Prof. Dr. Ing. Menwer Attarakih

Associate Professor of Computer-Aided Process Engineering at:
The University of Jordan
Faculty of Engineering & Technology
Department of Chemical Engineering
E-mail:attarakih@yahoo.com, m.attarakih@ju.edu.jo
Mobile: 00962 799 617 904

Homepages:

- The University of Jordan/ Jordan: http://www2.ju.edu.jo/sites/Academic/m.attarakih/Pages/attarakih.aspx
- The University of Kaiserslautern/ Germany: http://www.uni-kl.de/tvt/tvtlehrstuhl/tvtehemalige/tvtattarakih/

- Distinguished PhD holder of Computer-Aided Process Engineering/ The University of Kaiserslautern/ Institute of Process Engineering/ Germany.
- Frequent Reviewer of the Chemical Engineering Science, Computers & Chemical Engineering and the Chemical Engineering Research and Design Journals (IChemE).
- Appointed at Fraunhofer Institute for Industrial Mathematics/ Transport processes group/ Kaiserslautern/ Germany in 2009, Declined.
- Appointed at the University Technology Malaysia in 2008, Declined.
- Having long experience in Teaching Process and Plant design, Applied numerical analysis, Process modeling and simulation, Process optimization and Process Dynamics & control.
- Spent many Special Research Visits (three months each) at the Institute of Process Engineering/University of Kaiserslautern/ Germany and Fraunhofer Institie for Industrial Mathematics during the summer of 2005 until 2013.
- Having long experience in modelling discrete phase systems using the Population Balance Equation.
- Having long experience in modeling, dynamic analysis, optimization and numerical simulation of industrial scale chemical engineering processes such as: Two-phase high pressure oil splitting reactors, multicomponent glycerin and fatty acids distillation plants, chlorine drying plant, agitated & pulsed extraction columns.
- Having strong research cooperation with:
  - Institute of Process Engineering/ University of Kaiserslautern/ Germany.
  - Department of Applied Mathematics/ University of Kaiserslautern/ Germany.
  - Fraunhofer Institute of Industrial Mathematics/ Transport & Computational Fluid Dynamics Group
- Having strong research collaboration with the international chemical industries:
  - BASF the chemical company/ Germany.
  - NOVARTIS pharmaceutical company/Switzerland.
  - EDL-Poerner Company for Plant Engineering/ Germany.
- Published in this field of research more than 90 articles in peer reviewed International Journals and Conferences.
- Participated in more than 30 peer reviewed International Conferences.

- Developed **PPBLAB** software, which is used now by EDL-Poerner Company (http://www.edl.poerner.de/en.html) and the University of Kaiserslautern.
- Developed **LLECMOD** software, which is used by BASF company/ Germany and the University of Kaiserslautern/ Germany.
- Inventor of the **SQMOM** and the **MSQMOM** for discrete modelling of particulate systems.
- Developer of the Differential Maximum Entropy Method for solving Integral Population Balances.
- Developer of the **CQMOM**, which recently solved the Moment Problem in Population Balances.
- Developer of the **NQMOM**: A stable population balance solver, which is coupled to **FPM software** (Fraunhofer Institute for Industrial Mathematics).
- Developer of **OPOSPM**: A reduced Population Balance Model for modelling Two-phase flow systems with particular coupling to CFD software:
    - FLUENT: CFD Simulation of RDC and Kuhni Extraction columns
    - FPM: CFD simulation of RDC Extraction column
    - OPENFOAM: CFD simulation of RDC and Kuhni Extraction columns
- Having a special five-year experience in erection, start-up and operation of oil splitting, fatty acids and glycerin processes.

Education:

- **January 2001 – June 2004:** The University of Kaiserslautern, Faculty of Mechanical and Process Engineering/ Institute of Process Engineering/ Kaiserslautern-Germany:
- Doctor of Engineering Science (Chemical Engineering) with Distinction grade (Auszeichnung).
- Thesis: Solution Methodologies for the Population Balance Equations Describing the Hydrodynamics of Liquid-liquid Extraction Contactors. The thesis was a joint work with Cambridge University/ UK (Prof. Markus Kraft), URL: http://kluedo.ub.uni-kl.de/volltexte/2004/1746
- **1995-1997:** The University of Jordan/ Amman-Jordan:
- M.Sc. in Chemical Engineering
- Cumulative average: 3.96/4, Rating: Excellent.
- Thesis: Dynamic Modelling of Packed Bed Glycerol-Water Distillation Column.
- The thesis is based on modelling industrial scale plant and is published in the Ind. Eng. Chem. Res., 40, 4857-4865, URL: http://pubs.acs.org/doi/abs/10.1021/ie000430y.
-
- **1986-1988:** Jordan University of Science and Technology/ Chemical Engineering Dept./ Irbid-Jordan:
- The first two years of chemical engineering course work (Rating: Very Good, Ranking: the third).
- **1988-1993:** The University of Jordan/ Amman-Jordan: B.Sc. in Chemical Engineering (Rating: Good).

Academic Ranks:

- Professor of Computer-Aided Process Engineering at The University of Jordan in Amman, 11 September 2014- present.
-

- Associate professor of Computer-Aided Process Engineering at The University of Jordan in Amman, 11 September 2011- 11 September 2014.
- Associate professor of chemical engineering, Al-Balqa Applied University, February 2010 – 11 September 2011.
- Assistant professor of chemical engineering, Al-Balqa Applied University, November 2004 - February 2010.
- Lecturer in chemical engineering, Al-Balqa Applied University, Sep. 1998 – Sep. 2000.
- PhD Student & Coworker/ The University of Kaiserslautern/ Institute of Process Engineering/ / Germany: October 2000 - October 2004.
- Guest Professor/ The University of Kaiserslautern/ Institute of Process Engineering/ Germany during the summer (three months) of 2005-2013.

Academic Experience:

- Long experience in teaching: Process Design, Computer-Aided Process Design, Plant Design, Process Modelling and Simulation, Process Optimization, Applied Numerical Methods in Chemical Engineering, Water Chemistry.
- Frequent reviewer for the Celebrated Chemical Engineering Science Journal, Chemical Engineering Research and Design Journal, Computers & Chemical Engineering Journal and Many International Conferences (Population balance conferences, CFD for process industries, IChEAP ....).

Honors and awards:

- 2014: Awarded one year extraordinary time for full professorship promotion by the University of Jordan due to achieving 42 points with minimum University requirements of 12 points.
- 2013: The Award of the Most Downloaded Authors for the Computers & Chemical Engineering Journal.
- 2013: The first Award of Chemical Process Design Graduation project among the Jordanian Universities, which offered by the Jordanian Engineering Association.
- 2005-2013: Awarded a full gest Professor research stays at the Chair of Separation Sciences & Technology/ The University of Kaiserslautern/ Germany.
- 2011: Selected as a lead speaker on coupling population balances to CFD codes, CFD2011 conference, Trondheim/ Norway, 21 – 24 June 2011.
- 2010: Selected as a Committee member for Evaluating the best PhD Thesis in Chemical Engineering for Tiburtius Prize at the Universities of Berlin/ Germany.
- 2008: Honored with the selection as a Testimonial in the Postgraduate & Doctoral Education by the International School for Graduate Studies (ISGS) at the University of Kaiserslautern/ Germany.
- 2008: The University of Technology Malaysia (UTM)/ Faculty of Chemical and Natural Resources Engineering / Process Design Group, promoted me to Associate Professor rank in Chemical Engineering. UTM ranks the first in the ten-top Malaysian Universities for science & technology.
- 2008: My article Process intensification with reactive extraction columns appeared as the 17th in the top of the 25th hottest articles in the Chemical Engineering And Processing Journal.

- 2006: My article LLECMOD: A windows-based program for hydrodynamics simulation of liquid-liquid extraction columns appeared as the 13th in the top of the 25th hottest articles in the Chemical Engineering And Processing Journal.
- 2004: My article: Optimal temperature policy for immobilized enzyme packed bed reactor performing reversible Michaelis-Menten kinetics using the disjoint policy. Biotechnology and Bioengineering, 77, 163-173, was selected as the best practical research by the University of Jordan/ Amman-Jordan.
- 2000: I was awarded a full five-year Grant by Al-Balqa Applied University to get my PhD in Chemical Engineering.

Research Experience:

- Having long experience in modelling discrete phase systems using the Population Balance Framework
- Having long experience in modeling, dynamic analysis, optimization and numerical simulation of industrial scale chemical engineering processes such as: Two-phase high pressure oil splitting reactors, multicomponent glycerin and fatty acids distillation plants, chlorine drying plant, agitated & pulsed extraction columns.
- Having strong research cooperation with:
    - Institute of Process Engineering/ University of Kaiserslautern/ Germany
    - Department of Applied Mathematics/ University of Kaiserslautern/ Germany
    - Fraunhofer Institute of Industrial Mathematics/ Transport & Computational Fluid Dynamics Group.
    - University of Cambridge/ Department of Chemical engineering/ Computational Modelling Group.

- Having strong research collaboration with the international chemical industries:
    - BASF the chemical company/ Germany
    - NOVARTIS pharmaceutical company/Switzerland
    - EDL-Poerner Company for Plant Engineering/ Germany

Developed Software and Patents:

- Developed **PPBLAB** software, which is used now as a trial version by EDL-Poener Company (http://www.edl.poerner.de/en.html)
- Developed **LLECMOD** software, which is used by BASF company/ Germany, NOVARTS Pharmaceutical Company/ Switzerland, and the University of Kaiserslautern/ Germany
- Inventor of the **SQMOM** and the **MSQMOM** for discrete modelling of particulate systems (http://www.google.com/patents/US20100106467).
- Developer of the **CQMOM**, which recently solved the Moment Problem in Population Balances
- Developer of the **NQMOM**: A stable population balance solver, which is coupled to **FPM software** (Fraunhofer Institute for Industrial Mathematics)
- Developer of **OPOSPM**: A reduced Population Balance Model for modelling Two-phase flow systems with particular coupling to CFD software:

- FLUENT: CFD Simulation of RDC and Kuhni Extraction columns
- FPM: CFD simulation of RDC Extraction column
- OPENFOAM: CFD simulation of RDC and Kuhni Extraction columns

Industrial Experience:

- Dr. Attarakih has an active projects in modelling, troubleshooting, debottlenecking, design and operation with many leading international oil and petrochemical companies which include:

  1. **EDL Company in Leiptzeg/ Germany (**http://www.edl.poerner.de/en.html**)**
  2. **LANXESS/ Germany (**http://lanxess.com/en/corporate/home/**)**
  3. **SULZER Company/ Germany (**http://www.sulzer.com/en/**)**
  4. **BASF/ Germany (**http://www.basf.com/group/corporate/en/**)**
  5. **NOVARTIS/ Switzerland (**http://www.novartis.com/**)**

- Dr. Attarakih Conducted many courses in Process modelling & Simulation, Process Retrofitting & Energy Integration.
- Participated in many of International Symposia and Chemical Process Industrial Conferences, which include the famous symposium: ESCAPE (European Symposium on Computer-Aided Process Engineering).
- As a Prof. of Computer-aided process design, Attarakih conducted many computer-aided design projects including gas & oil industries, vegetable oil refineries and in biochemical engineering.
- Long experience in erection, start-up and operation of chemical process plants including oil splitting, fatty acids and glycerin distillation processes.
- Workshop on Teaching Product and Process Design, held at the National University of Singapore by the organizers of the 11th International Symposium on Process Systems Engineering (PSE2012). The workshop was given by the editor of the Computers and Chemical Engineering Journal (Prof. Rafiq Al ghani), Prof. Warren Seider & Soemantri Widagdo, 3M Co., 20 July-2012.
- Chemical and Process Engineer/ high pressure oil and fat splitting, fatty acids & glycerin distillation: June 1993 - September 1998.
- Certified internal auditor (ISO 9000 quality management system): December 1995 - August 1998.
- Course in internal quality auditing from quality college of Scotland (a course held in Jordan, 1996).
- Training course on improved productivity through method study. organized by industrial extension services project (UNDP).
- Training course on introduction to materials management. organized by industrial extension services project (UNDP).
- Training course on supervisory skills. organized by industrial extension services project (UNDP).
- Training course on production short term scheduling tactics. organized by industrial extension services project (UNDP).

Conferences and Workshops:

- Participated in more than 30 peer reviewed International Symposia and Conferences on Computer-Aided Process Engineering, CFD, Industrial Mathematics & Solvent Extraction (see the details on the last pages)
- Conducted two workshops on coupling population balances to CFD software/ Fraunhofer Institute for Industrial Mathematics/ Germany: October 2010 & January 2011.
- Workshop on Teaching Product and Process Design, held at the National University of Singapore by the organizers of the 11th International Symposium on Process Systems Engineering (PSE2012). The workshop was given by the editor of the Computers and Chemical Engineering Journal (Prof. Rafiq Al ghani), Prof. Warren Seider & Soemantri Widagdo, 3M Co., 20 July-2012.
- Computer-Aided Chemical Engineering Course: Consists of advanced case studies selected from chemical engineering which were solved using ASPEN PLUSE, CEMCAD, MATHCAD, ChemSep, MATLAB and Fluent. It was a two-month course held by the Institute of Process Engineering/ University of Kaiserslautern/Germany, 2001.
- Interne Arbeitssitzung der GVC-Fachhausschuesse "Mischvorgaenge" und "Computational Fluid Dynamics", (2003), Berlin, Germany.

International Symposia & Conferences:

1. 24th European Symposium on Computer-Aided Process Engineering (ESCAPE24), June 15-18, 2014, Budapest, Hungary.
2. The 8th International Chemical Engineering Congress & Exhibition (IChEC 2014), Kish, Iran, 24-27 February, 2014 .
3. 20th International Solvent Extraction Conference 2014, 7–11 September 2014, Würzburg, Germany.
4. 5th International Conference on Population Balance Modelling, Indian Institute of Science, Bangalore, India, September, 2013
5. 6th International Conference on Process System Engineering: PSE ASIA 2013, Kuala Lumpur, June, 2013.
6. 83rd Annual Scientific Conference of the International Association of Applied Mathematics and Mechanics, 26-30 March, 2012, Technische Universität Darmstadt, Germany.
7. Emulsification: Modeling, Technologies and Applications, 19-21 November 2012, Lyon, France.
8. CHISA: 20th International Congress of Chemical and Process Engineering, Prague, Czech Republic, 2012
9. The 11th International Symposium on Process System Engineering, 15-19 July, 2012, Singapore.
10. The European Symposium on Computer Aided Process Engineering-22, (2012), University College London, London.
11. Workshop Mulm and ReDrop, 22-23 September 2011, AVT - Thermische Verfahrenstechnik, RWTH Aachen University, Aachen, Germany
12. Aachen Conference on Computational Engineering Science ACCES, 13-15 July, 2011, Aachen, Germany.

13. Treffen der Fachgruppen Extraktion und Phytoextrakte, 18-20 April 2012, Clausthal-Zellerfeld, Germany.
14. ProcessNet-Jahrestagung und 30. DECHEMA-Jahrestagung der Biotechnologen 2012, 10. - 13. September 2012, Kongresszentrum Karlsruhe.
15. 8thi European Congress of Chemical Engineering**,** September 25 - 29, 2011, Berlin, Germany.
16. II International Conference on Particle-based Methods: Fundamentals and Applications, PARTICLES 2011, E. Onate and D.R.J. Owen (Eds), 26-28 October 2011, Barcelona/ Spain.
17. 8th International Conference on CFD in Oil & Gas, Metallurgical and Process Industries, SINTEF/NTNU, Trondheim Norway,21-23 June 2011.
18. The European Symposium on Computer Aided Process Engineering-21, (2011), Chalkididki, Greece.
19. The 16-th European Conference on Mathematics for Industry July 26-30, 2010 Wuppertal, Germany.
20. 4th International Conference on Population Balance Modelling (2010), Berlin, Germany.
21. European Symposium on Computer Aided Process Engineering-20, (2010), Ischia, Italy.
22. The European Symposium on Computer Aided Process Engineering-19, (2009), Cracow, Poland.
23. International Solvent Extraction Conference ISEC 2008. Tucson, Arizona, USA, 15-19 Sep. 2008.
24. 6th International Conference on CFD in Oil & Gas, Metallurgical and Process Industries, SINTEF/NTNU, Trondheim Norway,10-12 June 2008.
25. The European Symposium on Computer Aided Process Engineering-18, (2008), Lyon, France.
26. Third International Conference on Population Balance Modelling, (2007), Quebec City, Canada.
27. The European Symposium on Computer Aided Process Engineering-16, (2006), Garmish-Partinkirschen, Germany.
28. The 8th Conference on Process Integration, Modeling and Optimization for Energy saving and Pollution Reduction, PRES' 05, Giardini di Naxos, Italy, May 15-18, 2005.
29. International Solvent Extraction Conference ISEC 2005, 19-23 Sep. 2005, Beijing, China.
30. The European Symposium on Computer Aided Process Engineering-15, (2005), Barcellona, Spain.
31. DECHEMA/GVC – Jahrestagungen (2004), Karlsruhe, Germany.
32. Second Int. Conf. on Population Balance Modelling, (2004) Valencia, Spain.
33. Interne Arbeitssitzung der GVC-Fachhausschuesse “Mischvorgaenge” und “Computational Fluid Dynamics”, (2003), Berlin, Germany.
34. The European Symposium on Computer Aided Process Engineering-14, (2003), Finland.
35. The European Symposium on Computer Aided Process Engineering-12, (2002), Den-Hag/ The Netherlands.

Publications:

1. **A. Hasseinea, Z. Barhouma, M. Attarakih, H.-J. Bart (2014).** Analytical solutions of the particle breakage equation by the Adomian decomposition and the variational iteration methods, Advanced Powder Technology, In press.
2. **M. Attarakih & Bart, H.-J. (2014)**. Solution of the population balance equation using the Differential Maximum Entropy Method (DMaxEntM): An Application to liquid extraction columns, *Chemical Engineering Science, 108, 123-133.*
3. **M. Attarakih**, Hlawitschka, M., Abu-Khader, M., Al-Zyod, S., Bart, H.-J. (**2014**). CFD-Population Balance Modelling and Simulation of Coupled Hydrodynamics and Mass Transfer in Liquid Extraction Columns, *Applied Mathematical Modelling Journal, Submitted.*
4. **M. Attarakih** & H.-J. Bart (**2014**). A Novel MaxEnt Method for the Solution of Two-Dimensional Population Balance Equation with Particle Growth, *Computer-Aided Chemical Engineering*, 33, 901-906.
5. A. Hasseine, Z. Barhoum, **M. Attarakih**, H.- J. Bart (2014). Analytical solutions of the particle breakage equation by the Adomian decomposition and the variational iteration methods, *Journal of Advanced Powder Technology*, *Accepted for publication*.
6. T. Waechtler, H. B. Jildeh, M. W. Hlawitschka, J. Kuhnert, **M. Attarakih**, A. Klar, H.-J. Bart (**2014**). A Meshfree Extraction Column FPM Simulation using the NQMOM-Population Balance Method, *Computers & Chemical Engineering Journal, Under review.*
7. M. W. Hlawitschka, **M. M. Attarakih**, S. S. Al-Zyod, H.-J. Bart (2014), Computer Aided Simulation of Liquid-liquid Extraction Columns, *Proceedings of ISEC2014*, 7-11-Sep. 2014, Wuerzberg, Germany.
8. H. B. Jildeh, **M. Attarakih**, H.-J. Bart (**2014**) Modelling Approach to Estimate Droplet Interaction Parameters, *Proceedings of ISEC2014*, 7-11-Sep. 2014, Wuerzberg, Germany.
9. Jildeh, H. B., **Attarakih, M.** & Bart, H.-J. (**2014**). Parameter optimisation and validation for droplet population balances. *Canadian Journal of Chemical Engineering,* 92, 2010-219.
10. Mickler, M., Jildeh, H. B., **Attarakih, M.** & Bart, H. J. (**2014**). Online monitoring, simulation and prediction of multiphase flows. *Canadian Journal of Chemical Engineering*, 92, 307–317.
11. **M. Attarakih, Abu-Khader & Bart, H.-J**. (**2013**). Modelling and dynamic analysis of an RDC extraction column using OPOSPM. *Chemical Engineering Science,*, 91, 180-196.
12. **M. Attarakih, (2013).** Integral formulation of the population balance equation: Application to particulate systems with particle growth. *Computers & Chemical Engineering*, 48**,** 1-13.
13. **M. Attarakih, Albaraghthi, T., Abu-Khader, M., Al-Hamamre, Z. & Bart, H.-J**. (**2012**). Mathematical modeling of high- pressure oil-splitting reactor using a reduced population balance model. *Chemical Engineering Science,* 84, 276–291.
14. **M. Attarakih, Abu-Khader, M. & Bart, H.-J. (2013).** Dynamic analysis and control of sieve tray gas absorption column using MATALB and SIMULINK. *Applied Soft Computing,* 13**,** 1152-1169.

15. **Jildeh, H. B., Attarakih, M. & Bart, H.-J. R. (2013)**. Droplet coalescence model optimization using a detailed population balance model for RDC extraction column. *Chemical Engineering Research and Design*, 91, 1317-1326.
16. **M. Attarakih, M. Abu-Khader, T. Saeiq, & H.-J Bart**. (**2013**). Ethane production plant for better energy integration and cost reduction in Jordan. *Journal of Chemical Technology and Metallurgy*, 48, 265-276.
17. **H. Jildeh, M. Mickler, M. Attarakih and H.-J. Bart (2013).** A Comparison of droplet interaction models, Chemie Ingenieur Technik 85, 1390–1391 (doi: 10.1002/cite.201250676).
18. **Attarakih, M., Al-Zyod, S., Abu-Khader, M. & Bart, H. J. (2012).** PPBLAB: A new multivariate population balance environment for particulate system modelling and simulation. *Procedia Engineering*, 42, 1574-1591.
19. **Attarakih, M., Abu-Khader, M. & Bart, H. J. (2012).** Synthesis and control analysis of gas absorption column using MATALB and SIMULINK, *Procedia Engineering*, 42, 1796–1804.
20. **M. Jaradat, M. Attarakih and H.-J. Bart (2012**). RDC Extraction column simulation using the Multiprimary One Secondary Particle Method: Coupled Hydrodynamics and Mass Transfer, Computers & Chemical Engineering, 37, 22-32.
21. **H.B, Jildeh, Hlawitschka, M.W., Attarakih, M. & Bart, H.-J. (2012).** Solution of Inverse Problem with the One Primary and One Secondary Particle Model (OPOSPM) Coupled with Computational Fluid Dynamics (CFD), *Procedia Engineering*, 42, 1692 1710, doi:10.1016/j.proeng.2012.07.562.
22. **M. Jaradat, M. Attarakih, T. Steinmetz & H.-J. Bart (2012**). LLECMOD: A bivariate Population Balance Tool for Pulsed Liquid-Liquid Extraction Columns, The Open Chemical Engineering Journal, 6, 8-31.
23. **M. Jaradat, M. Attarakih & H.-J. Bart (2012**). Population Balance Modeling of Pulsed (Packed and Sieve-Plate) Extraction Columns: Coupled Hydrodynamic and Mass Transfer, *Ind. Eng. Chem. Res.*, 50,14121–14135.
24. **Jildeh, H., Attarakih, M., Bart, H.J. (2012).** Simulation von Extraktionskolonnen mit LLECMOD. Chemie Ingenieur Technik 84, 1282-1282.
25. **Jildeh, H., Attarakih, M., Bart, H.J.** (**2012**). Inverse Populationsbilanzen bei Extraktionskolonnen. Chemie Ingenieur Technik 84, 1228-1229.
26. **M. M. Attarakih, (2010).** System and method for simulating and modeling the distribution of discrete systems, United States Patent Application: 0100106467, April 29, 2010.
27. **M. Jaradat, M. Attarakih and H.-J. Bart (2011**). Advanced Prediction of Pulsed (Packed and Sieve) Extraction Column Performance using Population Balance Modeling, *Chem. Eng. Res. Design J.*, 89, 2752–2760.
28. **M. Mickler, S. Didas, M. Jaradat, M. Attarakih, H.-J. Bart (2011).**Tropfenschwarmanalytik mittels Bildverarbeitung zur Simulation von Extraktionskolonnen mit Populationsbilanzen, **Chem. Ing. Tech**.,**(83**), 226-237.
29. **M. Abu-Khader, O. Badran & M. Attarakih (2011).** Ballast water treatment technologies: Hydrocyclonic viable option. *Clean Techn. Environ. Policy* (**13**), 403-413.
30. **D. Zeidan, M. M. Attarakih, J. Kuhnert, S. Tiwari, V. Sharma, C. Drum and H.-J. Bart (2010).** On a high-resolution Godunov method for a CFD-PBM coupled model of two-phase flow in liquid-liquid extraction columns. *International Journal of Computational Methods, **7**, 421-442.*

31. **C. Drumm, M. M. Attarakih, M. W. Hlawitschk and H.-J. Bart (2010).** A one-group reduced population balance model for CFD simulation of a pilot-plant extraction column. *Ind. Eng. Chem. Res., 49* (7), 3442–3451**.**
32. **M. Jaradat, M. M. Attarakih and H.-J. Bart (2010):** Effect of Phase Dispersion and Mass Transfer Direction on Steady State RDC Performance. *Chemical Engineering Journal,* **165** (2), 379-387.
33. **M. Jaradat, M. Attarakih and H.-J. Bart (2010),** Simulation gekoppelter Hydrodynamik und Stofftransport mittels einer Populationsbilanz, Chemie Ing. Technik, **82**, pp. 1390.
34. **M. Jaradat, M. Attarakih and H.-J. Bart (2009),** Dynamische Simulation von Extraktionskolonnen auf der Grundlage einer multivariaten Populationsbilanz, Chem. Eng. Technol. 81, No. 8, 1061.
35. **S. Tiwari, C. Drumm, M. M. Attarakih, J. Kuhnert, and H.-J. Bart, (2008).** Coupling of the CFD and the Droplet population balance equation with finite poinset method. *Lecture Notes in Computational Science and Engineering*: *Meshfree Methods for Partial Differential Equations IV*, M. Griebel; M.A. Schweitzer (Eds.), Vol. 65, Springer Verlag.
36. **M. M. Attarakih, C. Drumm, H.-J. Bart & N. M. Faqir, (2009).** Solution of the population balance equation using the sectional quadrature method of moments (SQMOM). *Chemical Engineering Science, **64***, 742--752.
37. **C. Drumm, M. M Attarakih and H.-J. Bart, (2009).** Coupling of CFD with DPBM for an RDC extractor. *Chemical Engineering Science, **64***, 721 - 732.
38. **M.M. Attarakih, H.-J. Bart, T. Steinmetz, M. Dietzen & N. M. Faqir (2008).** LLECMOD: A Bivariate Population Balance Simulation Tool for Liquid-Liquid Extraction Columns. *The Open Chemical Engineering Journal, **2**, 2008, 10-34*.
39. **H.-J. Bart, C. Drumm & M.M. Attarakih (2008).** Process Intensification of Liquid-Liquid Extraction Columns. *Chemical Engineering & Processing J*. (47), 745-754.
40. **M. M. Attarakih, H.-J. Bart, N.M. Faqir (2006).** A hybrid scheme for the solution of the bivariate spatially distributed population balance equation. *Chem. Eng. Tech. J. 29,435-441*.
41. **M. M. Attarakih, Bart, H.-J., & Faqir, N. M. (2006).** Numerical solution of the bivariate population balance equation for interacting hydrodynamics and mass transfer in liquid-liquid extraction columns. *Chem. Eng. Sci., 61, 113- 123.*
42. **Schmidt, A. S., Simon, M., Attarakih, M. M., Lagar, L. G. & Bart, H.-J. (2006**). Droplet Population Balance Modelling: Hydrodynamics and Mass Transfer. *Chem. Eng. Sci., 61, 246-256.*
43. **M. M., Attarakih, Bart, H.-J., & Faqir, N. M. (2006).** LLECMOD: A windows-based program for hydrodynamics simulation of liquid-liquid extraction columns. *Chem. Eng. Procc., **45**, 113-123*.
44. **M. M. Attarakih, Bart, H. J., & Faqir, N. M. (2004).** Solution of the droplet breakage equation for interacting liquid-liquid dispersions: a conservative discretization approach. *Chem. Eng. Sci.*, **59**, 2547-2565.
45. **M. M. Attarakih, Bart, H.-J. & Faqir, N. M. (2004).** Numerical solution of the spatially distributed population balance equation describing the hydrodynamics of interacting liquid-liquid dispersions. *Chem. Eng. Sci.* **59**, 2567-2592.
46. **M. M. Attarakih, Bart, H. J., & Faqir, N. M. (2004).** Berchnung von fluessig-fluessig Extraktionskolonnen. *Chem. Ing. Tech., **76**, 1412-1413.*

47. **M. M. Attarakih, Bart, H. J., & Faqir, N. M. (2003).** Optimal moving and fixed grids for the solution of discretized population balances in batch and continuous systems: droplet breakage. *Chem. Eng. Sci.,* **58,** 1251-1269.
48. **Abu-Fara, D. I., Abu-Reesh, I. M. & Attarakih, M. (2003).** Effect of the type of input on the periodic operation of a bioreactor with input multiplicities. Mu'tah Lil-Buhooth wad-Dirasat 18, 57-72.
49. **M. M. Attarakih, Bart & Faqir, N. M. (2002).** An approximate optimal moving grid technique for the solution of discretized population balances in batch systems. *Computer Aided Chemical Engineering*, Vol. 10, 823-828.
50. **M. M. Attarakih, Abu Fara, D. & Sayed, S. (2001).** Dynamic modeling of a packed-bed glycerol-water distillation column. *Ind. Eng. Chem. Res.*, **40**, 4857-4865.
51. **Faqir, N.M. Attarakih, M. M. (2001).** Optimal temperature policy for immobilized enzyme packed bed reactor performing reversible Michaelis-Menten kinetics using the disjoint policy. *Biotechnology and Bioengineering*, **77**, 163-173.
52. **Faqir, N.M. Attarakih, M. M. (1999).** Optimum design of a series of CSTR's performing reversible Michaelis-Menten kinetics, *Bioprocess Engineering*, **20**, 329-335.
53. **M. M. Attarakih & H.-J. Bart (2012).** Integral Formulation of the Smoluchowski Coagulation Equation using the Cumulative Quadrature Method of Moments (CQMOM), *Computer-Aided Process Engineering*, 31, 1130-1134**.**
54. **M. M. Attarakih & H.-J. Bart (2012).** On the Constrained Maximum Entropy Solution of the Population Balance Equation**,** Ian David Lockhart Bogle and Michael Fairweather (Editors), Proceedings of the 22nd European Symposium on Computer Aided Process Engineering, 17 - 20 June 2012, London.
55. **H. B. Jildeh, Menwer Attarakih, Matthias Mickler & Hans-Jörg Bart (2012).** An Online Inverse Problem for the Simulation of Extraction Columns using Population Balances, *Computer Aided Process Engineering*, 30, 1043–1047.
56. **M. M. Attarakih, H. B. Jildeh, M. Mickler & H.J. Bart (2012).** The OPOSPM as a Nonlinear Autocorrelation Population Balance Model for Dynamic Simulation of Liquid Extraction Columns, *Computer-Aided Process Engineering, 31*, 1216-1220.
57. **H. B. Jildeh, M. M. Attarakih & H.J. Bart (2012).** Coalescence Parameter Estimation in Liquid Extraction Column using OPOSPM, *Computer-Aided Process Engineering, 31*, 960-964.
58. **M. Jaradat, Hussein, A. , Bart, H.-J. & *Attarakih*, M. (2012).** Dynamic modelling and simulation of Kühni extraction columns, *Computer Aided Chemical Engineering*, 30, p.1073-1077, Jan 2012, doi:10.1016/B978-0-444-59520-1.50073-7.
59. **M. M. Attarakih, M. Jaradat, M. Hlawitschkah, H.-J. Bart and J. Kuhnert (2011).** Integral Formulation of the Population Balance Equation using the Cumulative Quadrature Method of Moments (CQMOM). *Computer Aided Chemical Engineering*, Vol. 29, pp. 81-85.
60. **M. Jaradat, M. M. Attarakih, M. Hlawitschkah and H.-J. Bart (2011).** Detailed Mathematical Modelling of Liquid-Liquid Extraction Columns. *Computer Aided Chemical Engineering*, Vol. 29, pp. 1-5.
61. **M. Hlawitschkah, M. Jaradat, M. M. Attarakih, H.-J. Bart and J. Kuhnert (2011).** A CFD-Population Balance Model for the Simulation of Kuehni Extraction Column. *Computer Aided Chemical Engineering*, Vol. 29, pp. 66-70.

62. **M. M. Attarakih, M. Jaradat, C. Drumm, H.-J. Bart, S. Tiwari, V. K. Sharma, J. Kuhnert & A. Klar (2010).** A multivariate sectional quadrature method of moments for the solution of the population balance equation, *Computer Aided Chemical engineering*, Vol., 28, pp. 1551-1556.
63. **M. M. Attarakih, M. Jaradat, C. Drumm, H.-J. Bart, S. Tiwari, V. K. Sharma, J. Kuhnert & A. Klar (2009).** Solution of the population balance equation using the One Primary and One Secondary particle Method (OPOSPM), *Computer Aided Chemical engineering*, Vol., 26, pp. 1333-1338.
64. **M. M. Attarakih, M. Jaradat, C. Drumm, H.-J. Bart, S. Tiwari, V. K. Sharma, J. Kuhnert & A. Klar (2009).** A multivariate population balance model for liquid extraction columns. *Computer Aided Chemical engineering*, Vol., 26, pp. 1339-1344.
65. **V. K. Sharma, S. Tiwari, M. M. Attarakih, M. Jaradat, A. Klar, J. Kuhnert & H.-J. Bart, (2009).** A meshfree CFD-PBM coupled model. *Computer Aided Chemical engineering*, Vol., 26, pp. 1345-1350.
66. **M. M. Attarakih, H.-J. Bart, N.M. Faqir (2006).** Solution of the population balance equation using the sectional quadrature method of moments (SQMOM). *Computer Aided Chemical Engineering*, Vol. 21, pp. 209-214.
67. **M. M. Attarakih, Bart, H.-J., & Faqir, N. M. (2005).** The Bivariate Spatially distributed Population Balance Equation: An Accurate Reduction Technique. *Computer Aided Chemical Engineering, vol. 20, pp.163-168.*
68. **M. M. Attarakih, Bart, H.-J., & Faqir, N. M. (2003).** Solution of the population balance equation for liquid-liquid extraction columns using a generalized fixed-pivot and central difference schemes. *Computer Aided Chemical Engineering*, Vol. 13, 557 – 562.
69. **M. M. Attarakih, M. Jaradat, H. Allaboun, H.-J. Bart & N. M. Faqir (2008).** Dynamic Modelling of a Rotating Disk Contactor Using the Primary and Secondary Particle Method (PSPM). *Proc. Of the 18th European Symposium on Computer-Aided Process Engineering (ESCAPE 18),Linon/ France, June 2008*
70. **M. Attarakih & Bart, H.-J. (2014)**. A Novel MaxEnt Method for the Solution of Two-Dimensional Population Balance Equation with Particle Growth, *24th European Symposium on Computer-Aided Process Engineering (ESCAPE24),* June 15-18, 2014, Budapest, Hungary.
71. **M. Attarakih & Bart, H.-J. (2014).** Modelling of an RDC Extraction Column using the DMaxEntM , *The 8th International Chemical Engineering Congress & Exhibition (IChEC 2014)*, Kish, Iran, 24-27 February, 2014 .
72. **M. W. Hlawitschka1, Jildeh, H. B., Attarakih, M. M., Al-Zyoud, S. & Bart, H.-J. (2014).** Computer Aided Simulation of Liquid-liquid Extraction Columns , 20th International Solvent Extraction Conference 2014, 7–11 September 2014, Würzburg, Germany.
73. **M. Attarakih, Hlawitschka, M. W., Al-Zyod, S., Abu-Khader, M., Bart, H.-J (2013).** A Hyperbolic Population Balance Model for Dynamic Analysis of Liquid Extraction Columns, Proceedings of the 6th International Conference on Process Systems Engineering (PSE ASIA) 25 - 27 June 2013, Kuala Lumpur.
74. **M. Attarakih & Bart, H.-J. (2013).** On the Constrained Maximum Entropy Solution of the Bivariate Population Balance Equation for Liquid Extraction Columns, Proceedings of the 5th International Conference on Population Balance Modelling, 11-13 Sep., Bangalore, India.

75. **H. Jildeh, M. Mickler, M. Attarakih and H.-J. Bart (2013).** A Comparison of Droplet Interaction Models, Jahrestreffen derFachgemeinschaft Fluiddynamik und Trenntechnik, 25-27 September 2013, Vogel Convention Center, Würzburg, Germany.
76. **H.-J. Bart, Hlawitschka, M. W. & Attarakih, M. & (2013).** Mass transfer and Population Balance Modeling using 3D-CFD, Proceedings of the 5th International Conference on Population Balance Modelling, 11-13 Sep., Bangalore, India.
77. **H. B. Jildeh, M. Attarakih and H.-J. Bart (2013).** Modelling and Simulating of Liquid Extraction Columns using Optimized Droplet Interaction Models, 9th European Congress of Chemical Engineering (ECCE 2013), 21-25 April 2013, Hague, Netherlands.
78. **H. B. Jildeh, M. W. Hlawitschka, M. Attarakih and H.-J. Bart (2012).** Solution of inverse problem with the one primary and one secondary particle model (OPOSPM) coupled with computational fluid dynamics (CFD), 20th International Congress of Chemical and Process Engineering Proceeding, 25-29 August 2012, Prague, Czech Republic.
79. **Attarakih, M., Abu-Khader, M. & Bart, H. J. (2012).** Synthesis and control analysis of gas absorption column using MATALB and SIMULINK, 20th International Congress of Chemical and Process Engineering Proceeding, 25-29 August 2012, Prague, Czech Republic.
80. **T. Wächtler, J. Kuhnert, M. Attarakih & Axel Klar (2012)**. Counting Droplets: A solver for the droplet population balance equation, 83rd Annual Scientific Conference of the International Association of Applied Mathematics and Mechanics, 26-30 March, 2012, Technische Universität Darmstadt, Germany.
81. **T. Wächtler, J. Kuhnert , M. M. Attarakih, S. Tiwari, A. Klar** & **H.-J. Bart (2011).** The Normalized Quadrature Method Of Moments coupled with Finite Pointset method, II International Conference on Particle-based Methods: Fundamentals and Applications, PARTICLES 2011, E. Onate and D.R.J. Owen (Eds), 26-28 October, Barcelona/ Spain, http://congress.cimne.com/particles2011/proceedings/full/p100.pdf
82. **M. M. Attarakih, J. Kuhnert ,T. Wächtler, M. Abu-Khader, H.-J. Bart (2011).** Solution Of The Population Balance Equation Using The Normalized QMOM (NQMOM), *Proc. of the 8th International Conference on CFD in Oil & Gas, Metallurgical and Process Industries SINTEF/NTNU, Trondheim, Norway,21-23 June 2011*.
83. **T. Wächtler, J. Kuhnert , M. M. Attarakih, S. Tiwari, A. Klar** & **H.-J. Bart (2011).** The Normalized Quadrature Method Of Moments coupled with Finite Pointset method, II International Conference on Particle-based Methods: Fundamentals and Applications, PARTICLES 2011, E. Onate and D.R.J. Owen (Eds), 26-28 October, Barcelona/ Spain, http://congress.cimne.com/particles2011/proceedings/full/p100.pdf
84. **M. M. Attarakih, J. Kuhnert ,T. Wächtler, M. Abu-Khader, H.-J. Bart (2011).** Solution of The Population Balance Equation Using The Normalized QMOM (NQMOM), *Proc. of the 8th International Conference on CFD in Oil & Gas, Metallurgical and Process Industries SINTEF/NTNU, Trondheim, Norway,21-23 June 2011*.
85. **M. Jaradat, M. Attarakih and H.-J. Bart (2011**). Advanced Prediction of Pulsed Extraction Column Performance using LLECMOD, *(CM)^2-Young Researcher Symposium Proceedings*: 22-27, 15 February 2011, Kaiserslautern-Deutschland.

86. **H. B. Jildeh, M. Attarakih and H.-J. Bart (2011).** An Inverse Problem Method for RDC Simulation, (*CM)*^{2}*-Young Researcher Symposium Proceedings*: 45-49, 15 February 2011, Kaiserslautern-Deutschland.
87. **M. M. Attarakih, M. Jaradat, M. Hlawitschkah, H.-J. Bart and J. Kuhnert (2010).** Solution of the population balance equation using the Cumulative Quadrature Method Of Moments (CQMOM). *4th International Conference on Population Balance Modelling* hosted by the Max Plank Institute for Dynamics of Complex Technical Systems, 15-17.09.2010, Berlin, Germany.
88. **J. Kuhnert, M. Attarakih, S. Tiwari, M. Hlawitschka, H.-J. Bart(2010).** Finite Pointset Method (FPM): Meshfree numerical solution of Population Balance Equations, The *16-th European Conference on Mathematics for Industry*, July 26-30, 2010 Wuppertal, Germany.
89. **V. K. Sharma, S. Tiwari, M. M. Attarakih, M. Jaradat, A. Klar, J. Kuhnert & H.-J. Bart, (2010).** A spatially meshfree population balance model for the simulation of liquid extraction columns. 4th International Conference on Population Balance Modelling hosted by the Max Plank Institute for Dynamics of Complex Technical Systems, 15-17.09.2010, Berlin, Germany.
90. **M. Jaradat, M. Attarakih, M. Hlawitschka and H.-J. Bart (2010**). A multivariate population balance model for liquid extraction columns. *4th International Conference on Population Balance Modelling* hosted by the Max Plank Institute for Dynamics of Complex Technical Systems, 15-17.09.2010, Berlin, Germany.
91. .**M. W. Hlawitschka, C. Drumm, M. M. Attarakih, H.-J. Bart (2010).** Simulation of a Kühni extraction column using a CFD and population balance model. *4th International Conference on Population Balance Modelling* hosted by the Max Plank Institute for Dynamics of Complex Technical Systems, 15-17.09.2010, Berlin, Germany.
92. **M. M. Attarakih, H. Allaboun, C. Drumm, H.-J. Bart, S. Tiwari & J. Kuhnert (2008).** Dynamic Modelling of Liquid-Liquid Extraction Columns using the Direct Primary Secondary Particle Method (DPSPM). *Proc. of the 6th International Conference on CFD in Oil & Gas, Metallurgical and Process Industries, SINTEF/NTNU, Trondheim Norway,10-12 June 2008.*
93. **S. Tiwari, C. Drumm, V. K. Sharma, J. Kuhnert, M. Attarakih, A. Klar and H.-J., Bart (2008).** A Meshfree CFD-Population Balance Equation Coupled Model, *Proc. Of the 6th International Conference on CFD in Oil & Gas, Metallurgical and Process Industries, SINTEF/NTNU, Trondheim Norway,10-12 June 2008.*
94. **C. Drumm, M., Attarakih,_ S., Tiwari, J.,Kuhnert, & H.-J., Bart (2008).** Implementation of the Sectional Quadrature Method of Moments in a CFD code. *Proceedings of the 6th International Conference on CFD in Oil & Gas, Metallurgical and Process Industries, SINTEF/NTNU, Trondheim Norway,10-12 June 2008.*
95. **C. Drumm, S. Tiwari, M. M. Attarakih, J. Kuhnert, and H.-J. Bart, (2008).** CFD-PBM coupled model using the finite pointset method and the SQMOM. *Proc. of ISEC 2008 conference. Tucson, Arizona, USA, 15-19 Sep. 2008, pp. 1177 – 1182.*
96. **Steinmetz, T., Schmidt, S., Attarakih, M. & H.-J. Bart (2005).** Droplet Population Balancing for Column Simulation. International Solvent Extraction Conference, *Proc. Of ISEC '05, CD-ROM (ISBN 7-900692-02-9), China Acad. J. Electronic Publ. House, www.isec2005.org.ch*.
97. **Bart, H-J., Schmidt, S. & Attarakih, M. (2005)** Advanced Column Modelling for Reactive Extraction. The 8th conference on Process Integration, Modelling and

Optimization for Energy Saving and Polution Reduction. Klemes, J. (Ed*). Chemical Engineering Transactions* (**7**), 297-302.

98. **M. M. M.Attarakih, Bart, H. J., & Faqir, N. M. (2004).** Berchnung von fluessig-fluessig Extraktionskolonnen auf Basis bivarianter Populationsbilanzen. *DECHEMA/GVC – Jahrestagungen,* 12-14 Oktober 2004, Karlsruhe, Duetchland.
99. **M. M. Attarakih, H.-J. Bart, N.M. Faqir (2004).** Numerical solution of the bivariate population balance equation for interacting hydrodynamics and mass transfer in liquid-liquid extraction columns. *Proc. Of the 2nd Int. Conf. on Population Balance Modelling, 5./7.5.2004, Valencia, Spain, 94-97, J. Nopoens, K. Malisse, C.A. Biggs, J.J. Dcoste (eds.) EUROSIS, Ghent, Belgium.*
100. **S.A. Schmidt, M. Simon, M. M. Attarakih, L. Lagar Garcia, H.-J. Bart (2004).** Estimation of Populance Parameters in Liquid-Liquid Extraction Column. *Proc. Of the 2nd Int. Conf. on Population Balance Modelling, 5./7.5.2004, Valencia, Spain,55-58, J. Nopoens, K. Malisse, C.A. Biggs, J. J. Dcoste (eds.) EUROSIS, Ghent, Begium.*
101. **M. M. Attarakih, C. Drumm, H.-J. Bart & N. M. Faqir.** (2007). Solution of the population balance equation using the sectional quadrature method of moments. *Proc. Of the 3rd International Conference on Population Balance Modelling, Quebec, Canada, 19-21 Sep. 2007.*