

# PHILIPPE OUZILLEAU

## ABSTRACT

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PhD in metallurgical engineering. Specialisation in material science, electrometallurgy (e.g. the aluminium electrolysis process) and pyrometallurgy (e.g. graphitisation of carbon materials). Graphitisation is the process which produces graphitic carbons (materials similar to graphite) from graphenic carbons (materials similar to graphene) through extreme heat treatment ( $\sim 3000^\circ\text{C}$ ). My research impacts the environmental performance of various energy and metallurgical processes. For example, my work resulted in a technology transfer to potentially reduce the carbon anode consumption (and associated greenhouse gas emissions) by up to 30% during high temperature aluminium electrolysis.

## AFFILIATIONS (PAST AND PRESENT)

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### McGill, University

Assistant Professor, Department of Mining and Materials Engineering.

*August 2020 - Present*

### The University of Manchester, Royaume-Uni

Invited researcher, *Nuclear Graphite Research Group of the School of Mechanical, Aerospace and Civil Engineering.*

*September 2019 - July 2020*

International collaboration with Prof Abbie Jones (Manchester) on the recycling of nuclear graphites.

### Université de Sherbrooke, Canada

Postdoctoral researcher under the supervision of Prof Gervais Soucy, Department of chemical and biotechnological engineering.

*June 2019 - July 2020*

### Polytechnique Montréal, Canada

Postdoctoral researcher under the supervision of Prof Patrice Chartrand, Department of chemical engineering.

*February 2019 - June 2019*

### Member of the Royal Society of Chemistry

Member of the American Carbon Society

*November 2019 - present*

*July 2019 - present*

## EDUCATION

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### Polytechnique Montréal, Canada

PhD in metallurgical engineering

Second place at the 2019 best PhD thesis award of Polytechnique Montréal

*January 2019*

### Polytechnique Montréal, Canada

Master of applied science in metallurgical engineering

Second place at the 2014 best master thesis award of Polytechnique Montréal

*August 2014*

### Polytechnique Montréal, Canada

Baccalaureate in chemical engineering

Distinction of excellence in academic performance

*June 2012*

## SELECTED PUBLICATIONS

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[A1]. Ouzilleau, P., Gheribi A.E., Chartrand P., Soucy, G. and Monthieux, M. (2019) Why some carbons may or may not graphitize? The point of view of thermodynamics. *Carbon*. 149: 419-35

- The present work was published in the reputable journal *Carbon* (2018 impact factor of 7.466). This journal is leading reference in carbon science. In 2018, the Scimago Journal and Country Rank classed *Carbon* as one of the most important journals in material science (rank 79 out of 1641).
- In recognition of its excellence, the present paper was awarded the 2019 Young Scientist award from the Société Francophone d'Étude des Carbones (See [P1] for detailed description).

[A2]. Ouzilleau, P., Gheribi A.E. and Chartrand P. (2018) Prediction of CO<sub>2</sub>/CO formation from the (primary) anode process in aluminium electrolysis using an electrothermodynamic model (for coke crystallites). *Electrochimica Acta*. 259: 916-29

- The present computational model resulted in a technology transfer for the aluminium industry (Rio Tinto, Alcoa, Hydro Aluminium and Constellium)
- This paper was published in the reputable journal *Electrochimica Acta* (2018 impact factor of 5.383). In 2018, the Scimago Journal and Country Rank classed *Electrochimica Acta* as one of the most important journals in electrochemistry (rank 4 out of 35) and chemical engineering (rank 25 out of 400).
- In recognition of its excellence, the present paper was awarded the 2018 Louis-Berlinguet award from the Fonds de Recherche du Québec – Nature et Technologies (See [P2] for detailed description).

## SELECTED AWARDS

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[P1]. Young Scientist Société Francophone d'Étude des Carbones award July 2019  
*SFEC (Société Francophone d'Étude des Carbones)* Lexington, United-States

- The SFEC created the present award in recognition of a significant contribution to carbon science by a young non-tenured francophone scientist or engineer.
- The present work has been awarded for the excellence of publication [A1].

[P2]. Louis-Berlinguet award from the Fonds de Recherche du Québec – Nature et Technologies July 2018  
*FRQNT (Fonds de Recherche du Québec – Nature et Technologies)* Québec, Canada

- This award is given to student-researchers in recognition for the high value of their work for the scientific and industrial actors of Quebec.
- The present work has been awarded for the excellence of publication [A2].

## RESEARCH FUNDING

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1. Public research funding, PhD level (2016-2017) 27 000 \$CDN  
*Offered by the FRQNT (Fond de Recherche Québécois Nature et Technologie)*
2. Industrial research funding, Master level (2013-2014) 17 500 \$CDN  
*Offered by Rio Tinto*
3. Institutional research level, Undergraduate level, (2009-2010) 1 500 \$CDN  
*Offered by Polytechnique Montréal*

## AWARDS

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1. SFEC Young Scientist award 2019 3500 \$CDN
2. FRQNT Louis-Berlinguet award 2018 1000 \$CDN
3. CALPHAD conference award 2014 1500 \$CDN

## HONOURS

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1. **Best chemical engineering thesis award of Polytechnique Montréal** 2019
2. **Best oral presentation McGill chemical engineering research day** 2018
3. **Nomination for chemical engineering best lecturer Polytechnique Montreal** 2018
4. **Nomination for chemical engineering best lecturer Polytechnique Montreal** 2016
5. **Best chemical engineering master thesis award of Polytechnique Montréal** 2014

## APPENDIX 1: LIST OF PUBLICATIONS (8) IN SCIENTIFIC JOURNALS WITH REVIEWING COMMITTEE

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1. Dessemond, C., Soucy, G., Harvey, J.-P. and **Ouzilleau, P.** (2020) Phase Transitions in the  $\alpha - \gamma - \beta$  Spodumene Thermodynamic System and Impact of  $\gamma$ -Spodumene on the Efficiency of Lithium Extraction by Acid Leaching. *minerals*. 10: 519
2. **Ouzilleau, P.**, Gheribi A.E., Chartrand P., Soucy, G. and Monthieux, M. (2019) Why some carbons may or may not graphitize? The point of view of thermodynamics. *Carbon*. 149: 419-35
3. **Ouzilleau, P.**, Gheribi A.E. and Chartrand P. (2018) Thermodynamic description of graphitizable carbons and the irreversible graphitization process. *Carbon*. 132: 556-64
4. **Ouzilleau, P.**, Gheribi A.E. and Chartrand P. (2018) Prediction of CO<sub>2</sub>/CO formation from the (primary) anode process in aluminium electrolysis using an electrothermodynamic model (for coke crystallites). *Electrochimica Acta*. 259: 916-29
5. **Ouzilleau, P.**, Gheribi A.E. and Chartrand P. (2016) The graphitization threshold analyzed through a second-order structural transformation. *Carbon*. 109: 896-908
6. Ma, Z., **Ouzilleau, P.**, Trevisanut, C., Neagoe, C., Lofti, S., Boffito, D. and Patience. G. (2016) Partial oxidation of methane to syngas over Pt/Rh/MgO catalyst supported on FeCralloy woven fibre. *Canadian Journal of Chemical Engineering*. 94: 642-9
7. **Ouzilleau, P.**, Gheribi A.E., Lindberg D.K. and Chartrand P. (2016) A size-dependent thermodynamic model for coke crystallites: the carbon-sulfur system up to 2500 K. *Metallurgical and Materials Transactions B*. 47B: 1817-31
8. **Ouzilleau, P.**, Gheribi A.E., Eriksson G., Lindberg D.K. and Chartrand P. (2015) A size-dependent thermodynamic model for coke crystallites: the carbon-hydrogen system up to 2500 K. *Carbon*. 85: 99-118
9. **Ouzilleau, P.**, Robelin, C. and Chartrand, P. (2012) A density model based on the modified quasichemical model and applied to the (NaCl + KCl + ZnCl<sub>2</sub>) liquid. *Journal of Chemical Thermodynamics*. 47: 171-176

## APPENDIX 2: LIST OF CONFERENCE PAPERS (2) WITH REVIEWING COMMITTEE

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1. **Ouzilleau, P.**, Gheribi A.E. and Chartrand P. (2015) A size-dependent thermodynamic model for the carbon/hydrogen/sulfur system in coke crystallites: Application to the production of pre-baked carbon anodes. *Light Metals*: 1067-72
2. Dalaker, H., **Ouzilleau, P.** and Chartrand, P. (2015) The Application of a Recent Thermodynamic Model for Coke Crystallites: Chemisorption of Methyl Groups, Decomposition of Natural Gas, and the Reduction of Metal Oxides. *International Symposium on High- Temperature Metallurgical Processing*. 6: 331-38

### APPENDIX 3: LIST OF CONFERENCE AND SEMINAR PRESENTATIONS AS AN INVITED SPEAKER OR PUBLIC SPEAKER

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1. Public speaker (oral, international):  
The perspective of thermodynamics on why some carbons may or may not graphitize and the link to irradiation damage in nuclear graphites, *20th International Nuclear Graphite Specialist Meeting* (2019), Bruges, Belgium.
2. **INVITED** speaker (oral, international):  
Why some carbons may or may not graphitize? How thermodynamics can identify optimal precursors best suited for the needs of the industry, *Seminar for the Corporate Strategic Research Laboratory of ExxonMobil* (2019), Annandale, United States.
3. **INVITED** speaker (oral, international):  
Why some carbons may or may not graphitize? Interpreting graphitization data with a phenomenological model inspired from thermodynamics, *International Carbon conference* (2019), Lexington, United States.
4. Public speaker (oral, international):  
Why some carbons may or may not graphitize?, *Atomistic Computational Studies of Carbon : A meeting to celebrate the scientific achievements of Malcolm Heggie* (2019), Brigton, United Kingdom.
5. **INVITED** speaker (oral, international):  
Pourquoi certains carbones graphitent ou ne graphitent pas? Une interprétation phénoménologique inspirée de la thermodynamique, *SFEC (Société Francophone d'Étude des Carbones) international conference* (2019), Toulouse, France.
6. Public speaker (oral):  
Thermodynamic modeling of the graphitizability of carbon materials, *Canadian Material Science Conference (CMSC) of the Metallurgy and Materials Society of the Canadian Institute of Mining, Metallurgy and Petroleum* (2018), Edmonton, Canada.
7. Public speaker (oral, international):  
Modéliser la graphitabilité des carbones par la thermodynamique, *SFEC (Société Francophone d'Étude des Carbones) international conference* (2018), Obernai, France.
8. Public speaker (oral):  
Prédiction de la formation de CO<sub>2</sub>/CO par le processus anodique primaire durant l'électrolyse de l'aluminium par un modèle électro-thermodynamique pour les cristallites de coke, *Acfas (Association francophone pour le savoir) conference* (2018), Chicoutimi, Canada.
9. Public speaker (oral, international):  
Thermodynamic rationalization of graphitization: the critical temperature threshold, *International Carbon conference* (2017), Melbourne, Australia.
10. **INVITED** speaker (oral, international):  
Le seuil de graphitisation traité par une approche structurale et thermodynamique, *SFEC (Société Francophone d'Étude des Carbones) international conference* (2016), Carqueiranne, France.
11. Public speaker (oral, international):  
Coke crystallite thermodynamics applied to sulfur control and energy balance in a blast furnace, *conference TMS (The Minerals, Metals and Materials Society)* (2016), Nashville, United States.
12. Public speaker (oral, international):  
A size-dependent thermodynamic model for graphitic crystallites integrating the binary interactions of sulfur/hydrogen with carbon up to 2500 K, *International Carbon conference* (2015), Dresden, Germany.

13. Public speaker (oral, international):

A size-dependent thermodynamic model for the carbon/hydrogen/sulfur system in coke crystallites : Application to the production of pre-baked carbon anodes, *TMS (The Minerals, Metals and Materials Society) conference* (2015), Orlando, United States.

14. Public speaker (poster, international):

A size- dependent thermodynamic model for coke crystallites: the carbon-hydrogen-sulfur system, *CALPHAD (Calculation of Phase Diagrams) conference* (2015) Changsha, China.