



## Education

- **École Polytechnique de Montréal, University of Montreal, QC, Canada** (2016)  
*Post-doc, Department of Chemical Engineering*
- **École Polytechnique de Montréal, University of Montreal, QC, Canada** (2013)  
*Ph.D. Degree, Department of Chemical Engineering*
- **University of Ain Shams, Cairo, Egypt** (2008)  
*M.Sc. Degree, Department of Physics Engineering*
- **University of Ain Shams, Cairo, Egypt** (2005)  
*Qualification Degree in Physics and Mathematics Engineering*
- **University of Helwan, Cairo, Egypt** (2002)  
*B.Sc. Degree, Department of Mechanical Power Engineering*

## Research Interests

- Energy and Fuel Processing
- Renewable Energy
- Biomass Processing
- Waste Valorization
- Thermal and Catalytic Reactions
- Bio-Products Upgrading
- Microwave and Plasma Technologies;
- Oil Refinery
- Pyrolysis, Gasification, and Combustion
- Process Design, Development and Optimization
- Energy Management Systems
- Process Integration
- Extraction Processes
- Modeling and Simulation
- Pulp and Paper
- Techno-Economic Analysis

## Work Experience

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|--|--------------------------------|--------------------|
| • <b>Process Engineering Advanced Research Lab (PEARL)</b><br>École Polytechnique, University of Montreal, QC, Canada        | <b>Researcher I</b>            | <b>2017 -</b>      |
| • <b>RMTech For Environmental Solutions Inc.</b><br>Montreal, Quebec, Canada (www.RMTech.ca)                                 | <b>CEO</b>                     | <b>2016 -</b>      |
| • <b>Process Engineering Advanced Research Lab (PEARL)</b><br>École Polytechnique, University of Montreal, QC, Canada        | <b>Research Associate</b>      | <b>2016 - 2017</b> |
| • <b>Research Center in Process Engineer – Biorefinery (CRIP)</b><br>École Polytechnique, University of Montreal, QC, Canada | <b>Postdoctoral Researcher</b> | <b>2014 - 2016</b> |
| • <b>Research Center in Process Engineer – Biorefinery (CRIP)</b><br>École Polytechnique, University of Montreal, QC, Canada | <b>Doctorate Researcher</b>    | <b>2010 - 2013</b> |
| • <b>Egyptian Company for Air Conditioning and Refrigeration Services, Cairo, Egypt</b>                                      | <b>CEO</b>                     | <b>2004 - 2009</b> |
| • <b>Arab Academy for Science, Technology and Maritime Transport, Cairo, Egypt</b>   | <b>Lecturer (Part-Time)</b>    | <b>2007 - 2009</b> |
| • <b>Faculty of Engineering, University of Helwan, Cairo, Egypt</b>  | <b>Lecturer</b>                | <b>2002 - 2009</b> |

## Career Highlights

### Research and Development

1. Published more than 35 scientific communications during the last six years
2. Lead three projects funded by TOTAL American Services Inc. to investigate the multiphase processes at extreme conditions (2015 – present)
3. Initiated RMTech for Environmental Solutions Inc. – Canada to develop and deliver world-class technologies for complex feedstock processing (2016)
4. Led a project funded by the Lignoworks NSERC Strategic Network – Canada to create a cost-effective technology to convert lignin to high-value aromatics (2010 – 2015)
5. Led a collaboration with FPIInnovations – Canada to employ the lignin pyrolysis oil as a substitute in phenol-formaldehyde resins and adhesives (2011 – 2015)
6. Collaborated with KENGTEK Engineering Services (Montreal) and Pyrowave Inc. – Canada to develop the world's first distributed microwave pyrolysis system
7. Worked with Queen's University, the University of Western Ontario, and the University of Ottawa – Canada to synthesize commercially viable bio-products (2012 – 2015)
8. Participated with the University of Helwan to develop a mobile system to produce energy based on non-recyclable waste materials (2014 – 2016)

### Inventions for the Last Two Years

1. Invented a green process to recover the inorganic chemicals of the pulp and paper industry from black liquor (Patent Pending, the IP belongs to RMTech for Environmental Solutions Inc. – Canada)
2. Co-inventor in developing a method for the demetallization and desulphurization of heavy petroleum oil (Patent in progress, the IP belongs to TOTAL American Services Inc)
3. Developed a process for the cadmium removal from phosphate (Patent in advance)
4. Co-inventor in developing a green method for the dezincification and desulphurization of waste tires pyrolysis char (Patent in progress)
5. Developed a green process for the desulphurization of tires pyrolysis oil (Patent in advance)

### Teaching Experience

1. Created a postgraduate course relates to the employment of clean electricity (Plasma, Microwaves, Induction Heating, Electric Field, and Ultrasound) in chemical reactions.
2. Taught more than 20,000 undergraduate engineering students of different disciplines, cultures, and backgrounds in a class size of 500 students
3. Supervised more than 42 graduate and undergraduate students
4. Taught the following undergraduate courses for the Chemical Engineering, Physics Engineering and Mechanical Engineering students:
  - Fundamentals of Thermodynamics, seven semesters
  - Advanced Thermodynamics, five semesters
  - Fundamentals of Fluid Mechanics, six semesters
  - Advanced Fluid Mechanics, three semesters
  - Heat and Mass Transfer, four semesters
  - Solid Waste Treatment, one semester
  - Fundamentals of Combustion, four semesters
  - Fundamentals of Gas Turbine, one semester
  - Principles of Energy Conversion, two semesters
  - Mechanics and Waves, ten Semesters
  - Electromagnetism and Optics, seven Semesters
  - Fundamentals of Engineering Drawing, six Semesters
  - Mechanical Engineering Drawing, four Semesters
  - Properties of Matter, twelve semesters
  - Fundamental of Magnetism, ten Semesters
  - Fundamentals of Electricity, nine Semesters



## Research, Scholarly, And Creative Activities

### Patent Pending

**Farag, S,** Chaouki J. (2017). A methodology to recover the inorganic chemicals of the pulp and paper industry from black liquor. (Application Number: 62576738)

### Book Chapters and Dissertations

1. Samih, S, **Farag S,** Chaouki J. (2018). Innovative microreactors for low-grade feedstock gasification. Accepted for publication. INTECH
2. **Farag, S,** Chaouki J. (2015). Innovative solutions in fluid-particle systems and renewable energy management. Hershey, PA – USA, IGI Global: 1-316.
3. **Farag, S.** (2013). Production of chemicals by microwave thermal treatment of lignin. Department of Chemical Engineering, École Polytechnique Montreal, University of Montreal – Canada. Ph.D. dissertation.
4. **Farag, S.** (2008). Measurements of specific heat at constant volume of jojoba bio-gasoline fuel. Faculty of Engineering, University of Ain Shams. M.Sc. dissertation.

### Peer Reviewed Journal Publications

1. **Farag S,** Chaouki J. 3D model to predict the yield and composition of lignin pyrolysis oil. Submitted to J Anal Appl Pyrolysis. 2018.
2. Samih, S, Latifi M, **Farag S,** Leclerc P, Chaouki J. From complex feedstocks to new processes: the role of the newly developed micro-reactors. 2018; Submitted to Chemical Engineering & Processing.
3. **Farag S,** Mudrabovina BP, Jessop PG, Chaouki J. Impact of the heating mechanism on the yield and composition of bio-oil from pyrolysis of kraft lignin. Biomass Bioenergy. 2016;95:344-53.
4. Mudraboyina BP, **Farag S,** Banerjee A, Chaouki J, Jessop PG. Supercritical fluid rectification of lignin pyrolysis oil methyl ether (LOME) and its use as a bio-derived aprotic solvent. Green Chem. 2016;18(7):2089-94.
5. Esmaeili A, **Farag S,** Guy C, Chaouki J. Effect of elevated pressure on the hydrodynamic aspects of a pilot-scale bubble column reactor operating with non-Newtonian liquids. Chem Eng J. 2016;288:377-89.
6. Attia M, **Farag S,** Sajad H, Sepehr H, Chaouki J. Fast pyrolysis of lignocellulosic biomass for the production of energy and chemicals: A critical review. Curr Org Chem. 2016;20:1.
7. **Farag S,** Chaouki J. Economics evaluation for on-site pyrolysis of kraft lignin to value-added chemicals. Bioresour Technol. 2015;175(0):254-61.
8. **Farag S,** Chaouki J. A modified microwave thermo-gravimetric-analyzer for kinetic purposes. Appl Therm Eng. 2015;75:65-72.
9. **Farag S,** Fu D, Jessop PG, Chaouki J. Detailed compositional analysis and structural investigation of a bio-oil from microwave pyrolysis of kraft lignin. J Anal Appl Pyrolysis. 2014;109(0):249-57.
10. **Farag S,** Kouisni L, Chaouki J. Lumped approach in kinetic modeling of microwave pyrolysis of kraft lignin. Energy Fuel. 2014;28(2):1406-17.
11. Fu D, **Farag S,** Chaouki J, Jessop PG. Extraction of phenols from lignin microwave-pyrolysis oil using a switchable hydrophilicity solvent. Bioresour Technol. 2014;154(0):101-8.
12. Doucet J, Laviolette J-P, **Farag S,** Chaouki J. Distributed microwave pyrolysis of domestic waste. Waste Biomass Valor. 2014;5(1):1-10.
13. **Farag S,** Sobhy A, Akyel C, Doucet J, Chaouki J. Temperature profile prediction within selected materials heated by microwaves at 2.45GHz. Appl Therm Eng. 2012;36(0):360-9.

## Conference Publications/Presentations

1. Developing Novel Processes from Complex and Abundant Feedstocks: Which role for the Innovative Microreactors. Accepted as a Keynote Speaker in the 10th International Chemical Engineering Congress & Exhibition, Isfahan, Iran, 6-10 May 2018.
2. A novel model to forecast the yield and composition of the pyrolysis products: reaction kinetics and hydrodynamics study. Accepted in the 8th World Congress on Particle Technology. Orlando World Center Marriott, Orlando, Florida – USA, April 22-26, 2018.
3. On-site thermochemical conversion of lignin: Technical and economic aspects. Biomass North AGM and Forum Research Symposium. Clarion Resort Pinewood Park, North Bay, Ontario – Canada, October 24-26, 2016.
4. Microwave heating assisted chemical reactions. TOTAL American Services Inc., TOTAL Students Sponsored Meeting, MIT, Cambridge, MA – USA, March 21-22, 2016.
5. Microwave pyrolysis of lignin. NSERC Biomaterials and Chemicals Network (LIGNOWORKS), Annual General Meeting, Hilton Lac-Leamy, Gatineau, Quebec – Canada, November 23-24, 2015.
6. Hydrodynamic aspects of multiphase reactors at extreme conditions. TOTAL American Services Inc., TOTAL Students Sponsored Meeting, Marriott Hotels and Resorts, Santa Clara, California – USA, February 3-4, 2015.
7. Technical and economic feasibility of pyrolysis of kraft lignin. Materials for Oil, Gas & Biofuels Chapter 4, Materials for Energy, Efficiency and Sustainability, TechConnect Briefs, 2015.
8. Technical and economic feasibility of pyrolysis of kraft lignin. TechConnect World Innovation Conference, Gaylord National Hotel & Convention Center, Washington, DC – USA, June 14-17, 2015.
9. Energy and chemicals from biomass & waste: The-state-of-the-art. SYMPHOS 2015, Marrakesh – Morocco, May 18-20, 2015.
10. Preliminary economic assessment for the production of lignin-based chemicals. The 3rd Annual FIBRE (Forest Innovations by Research and Education) CONFERENCE “The Path Forward,” École Polytechnique, Montreal, Quebec – Canada, May 11-13, 2015.
11. Microwave-assisted pyrolysis of kraft lignin for value-added chemicals. Industry Connect – FIBRE Regional Workshop, Ivey Spencer Leadership Centre, London, Ontario – Canada, March 30, 2015.
12. Hydrodynamics of bubble column reactors at extreme conditions. TOTAL American Services Inc., Annual General Meeting, École Polytechnique Montreal, Quebec – Canada, November 22, 2014.
13. Microwave pyrolysis of lignin. NSERC Biomaterials and Chemicals Network (LIGNOWORKS), Annual General Meeting, The Listel Hotel, Vancouver, BC – Canada, June 5-7, 2014.
14. Microwave-assisted pyrolysis of kraft lignin for value-added bioproducts. Fourth International Forest Biorefinery Symposium PaperWeek Canada, Fairmont Queen Elizabeth Hotel, Montreal, Quebec – Canada, February 3-4, 2014.
15. Microwave pyrolysis of lignin. NSERC Biomaterials and Chemicals Network (LIGNOWORKS), Principle investigators’ meeting, Holiday Inn. Ottawa – Canada, January 27-28, 2014.
16. Microwave-assisted pyrolysis of kraft lignin for biochemicals production. FIBRE Cross-Country/Cross-Linking Workshops, Eastern Canada Workshop, University of McGill, Montreal, Quebec – Canada, November 19, 2013.
17. Microwave pyrolysis of lignin. NSERC Biomaterials and Chemicals Network (LIGNOWORKS) Annual General Meeting, NAV Centre, Cornwall, Ontario – Canada, May 12-14, 2013.
18. Microwave pyrolysis of lignin. The 1st FIBRE Network conference, NAV Centre, Cornwall, Ontario – Canada, May 14-16, 2013.
19. Upgrading pyrolysis products with the assistance of microwave heating. The 62nd Canadian Chemical Engineering Conference, Vancouver, BC – Canada, October 14-17, 2012.
20. Distributed microwave pyrolysis of domestic waste. The 4th International Conference on Engineering for Waste and Biomass Valorization, Porto – Portugal, September 10-13, 2012.
21. Microwave pyrolysis of lignin. NSERC Biomaterials and Chemicals Network (LIGNOWORKS), Annual General Meeting, Hilton Whistler Resort, Vancouver, British Columbia – Canada, May 1-4, 2012.

22. Production of aromatics using microwave pyrolysis of lignin. The 61st Canadian Chemical Engineering Conference, London, Ontario – Canada, October 23-26, 2011.
23. Energy consumption in microwave pyrolysis of biomass. The 61st Canadian Chemical Engineering Conference, London, Ontario – Canada, October 23-26, 2011.
24. Microwave pyrolysis of lignin. NSERC Biomaterials and Chemicals Network (LIGNOWORKS), Annual General Meeting, Hockley Valley Resort, Orangeville, Ontario – Canada, May 11-13, 2011.
25. Production de produits chimiques à partir du traitement thermique aux micro-ondes de lignine. Colloque étudiant sur le développement de produits biosourcés, ACFAS-COLLOQUE 118, University of Sherbrooke, Quebec – Canada, May 9-10, 2011.
26. Comparison between microwave and conventional heating for high-temperature biorefinery of waste biomass. International Forest Biorefinery Symposium, Fairmont Queen Elizabeth Hotel Montreal, Quebec – Canada, February 1-2, 2011.
27. Microwave-assisted pyrolysis and gasification of waste biomass. International Forest Biorefinery Symposium, Fairmont Queen Elizabeth Hotel, Montreal, Quebec – Canada, February 1-2, 2011.
28. Calculation of some thermodynamic properties based on isochoric specific heat and PvTx relationship for jojoba bio-gasoline as a renewable fuel. Accepted at the 17th Symposium on Thermophysical Properties, Boulder, Colorado – U.S.A, June 21-26, 2009.
29. Measurements of specific heat at constant volume and PvTx relationship for jojoba bio-gasoline as a renewable fuel. 18th European Conference on Thermophysical Properties, Pau – France, August 31 – September 4, 2008.