Kinetic modeling of phosphate ore smelting	Mohammad Latifi
15	Atile	Henok	Ph.D.	Scale-up of microwave heating assisted pyrolysis	
16	Adavi	Kazem	Ph.D.	Development of a two-step ammonium synthesis reactor	
17	Zriki	Mohammed	Ph.D.	Heavy metals removal from phosphate ore	
18	El Aziz	Sara	Ph.D.	Removal of heavy metals from phosphate based materials	Adrian Carrillo
19	Emam	Ahmed	Ph.D.	Nanothermite materials for energetic applications	

20	Diamond	James	Ph.D.	Developing a new plasmaprocess of various microparticles generated by amicrowave generator	
21	Vatankhah	Fatemeh	Ph.D.	Kinetic modeling of waste plastics pyrolysis	Jaber Shabanian Mohammad Latifi
22	Khodabandehloo	Mohammad	Ph.D.	Scale-up of microwave heating assisted dry reforming of methane	Jaber Shabanian
23	Wang	Zerui	Ph.D.	Microwave heating assisted waste plastic pyrolysis	
24	Mirakhori	Ghazaleh	Ph.D.	Polystyrene pyrolysis with microwave heating	
25	Sadek	Ramy	Ph.D.	Synthesis andcharacterization of nanocomposite material for electromagnetic waves attenuation	
26	Abdelrahman	Hussain	Ph.D.	Microwave heating-assisted process for thermal conversion of methane to acetylene and hydrogen	
27	Iman	Soleimani	Ph.D.	Estimation of interparticle forces in fluidized bed reactors at extreme conditions	
28	Laasri	Fadoua	Ph.D.	Valorization of phosphogypsum through its decomposition in reductive media	
29	Mohamed	Khalil	Ph.D.	e-Waste Pyrolysis	Jean-Philippe Harvey
30	Monzavi	Mohammad Hussain	Ph.D.	Microwave heating assisted upgrading of heavy oil	
31	Mokhtari	Mojtaba	Ph.D.	High Temperature and High Pressure Bubble Column Hydrodynamic	
32	Soulouki	Amin	Ph.D.	Process design and simulation of a microwave heating assisted process for de-metallization of heavy oil	
33	Najjar	Ahmed	M.Sc.A	New method for phosphorous extraction from ore	Mohammad Latifi
34	Masri	Lana	M.Sc.A.	Cadmium removal from phosphoric acid	Adrian Carrillo
35	Dourid	Issam	M.Sc.A.	Control of microwaveenergy in chemical processes	
36	Najam	Mouad	M.Sc.A.	Model a microwavereactor for polystyrene depolymerization and control the reflected wave	
37	Tao	Ling	M.Sc.A.	The large-scale production and catalytic properties of nanocrystalline cerium oxide particles in a fluidized-bed reactor.	Pierre Sauriol

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. Member of the 15th Int. Conf. on G-L and G-L-S Reactor Eng. (GLS-15), Ottawa, Canada (2021)
2. Member of The 6th International Symposium on Gasification and its Application (ISGA-6), China (2018)
3. Member of the PARTEC Scientific Committee, Germany (2018)
4. Member of the 8th World Congress on Particle Technology, WCPT8, April 22-26, 2018, Orlando, USA (2018)
5. Member of the scientific committee of the 8th International Conference on Environmental Pollution and Remediation (ICEPR'18), Madrid, Spain (2018)
6. Member of the International Advisory Board Invitation, Fluidization (since 2016)
7. Member of the International Symposium on Gasification and Its Applications, Shenyang, China (2017)
8. Member of the 10th WCCE, Barcelona, Spain (2017)
9. Member of the recycling Summit, Kuala Lumpur, Malaisia (2017)
10. Chairman of Int. Fluidization, Montreal, Canada (2016)
11. 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)
12. Member of the Organizing Committee of the IX ème Congrès International sur les Énergies Renouvelables et l'Environnement, Tunisia (2015).
13. Member of the Organizing Committee of the conference: "Biorefinery I: Chemicals and Materials From Thermo-Chemical Biomass Conversion and Related Processes", Greece (2015).
14. Member of the Organizing Committee "International Forest Biorefinery Symposium", PaperWeek Canada (2014).
15. Member of the Organizing Committee of the 9th CFGP (2014).
16. Member of the Organizing Committee 2014, Brasil (2014)
17. Chairman "Trends in Numerical and Physical Modeling for Industrial Multiphase Flows", Corcica(2012)
18. Member of the Organizing Committee of the 6th Journées Francophones sur les Réacteurs Gaz-Liquide et Gaz-Liquide-Solide (GLS F6),Marrakech, Maroc (2012).
19. Member of the Organizing Committee "Symphos I and II", Marrakech, Agadir Morocco (2011, and 13).
20. Member of the Organizing Committee "Bioenergy III", Canary Islands, Spain, (2010).
21. Technical Director of the 8th WCCE, Montréal (2009)
22. Organizer of the International Conference on Fluidized Beds (1996, 2000 and 2008, 2010)
23. Organizer of the International Conference on chemical reactors (2003 and 2005)
24. Organizer of the International Conference on tracers in chemical reactors (2004)
25. Evaluator of the graduate studies program in the Chemical Engineering Dept. at Université Laval (2004)
26. Member of the Academic Council (CA), École Polytechnique de Montréal (depuis 2003)
27. President of the scientific committee at Cynovad (2003-2004)

28. Organizer of the sessions “Visualization at the service of Man” J. Cartier Conferences(2003)
29. Organizer of the European conference of visualization in chemical engineering (2002)
30. Committee of exams for the Order of Engineers of Québec (from 1996 to 2006)
31. International conference on gaseous emissions (1998 and 2000)
32. Grants Committee for graduate students at École Polytechnique de Montréal (2000, 2001 and 2002)
33. Committee for the selection of director for the department of chemical engineering (2003)
34. 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

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

Master’s

192 theses as president or member in North America

INVITED CONFERENCE SPEAKER

<u>Conference:</u> 50 plenary sessions. The most importants are:

1. J. Chaouki, Plenary Lecture, Fluididization XVI, Guilin, China (2019)
2. J. Chaouki, Plenary Lecture, Conference on "Dispersed Two-Phase Flows", Toulouse, France (2018)
3. J. Chaouki, Plenary Lecture, Int. Conf. for Research on Phosphates and Derivatives, BenGuérir, Morocco (2018)
4. J. Chaouki, Plenary Lecture, "The Development of Industrial (Thermal) Processes in a Context of Sustainability", Toronto Canada (2018)
5. J. Chaouki, Plenary Lecture International Congress on Thermal Sciences, Safi, Morocco (2018)
6. J. Chaouki, Plenary Lecture, 10th Int. Chem. Eng. Congress & Exibition, Isfahan, Iran (2018)
7. J. Chaouki, Plenary Lecture, MATHIAS, Paris, France (2017)
8. J Chaouki, Plenary Lecture, The recycling Summit, Kuala Lumpur, Malaisia (2017)
9. J. Chaouki, Plenary Lecture "Yesterday, Waste was a Problem. Today, it is a Valuable Resource", 66th Canadian Chemical Engineering Conference, Québec, Canada, (2016).
10. J. Chaouki, Plenary Lecture "Biomimicry and reduction of greenhouse gases", COP22, Marrakech, Morocco, (2016).
11. J. Chaouki, Plenary Lecture "Improving resource efficiency to address climate change by observing Nature", Green Processes, Canada, (2016).
12. J. Chaouki, "Les défis du génie des proceeds dans les pays en voie de développement", Plenary, 10ème Congrès Int. sur les énergies renouvelables et l'environnement", Sousse, Tunisia (2016).
13. J. Chaouki, "Les nombreux procédés industrielsinfructueux: Une réalité cachée aux étudiants enfin révélée !", Plenary, 10ème Congrès Francophone de Génie Chimique, Maroc (2016).
14. J. Chaouki, "Thermal Chemical Engineering Kinetics and Reactor Design: New Tools, Plenary", Algeria (2016).
15. J. Chaouki, "Les technologies de réduction des gaz à effet de serre", Plenary (2016).
16. J. Chaouki, "RPT Technique: New Developments", Plenary, 14th International Conference on Modern Trends in Activation Analysis, The Netherlands (2015).
17. J. Chaouki, "Hier, les déchets etaient de sérieux problèmes. Demain, ils seront de précieuses ressources. Nos procédés doivent donc changer en conséquence », Plenary Lecture 9ème CFGP, Agadir, Maroc (2014).
18. J. Chaouki, "Distributed Microwave Pyrolysis of Solid Waste", Iran Conf. CH. En., Plenary (2015).
19. J. Chaouki, "RPT Technique: New Developments", Plenary, 14th International Conference on Modern Trends in Activation Analysis, The Netherlands (2015).
20. J. Chaouki, "Hier, les déchets etaient de sérieux problèmes. Demain, ils seront de précieuses ressources. Nos procédés doivent donc changer en conséquence », Plenary Lecture 9ème CFGP, Agadir, Maroc (2014).
21. 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).
22. J. Chaouki, "Innovate: yes you can", Symphos II, Plenary Lecture, Agadir, Morocco (2013).
23. 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)
24. Alizadeh, H. Bashiri, J. Chaouki and F. Bertrand, "Characterization of mixing processes by radioactive particle tracking", NAMF, Cancun (2012).
25. J. Chaouki, "The Future of G/S Fluidized Beds", GLS, Marrakech, Morroco (2012)
26. J. Chaouki, "Gasification & Combustion of Biomass and waste", in Green Technologies for the Production and the Sustainable use of Energy, Celaya, Mexico (2009);

27. J. Chaouki, “The Industrial Benefits of Current Researches in Fluidized Bed Technology”, PIChE, Davao, Philippines (2009).
28. J. Chaouki, “La troisième génération des procédés thermiques de bioraffinage : état de l’art et futurs chalenges”, 9th Mechanical Congress Marrakech –Morocco (2009).
29. J. Chaouki"Bioraffinage de 3ème génération", Congrès Int. Génie mécanique (2009);
30. J. Chaouki, "New Chalanges in Fluidized Beds Technology", Congrès Int. (2008);
31. J. Chaouki, "Innovations Technologiques", (2007, 2008 et 2009);
32. R. Contractor et J. Chaouki, "CFB as catalytic reactors", International. Congress Circulatig Fluized Bed III, Japon (1990).
33. J. Chaouki, "Catalytic Combustion of Natural Gas" Int. Congress Reactor Eng. (1997).
34. J. Chaouki, "Radioative Particle Tracking in Fluidized Beds", Int. Congress Multiphase Reactors, Belgique (2000).
35. J. Chaouki, "La visualisation des écoulements multiphasiques grâce à de nouvelles méthodes expérimentales", Congrès Int. Sur la visualisation, France (2002).

Industries: **197conferences**

Universities and research centers: **295 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 (**CVE: ECM)
- Development of microwave pyrolysis for waste for **Pyrowave** (since 2013)
- Development of electronic waste process for **Pyrocycle** (since 2017)
- Gypsum Decomposition to recycle SO2 for **OCP Group** (2017)
- Development of new injectors in fluidized beds for **Dupont** (2015)
- Development of new types of bubble columns for **EXXON** (2012)
- Design of a fluidized bed for roasting ore for **MANAGEM** (2011)
- Development of a new olfactometer based on the Pelletier effect for **Meteoglobe** (2006)
- Development of a new type of dryer for **Recypro** (1997)
- Development of two technologies (a power cycle catalytic reactor and an auto cycle fixed bed) for the catalytic combustion of natural gas for **CTGN** (1993)
- Development of a gas contact and an oxygas burner for **Gaz de France** (1990)

FOUNDER & CO-FOUNDER :

- Cpfounder of NeoCtech (2019)
- Cofounder of Pyrocycle (2018): **(Polytechnique Spinoff, won at least 20 prices including Genium 360 (2018), Clean50 (2018)**)
- Cofounder of TM Technologies (2017)
- Cofounder of Pyrowave (2013): (**Polytechnique Spinoff, won at least 20 prizes including Innovation Génie innovation 2018 de l’OIQ, Clean 50 (2017), IQ Chem, CIX Top 20…)**
- Cofounder of Virtual Artifact (2010)
- Scientific Director of Ecolomondo (2010)
- Cofounder of Formmat Technologies Inc. and technological transfer for composites (1999)

INTERVIEWS AND MEDIA RELATIONS (last 10 years)

- https://www.h24info.ma/culture/debats-idees/jamal-chaouki-produire-de-lhydrogene-au-maroc-a-grande-echelle-est-absurde/ (2021)
- http://www.polymtl.ca/carrefour-actualite/nouvelles/polytechnique-montreal-en-vedette-dans-la-revue-plan (2018)
- http://www.polymtl.ca/carrefour-actualite/magazine-poly/sinspirer-de-la-nature-pour-inventer-les-meilleurs-procedes-innovants (2017)
- http://www.polymtl.ca/carrefour-actualite/innovatio (2016)
- 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.poelesfoyers.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.

Simultaneous Measurement of Buble size and Solids Volume Fraction in tri or two Bubble Column

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 powders and its use as Chemical Vapor Deposition

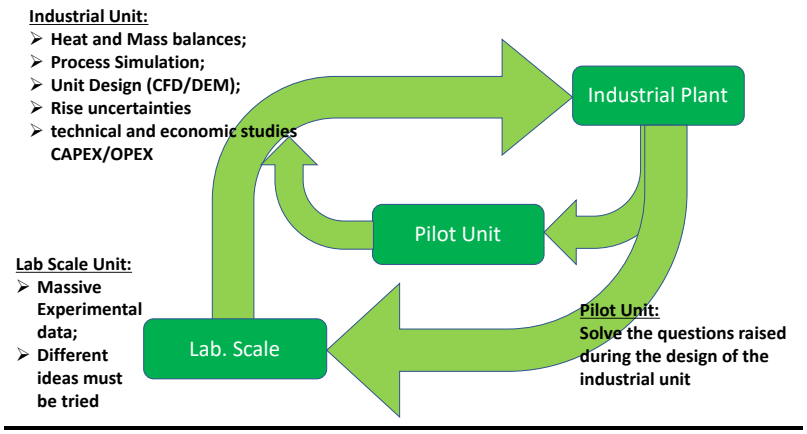
For the past years, I was one of the first researchers who have highlighted the role of interparticle forces on the fluidisability fine particles including nanoparticles. Currently, there is a general consensus on their importance. Because of these forces, these fine particles usually do not allow a good quality of fluidization. Despite this, I have developed several methods to their fluidization by modification of these forces, and designing an original bed.

- We recently succeeded in coating nanoscale particles in a gas-solid fluidized reactor for many applications. The lithium iron phosphate ($LiFePO_4$) is a promising building material for the cathode electrode that is the most costly constituent of the rechargeable lithium ion batteries. It suffers, however, from low ion conductivity and low electric conductivity. Coating a uniform layer of conductive carbon with an optimum thickness on $LiFePO_4$ powders enhances its electric conductivity. We have developed a new chemical vapor deposition process in fluidized bed reactors to overcome challenges in conventional carbon coating processes.

- Conformal multilayer TiO2 /SiO2 /TiO2 coatings were deposited on the surface of ~ 27 μm spherical soda lime glass (SLG) particles using fluidized bed chemical vapor deposition at atmospheric pressure. The photodegradation performance of the coated particles was examined by the degradation of methylene blue as the model reaction. It was found that a multilayer thin film of titania and silica can eff ectively prevent sodium ion diff usion from the SLG microsphere substrates, thus improving the photocatalytic performance of such system.

New method for designing a process

The conventional method of scaling is carried out in a linear manner: started at the laboratory scale, followed by the pilot scale and, at the end, the industrial scale. This approach has many disadvantages, which are related to the pilot scale step. Indeed, the value of the pilot scale test is not well established. Its size is determined in a blind way and one does not know what parameters are necessary to measure during the operation; thus, many industrial processes fail at the early stage of the operation. In order to avoid the uncertainties involved in a pilot scale test, we have developed a new method based on an iterative procedure (Figure below): from a lab scale directly to an industrial scale design and back to either the lab or the pilot scale followed by successive back and forth iterations.



This new method has many advantages:

- Drastically decrease in the uncertainties related to scale up;
- Increased collaboration and knowledge exchange between researchers involved in different steps. For example, I am leading the project entitled: "Development of a Process for Recovery of Rare Earth Elements from Bastnasite and Monazite Minerals" from Collaborative Research and Development Grant of NSERC. The research team includes professors from Polytechnique, McGill University and Laval University as well as specialists from Niobec Corporation. The proposed process includes physical beneficiation for concentrate production, concentrate thermal cracking to gain high grade rare earth oxides and individual separation of the rare earth elements. The collaboration between these researchers has led to very original solutions so that several patent applications are being made.
- Discovery of novel solutions for the process and file patents more quickly. For example, in project with Total Inc. entitled: "Single step Lactide production process", by using this methodology, we took 4 patents very quickly by developing a flow diagram just after laboratory testing (Sels, et al, 2016).

Right now, we are applying the same methodology for several different and confidential projects. For instance:

- For OCP group: Phosphogypsum decomposition into SO_2 and CaO;
- For Advanced Potash Tech. LTD with MIT: Conversion of potassium aluminosilicate rocks into K-fertilizers by lime;

- For Setec and Incinerateurs de Paris: carbon capture and recovery from the incineration steams through a high energy efficient bioremediation industrial process for biomaterial and biofuel production.

Scale-Up Book

I recently wrote the book "Scale-up Processes- Iterative Methods for the Chemical, Mineral and Biological Industrise". 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 makes them suffer from the lack of confidence which consequently leads to the lack of innovation. The emphasis of most books is on classical design of chemical processes/equipment and product design, but 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.

New Chemical Reactors for kinetics

New microreactors equipped with different mixing techniques and unconventional heating methods have been developed. The first microreactor is the Fluidized Bed Thermogravimetric Analyzer (FB-TGA), which is conventionally heated up to 1200 °C and can perfectly mix 5 g of complex feedstock while instantaneously measuring weight loss. The second microreactor is the induction heating fluidized bed reactor (IHFBR), which is composed of a lift tube and a reaction zone that relies on the electromagnetic irradiation heating method facilitating fast heating rates of up to 200 °C/s and operation up to 1500 °C. The lift tube helps precisely inject a mass of feedstock in less than one second to the reaction zone. To take advantage of the microwave heating technique, the Microwave Thermogravimetric Analyzer (MW-TGA-1) was developed. It measures a payload mass as low as 300 mg, and uses a custom-made infrared thermometer equipped with a set of optical filters. To overcome the drawbacks of MW-TGA-1 related to collecting products for analytical purposes, the MW-TGA-2was built. It accepts a payload mass of a gram scale and can record the instantaneous yield of the products. The outlet of the above-mentioned reactors is connected to several analytical techniques to analyse the gas product (2 patents).

Application of Microwave Heating

- <u>To simultaneously promote catalytic reactions and restrict gas phase side reactions</u>. Catalytic reactions account for more than 90% of the worldwide chemical manufacturing processes. However, catalytic reactions in some cases unintentionally facilitate the formation of undesired components simultaneously. Implementing catalytic reactions with microwave heating provides new opportunities for material processing and chemical reactions. Based on this unique heating mechanism higher local temperature on the active sites promotes higher selectivity and yield of the catalytic reactions, while lower bulk temperature and negligible microwave interaction of the gaseous components restricts the prospect of the undesired gas phased reactions (2 submitted patents).

- To simultaneously promote both ultra-fast pyrolysis and quench. For example, Polystyrene is not interactive with microwave and can be kept in the liquid phase at low temperatures. If the Liquid-Solid Fluidized Bed (Polystyrene as Liquid and SiC as Solid are used) is heated by microwave, (SiC is very interactive with Microwave), the Polystyrene decomposes very rapidly on the very hot particles of SiC and produces styrene which will cool down very quickly in the liquid without further decomposition. Therefore, more than 90% of the selectivity is achieved with microwave heating compared to 60% maximum with conventional heating (3 patents). This method can be used in many others applications.
- To develop a new process to remove sulfur and metals (mainly Ni, Mg and V) at low pressure and temperature from petroleum oil. In this process, the crude oil reacts with a demetallization agent using microwaves. This is still confidential and may revolutionize petrochemicals.

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 (2 patents).

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