Mohsen Karimi

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EDUCATION AND RESEARCH EXPERIENCE

EDUCATION

Department of Applied Science and Technology,
Politecnico di Torino — Turin, Italy
Post-doctoral Research Fellow — *February 2014 - Present*
Supervisor: Daniele L. Marchisio

Process Engineering Department,
University of Stellenbosch — Stellenbosch, South Africa
Ph.D. in Extractive Metallurgical Engineering — *December 2013*
Dissertation: "CFD Analysis of Solid-Liquid-Gas Interactions in Flotation Vessels"
Advisors: Guven Akdogan, Steven M. Bradshaw

Faculty of Mining and Metallurgical Engineering,
Yazd University — Yazd, Iran
M. Sc. in Mineral Processing — *October 2009*
Thesis: "CFD Modelling and Evaluating the Effects of Operational Parameters on the Performance of Hydrocyclones"
Advisors: Ali Dehghani, Shahram Talebi

Faculty of Mining Engineering,
Kashan University — Kashan, Iran
B. Sc.in Mining Engineering — *June 2000*

RESEARCH INTERESTS

Application of CFD for different engineering fields; formulations and developments of CFD solvers for single and multiphase systems; fundamental studies towards establishing new modelling methodologies for a range of engineering problems encountering in the chemical, mechanical, process and mining engineering;

RESEARCH EXPERIENCE

Postdoctoral Fellowship — **2014 - Present**

Working with Professor Marchisio on "Modelling of Morphology Development of Micro and Nano Structures (MoDeNa)" project aiming to develop, demonstrate and evaluate a CFD-PBE model for polyurethane foams.

- Formulating a novel approach based on population balance equation for the simulation of polyurethane foams.

- Developing and validating a zero-dimensional framework for simulation of reacting expanding polyurethane foams, (source code).

- Introducing a new solver, "`PUFoam`", in OpenFOAM CFD code, based on coupling of PBE with CFD.

- Providing guidance and mentorship to post graduate students in "multiscale modelling for materials science and process engineering research group":

- Hermes Droghetti; "*Development of an OpenFOAM solver for polyurethane foams*".

- Marco Cravero; "*Testing and validation of a computational fluid dynamics model for polyurethane foams*".

- Alessandro Concas; "*Modeling of polyurethane foams with commercial fluid dynamic computational code FLUENT*".

Doctoral Research **2010 - 2014**

Worked with Professor Akdogan and Professor Bradshaw on the development of a CFD model for conventional flotation vessels. A CFD-based methodology was formulated, and validated for the prediction of flotation macro response by integrating the significance of the hydrodynamic flow features into the flotation micro-processes.

Master's Research **2007 - 2009**

Worked with Professor Dehghani and Professor Talebi on experimental, analytical and computational modelling of hydrocyclones.

PUBLICATIONS

REFEREED JOURNAL PAPERS

1. P. Ferkl, M. Karimi, D. L. Marchisio, J. Kosek, "Multi-scale modelling of expanding polyurethane foams: coupling macro- and bubble-scales", submitted to *Chemical Engineering Science*, January 2016.
2. M. Karimi, H. Droghetti, D. L. Marchisio, "Multiscale Modelling of Expanding Polyurethane Foams via Computational Fluid Dynamics and Population Balance Equation", *Macromolecular Symposia*, Vol. 360(1), pp. 108–122, 2016.
3. M. Karimi, D. L. Marchisio, "A Baseline Model for the Simulation of Polyurethane Foams via the Population Balance Equation", *Macromolecular Theory and Simulations*, Vol. 24(4), pp. 291–300, 2015.
4. M. Karimi, G. Akdogan, S. M. Bradshaw, "A Computational Fluid Dynamics Model for the Flotation Rate Constant, Part I: Model Development", *Minerals Engineering*, Vol. 69, pp. 214–222, 2014.
5. M. Karimi, G. Akdogan, S. M. Bradshaw, "A CFD-Kinetic Model for the Flotation Rate Constant, Part II: Model Validation", *Minerals Engineering*, Vol. 69, pp. 205–213, 2014.
6. M. Karimi, G. Akdogan, K. H. Dellimore, S. M. Bradshaw, "Quantification of Numerical Uncertainty in Computational Fluid Dynamics Modelling of Hydrocyclones", *Computer & Chemical Engineering*, Vol. 43, pp. 45–54, 2012.
7. M. Karimi, G. Akdogan, S. M. Bradshaw, "Effects of Different Mesh Schemes and Turbulence Models in CFD Modelling of Stirred Tanks", *Physicochemical Problems of Mineral Processing*, Vol. 48(2), pp. 513–531, 2012.
8. A. Ghaffari, M. Karimi, "Numerical Investigation on Multiphase Flow Simulation in a Centrifugal Flotation Cell", *International Journal of Coal Preparation and Utilization*, Vol. 32(3), pp. 120–129, 2012.
9. M. Karimi, G. Akdogan, A. Dehghani, S. M. Bradshaw, "Selection of Suitable Turbulence Models for Numerical Modelling of Hydrocyclones", *Chemical Product and Process Modelling*, Vol. 6(1), 2011.
10. M. Karimi, A. Dehghani, A. Nezamalhosseini, S. Talebi, "Prediction of Hydrocyclone Performance Using Artificial Neural Networks", *The Journal of South African Institute of Mining and Metallurgy*, Vol. 110, pp. 207–212, 2010.

CONFERENCE PROCEEDINGS

11. M. Karimi, P. Ferkl, D. L. Marchisio, J. Kosek, H. Droghetti, "Coupling of a macro-scale CFD model with a bubble-scale model for simulation of polyurethane foams", to be presented at the *22^{nd} International Congress of Chemical and Process Engineering, CHISA*, Prague, Czech Republic, August 28-31, 2016.

12. M. Karimi, D. L. Marchisio, "Coupling Population Balance Equation (PBE) with Computational Fluid Dynamics (CFD) for Multiphase Modelling of Expanding Polyurethane Foams", to be presented at the 9^{th} *International Conference on Multiphase Flow*, Firenze, Italy, May 22-27, 2016.
13. P. Ferkl, M. Karimi, D. L. Marchisio, J. Kosek, "Introducing a Multiscale modelling tool for the Simulation of Polyurethane Foams", to be presented at the 9^{th} *International Conference on Multiphase Flow*, Firenze, Italy, May 22-27, 2016.
14. M. Karimi, D. L. Marchisio, "Validation of a Macro-Scale CFD-PBE Model for the Polyurethane Foaming Process", *In: Proceeding of the AIChE 2015 Annual Meeting*, Salt Lake City, UT, USA, November 8-13, 2015.
15. M. Karimi, G. Akdogan, S. M. Bradshaw, "A CFD Model for the Flotation Rate Constant", *In: Proceedings of the* 37^{th} *International Symposium Application of Computers and Operations Research in the Mineral Industry (APCOM)*, pp. 445-456, May 23-27, 2015.
16. M. Karimi, D. L. Marchisio, "Multi-scale Modelling of a Reacting-Expanding Polyurethane Foam", *10th European Congress of Chemical Engineering*, Nice, France, September 27 to October 1, 2015.
17. M. Karimi, D. L. Marchisio, "Multiscale Modelling of Expanding Polyurethane Foams via Computational Fluid Dynamics and Population Balance Model", *In: Proceedings of Polymer Reaction Engineering IX (PRE9),* Cancun, Mexico, May 10-15, 2015.
18. M. Karimi, G. Akdogan, K. Dellimore, S. M. Bradshaw, "Comparison of Different Drag Coefficients in CFD Modelling of a Laboratory Scale Rushton-Turbine Flotation Tank", *In: Proceedings of the Ninth International Conference on CFD in the Minerals and Process Industries*, CSIRO, Melbourne, Australia, December 10-12, 2012.
19. M. Karimi, G. Akdogan, K. Dellimore, S. M. Bradshaw, "Quantification of Numerical and Model Uncertainties in the CFD Simulation of the Gas Holdup and Flow Dynamics in a Laboratory Scale Rushton-turbine Flotation Tank", *In: Proceedings of the Ninth International Conference on CFD in the Minerals and Process Industries*, CSIRO, Melbourne, Australia, December 10-12, 2012.
20. M. Karimi, G. Akdogan, S. M. Bradshaw, A. Mainza, "Numerical Modelling of Air Core in Hydrocyclones", *In: Proceedings of the Ninth International Conference on CFD in the Minerals and Process Industries*, CSIRO, Melbourne, Australia, December 10-12, 2012.
21. M. Karimi, G. Akdogan, S. M. Bradshaw, "CFD Simulation of a Mechanically Stirred Tank using Multiple Reference Frames Technique", *MINPRO 2011 South African Institute of Mining & Metallurgy*, Western Cape Branch, Cape Town, South Africa, 2011.
22. M. Karimi, G. Akdogan, S. M. Bradshaw, "Comparison of Various Turbulence Models for CFD Simulation of Hydrocyclones", *MINPRO 2011 South African Institute of Mining & Metallurgy*, Western Cape Branch, Cape Town, South Africa, 2011.

PROFESSIONAL DEVELOPMENT

- *MoDeNa* technical workshop on the quantum, molecular and meso-scale modelling, University of Stuttgart, Stuttgart, Germany, Feb 2015.

- *MoDeNa* technical workshop on the production of polyurethane foams, Lemförde, Germany, Feb 2014.

- Grant Writing Workshop, Division for Research Development, Stellenbosch University, April 2012.

- A Strategic Plan and Approach for the Launching of a Successful Article to an Accredited Journal, Division for Research Development, Stellenbosch University, April 2012.

AWARDS AND HONOURS

- South African Minerals to Metals Research Institute (SAMMRI), Scholarship Recipient, 2013.

- OUTOTEC Travel Grant Recipient, 2012.

- PGIO Overseas Conference Grant Recipient, 2012.

- OSP Scholarship Recipient, 2011 and 2010.

- First Grade Graduate of Yazd University, 2010.

SKILLS

Pre-processing: Proficient in Design Modeller and GAMBIT.

CFD codes: Proficient in OpenFOAM and Fluent.

Post-processing: Proficient in CFD-Post and paraView, familiar with Tecplot 360.

Programming: Proficient in C++, experienced with Python and MATLAB.

Design of Experiments: Proficient in Design Expert, MiniTab, Qualitek.

Mineral processing tools: Experienced with MODSIM, familiar with JKSimMet.

REFERENCES

- Guven Akdogan (gakdogan@sun.ac.za), Associate Professor, Department of Process Engineering, Stellenbosch University, Stellenbosch, South Africa.

- Daniele L. Marchisio (daniele.marchisio@polito.it), Associate Professor, Department of Applied Science and Technology, Politecnico di Torino, Turin, Italy.

- Steven M. Bradshaw (smb@sun.ac.za), Professor, Department of Process Engineering, Stellenbosch University, Stellenbosch, South Africa.

- Ali Dehghani, (a.dehghani@yazduni.ac.ir), Associate Professor, Faculty of Mining and Metallurgical Engineering, Yazd University, Yazd, Iran.