

Dr. Ayyaz Muhammad

Associate Professor

Institute of Chemical Engineering & Technology, University of the Punjab, New Campus, Lahore-54590

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EDUCATION

Jan. 2006-Jul. 2009

Universiti Teknologi Petronas, Tronoh, Perak, Malaysia

Ph.D (Chemical Engineering)

Sept. 2002- Dec. 2003

Institute of Chemical Engineering & Technology, University of the Punjab. Lahore, Pakistan

M.Sc (Chemical Engineering) “**Gold Medalist**”

Sept. 1996-Jan. 2001

Institute of Chemical Engineering & Technology, University of the Punjab. Lahore, Pakistan.

B.Sc. (Chemical Engineering)

RESEARCH PROJECTS

Ph.D (Chem. Engg.) Research project

Thermophysical Properties and Solubility of CO₂/CH₄ in Aqueous Alkanolamine Solutions and Ionic Liquids.

M.Sc. (Chem. Engg.) Research project

Application of Advance Oxidation Processes (AOPs) on Raw and Biotreated Textile Dye bath Effluent

B.Sc. (Chem. Engg.) Plant design project

Production of 50 tons/day Ethyl Acetate by Esterification of Ethanol and Acetic Acid.

Completed

Principle Investigator

- Heat capacities and decomposition kinetics of imidazolium based ionic liquids and thermal effects of contaminants, funded by PU (Rs. 0.125 million) for 2010-2011.

Co-Principle Investigator

- Mitigation of internal corrosion of SNGPL gas pipelines, funded by SNGPL (Rs. 3 million) for 2010-2011.
- Separation of PET/PVC mixture using Froth Flotation Process, funded by PU (Rs. 0.125 million) for 2010-2011.
- An experimental study to explore the characteristics of different metals for the purpose of heat transfer by convection and radiation, funded by PU (Rs. 0.2 million) for 2010-2011.

In Progress

Principle Investigator

- Design and process study for conversion of plastic wastes to oil, PU (Rs. 0.125 million) for 2011-2012.

Co-Principle Investigator

- Design and process study for liquid-liquid extraction, PU (Rs. 0.125 million) for 2011-2012.

RESEARCH INTERESTS

- Separation processes and Purification
- CO₂ capture and Green Processing technologies (Ionic liquids/ Alkanolamines)
- Thermodynamic modelling
- Fuel and energy engineering particularly renewable energy resources
- Optimisation/scheduling processes of industrial engineering interests
- Environmental issues: Waste water using advanced oxidation processes (AOPs)

JOURNAL PUBLICATIONS

1. A. Ijaz, A. Shafeeq, **Ayyaz Muhammad**, S. S. Daood, Optimized values for a sieve plate pulsed column for acetic acid, water and kerosene system, *Journal of Quality and Technology Management*, VI(I) **2010**, 119-133.
2. **Ayyaz Muhammad**, M. I. Abdul Mutalib, T. Murugesan, A. Shafeeq, Thermophysical properties of aqueous piperazine and aqueous (*N*-methyldiethanolamine + piperazine) solutions at temperatures (298.15 to 338.15) K, *J. Chem. Eng. Data*, 54(8), **2009**, 2317-2321.
3. A. Shafeeq, **Ayyaz Muhammad**, R. U. Khan, M. Azam, Application of Heuristics to solve scheduling problems of intermediate transfer policies in multiproduct chemical batch processes, *J. of Quality and Tech. Management*, V(I), **2009**, 67-81.
4. **Ayyaz Muhammad**, A. Shafeeq, M. A. Butt, Z. H. Rizvi, M. A. Chughtai, S. Rehman, Decolorization and Removal of COD and BOD from Raw and Biotreated Textile Dye Bath Effluent through Advance Oxidation Processes (AOPs), *Brazilian J. of Chem. Eng.*, 25(3), **2008**, 453-459.
5. **Ayyaz Muhammad**, M. I. Abdul Mutalib, C. D. Wilfred, T. Murugesan, A. Shafeeq, Thermophysical properties of 1-hexyl-3-methyl imidazolium based ionic liquids with tetrafluoroborate, hexafluorophosphate and bis(trifluoromethylsulfonyl)imide anions, *J. Chem. Thermodyn.*, 40(9), **2008**, 1433-1438.
6. **Ayyaz Muhammad**, M. I. Abdul Mutalib, T. Murugesan, A. Shafeeq, Density and excess properties of aqueous *N*-methyldiethanolamine solutions from (298.15 to 338.15) K, *J. Chem. Eng. Data*, 53(9), **2008**, 2217-2221.
7. **Ayyaz Muhammad**, M. I. Abdul Mutalib, C. D. Wilfred, T. Murugesan, A. Shafeeq, Viscosity, refractive index, surface tension, and thermal decomposition of aqueous *N*-methyldiethanolamine solutions from (298.15 to 338.15) K, *J. Chem. Eng. Data*, 53(9), **2008**, 2226-2229.
8. M. Saif Ur Rehman, **Ayyaz Muhammad**, A. Shafeeq, A. M. Ali, F. Ahmad, Decolorization of Turquoise blue dye by ozonation, O₃/H₂O₂ and Fenton Process, *Research J. of Env. Sci.*, 2(5), **2008**, 310-315.
9. A. Shafeeq, M. I. Abdul Mutalib, K. A. Amminudin, **Ayyaz Muhammad**, Determination of inter-stage idle times in scheduling design of a three stage zero wait batch process, *J. of Applied Sci.*, 8(9), **2008**, 1706-1712.
10. A. Shafeeq, M. I. Abdul Mutalib, K. A. Amminudin, **Ayyaz Muhammad**, Scheduling three stage flowshop processes with no intermediate storage using novel matrix approach, *J. of Applied Sci.*, 8(11), **2008**, 2136-2141.
11. A. Shafeeq, M. I. Abdul Mutalib, K. A. Amminudin, **Ayyaz Muhammad**, New completion time algorithms for sequence based scheduling in multiproduct batch processes using matrix, *Chem. Eng. Research and Design*,

86(10), 2008, 1167-1181.

12. A. Shafeeq, M. I. Abdul Mutalib, K. A. Amminudin, **Ayyaz Muhammad**, More on completion time algorithms for intermediate storage tanks in multiproduct batch process scheduling using matrix representation, *Ind. and Eng. Chem. Research*, 47(24), 2008, 9957-9970.
13. M. Saif Ur Rehman, N. Ahmad, A. Yasar, M. Sarwar, **Ayyaz Muhammad**, Application of H₂O₂, UV & UV/H₂O₂ systems for the post treatment of biotreated industrial wastewater, *EJEAFChe*, 5(6), 2006, 1575-1582.

CONFERENCE PROCEEDINGS

1. **Ayyaz Muhammad**, A. Shafeeq, Z. H. Rizvi, A. Ijaz and M. I. Abdul Mutalib, Experimental solubility of CO₂ and CH₄ in imidazolium based ionic liquid; [C₆mim][BF₄] at high pressures, *2nd International Conference on Chemical, Biological and Environmental Engineering (ICBEE 2010)*, Egypt, 02-04 Nov., 2010.
2. A. Shafeeq, S. S. Daood, **Ayyaz Muhammad** and A. Ijaz, Effect of variable reflux ratio on binary distillation in a laboratory scale distillation Column, *2nd International Conference on Chemical, Biological and Environmental Engineering (ICBEE 2010)*, Egypt, 02-04 Nov., 2010.
3. **Ayyaz Muhammad**, A. Shafeeq, A. Ijaz, T. Murugesan, M. I. Abdul Mutalib, Solubility of carbon dioxide in fresh and recycled ionic liquid [C₆mim][PF₆] at pressures up to 60 bar, *International Conference on Process Engineering and Advanced Material (ICPEAM2010)/24th Symposium of Malaysian Chemical Engineers (SOMChE2010)*, Malaysia, 15-17 June 2010.
4. A. Ijaz, M. Saleem, A. Shafeeq, **Ayyaz Muhammad**, Clogging Performance of Plain and Pleated Fibrous Microfiltrex Cylindrical Filter Candles, *International Conference on Process Engineering and Advanced Material (ICPEAM2010)/24th Symposium of Malaysian Chemical Engineers (SOMChE2010)*, Malaysia, 15-17 June 2010.
5. A. Shafeeq, **Ayyaz Muhammad**, A. Ijaz, M. I. Abdul Mutalib, "A software application for scheduling multiproduct chemical batch processes, *International Conference on Process Engineering and Advanced Material (ICPEAM2010)/24th Symposium of Malaysian Chemical Engineers (SOMChE2010)*, Malaysia, 15-17 June 2010.
6. **Ayyaz Muhammad**, M. I. Abdul Mutalib, T. Murugesan, Z. Man, M. A. Bustam, Density and viscosity estimation of 1-hexyl-3-methyl imidazolium based ionic liquids (ILs) with [BF₄] and [PF₆] anions at high pressures, *23rd Symposium of Malaysian Chemical Engineers in Conjunction with the 3rd International Conference on Chemical and Bioprocess Engineering*, Malaysia, 12-14 August, 2009.
7. A. Shafeeq, **Ayyaz Muhammad**, M. Azam, More on heuristics for scheduling in multiproduct chemical batch processes with various intermediate transfer policies, *Proceedings of Symposium on Engineering Sciences, Faculty of Engg. & Tech., Punjab University, Lahore, Pakistan*, 30th April 2009.
8. **Ayyaz Muhammad**, M. I. Abdul Mutalib, T. Murugesan, A. Shafeeq, Predicting density and surface tension of imidazolium based ionic liquids (ILs), *Proceedings of National Postgraduate Conference on engineering, Science and Technology*, Malaysia, 25-26 March, 2009.
9. **Ayyaz Muhammad**, M. I. Abdul Mutalib, T. Murugesan, Z. Man, M. A. Bustam, A. Shafeeq, A study on the mutual solubilities and thermal stability of imidazolium based ionic liquids (ILs) and organic solvents, *Proceedings of International Conference on Environment*, Malaysia, 15-17 December, 2008.
10. **Ayyaz Muhammad**, M. I. Abdul Mutalib, T. Murugesan, Z. Man, M. Azmi Bustam, A. Shafeeq, Lattice potential energy and standard absolute entropy of imidazolium based ionic liquids (ILs), *Proceedings of 15th Regional Symposium on Chemical Engineering in Conjunction with 22nd Symposium of Malaysian Chemical Engineers*, Malaysia, 2-3 December, 2008.

11. A. Shafeeq, M. I. Abdul Mutalib, K.A. Amminudin, **Ayyaz Muhammad**, A heuristic method to search for optimal solution using partial enumeration for a multiproduct chemical batch process, *Proceedings of 22nd Symposium of Malaysian Chemical Engineers*, Malaysia, 2-3 December, **2008**.
 12. **Ayyaz Muhammad**, M. I. Abdul Mutalib, C. D. Wilfred, T. Murugesan, A. Shafeeq, Solubility of carbon dioxide and methane in aqueous solutions of Piperazine activated N-Methyldiethanolamine at high pressure, *Proceedings of 21st Symposium of Malaysian Chemical Engineers*, Malaysia, 12-14 December, **2007**.
 13. A. Shafeeq, M. I. Abdul Mutalib, K.A. Amminudin, **Ayyaz Muhammad**, Completion time in single product chemical batch process with parallel unit for ZW/NIS/UIS transfer policies, *Proceedings of 21st Symposium of Malaysian Chemical Engineers*, Malaysia, 12-14 December, **2007**.
 14. A. Shafeeq, M. I. Abdul Mutalib, K.A. Amminudin, **Ayyaz Muhammad**, Determination of makespan for zero wait batch processes: a novel method using matrix, *Proceedings of International MultiConference of Engineers and Computer Scientists*, Hongkong, Vol.(II): 21-23 March, **2007**, 2038-2042.
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BOOKS

Book Chapter

1. A. Shafeeq, M. I. Abdul Mutalib, K.A. Amminudin and **Ayyaz Muhammad**, A novel matrix approach to determine makespan for zero wait batch processes, *Advances in industrial engineering and operations research*, Springer, **2008**, 143-153.

Book

1. **Ayyaz Muhammad**, Green Processing Technology: Application of Ionic liquids for CO₂ capture from natural gas, Publisher VDM Verlag Dr Muller, August, 2011 (under review).
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ESTEEM INDICATORS

Reviewer for Journals

- Journal of Chemical & Engineering data (American Chemical Society)
- Journal of hazardous materials (Elsevier)
- Journal of Solution Chemistry (Springerlink)
- International journal of environmental engineering (Inderscience)
- African Journal of Environmental Science and Technology (Academicjournals)

Member Editorial Advisory board of "Kasetsart Journal of Natural Sciences" ISSN 0075-5192, Thailand

INDUSTRIAL EXPERIENCE

One year Industrial experience (2001 -2002) as a "Textile Processing Engineer" for Hang-Ten brand and "Trainee Engineer" in Polyester unit, Lahore, Pakistan

ACADEMICIAN & RESEARCHER

Jan. 2006 – Jul. 2009

Graduate Assistant during PhD studies at Chemical Engineering Department, UTP, Malaysia.

Academic activities: Worked as demonstrator at laboratories of Hysys, Separation processes and Process safety & loss prevention.

Worked as facilitator for undergraduate Chemical Engineering students to conduct tutorials of Thermodynamics, Organic/Physical chemistry and Process safety & loss prevention.

Co-academic-Activities: Worked as member (Jan. 2008-July 2008) and President (Aug. 2008- Aug. 2009) of postgraduate Students representative committee at UTP, Malaysia.

8th Feb. 2002-06th March 2010

Lecturer at I.C.E. & T, University of the Punjab, Lahore, Pakistan

(Eligible Applicant for the advertised post of Associate Professor at I.C.E.&T, PU)

Since 07th March 2010

Associate Professor at I.C.E. & T, University of the Punjab, Lahore, Pakistan

Academic activities: Engaged in imparting technical knowledge and demonstrating practical work to undergraduate and postgraduate Engineers

1. B.Sc. (Engg.) Chem. Engg.: Separation processes, Fuel engineering, Fluid & Particle Mechanics, Chemical Reaction Engineering, Chemical Engineering Principles and Transport Phenomenon.

2. M.Sc. (Engg.) Chem. Engg.: Advanced Separation Processes, Advanced Transport Phenomenon, Instrumental Techniques in Engineering Research, Polymer Synthesis & Characterization, Rheology and Processing

Co-academic-Activities:

Head: Continual Professional development Cell (CPDC)

Focal Person: PU Office of Research and Innovative Cooperation

Administrative duties:

Assistant-Coordinator: M.Sc. Chem. Engg. Programme

Incharge: Industrial Internship training program & Industrial tours

Team Leader: Quality Enhancement Cell (QEC) Program at ICE&T

Member: Board of studies, Scholarship Committee, Hardship Committee, Course Review and Curriculum Development Committee

SEMINARS, CONFERENCES, SYMPOSIUMS, WORKSHOPS & TRAININGS

I. PARTICIPATED/ATTENDED

2011: Pakistan Engineering Council, Islamabad.

- “Interactive workshop on: **Professional Engineering Bodies**” (one day: 28th, May)

2011: Asian Institute of Technology, AIT-Extension, Bangkok, Thailand, Sponsored by LID, HEC, Pakistan.

- “Advanced Faculty Professional Development Program: **Ensuring Training Effectiveness**” (20 days: 6-26, March)

2010: Pakistan Society for Training and development (PSTD) and Engro Corporation at PC, Lahore, Pakistan.

- 3rd Women in Business & Leadership Conference, “**Wibcon, 10**” (One day: 23 November)

2010: Institute of Quality and Technology Management (IQTM), University of the Punjab, Lahore, Pakistan.

- A workshop on “**Research Management**” (One day: 15 November)

2010: A joint project of European Commission and Pakistan (SCI-Pak Project) held at Holiday Inn, Lahore

- A training session on “**Sustainable & Cleaner Production**” (Four days: 30 August-02 September)

2010: Institute of Quality and Technology Management (IQTM), University of the Punjab, Lahore, Pakistan.

- A workshop on “**Research Management**” (One day: 27 July)

2010: Higher Education Commission (HEC) Regional Centre, Lahore, Pakistan.

- “3rd Advanced Specified Course for Master Trainers Faculty Professional Development Program (MT-FPDP) Alumni” (6 days: 21-26 June)

2010: Institute of Chemical Engineering & Technology (ICE&T), University of the Punjab, Lahore, Pakistan.

- Symposium on “**Engineering Sciences**” (1 day: 10 March)

2009: Chemical Engineering Department, Universiti Teknologi Petronas, Tronoh, Malaysia.

- Seminar on “**Green Technology: Fundamentals & Applications**” (2 days: 29-30 July)

2008: Chemical Engineering Department, Universiti Teknologi Petronas, Tronoh, Malaysia.

- Seminar on “**Polymer Reaction Engineering**” (2 days: 13-15 August)

2008: Chemical Engineering Department, Universiti Teknologi Petronas, Tronoh, Malaysia.

- Workshop on “**Material Studio basic Software Training**” (3 days: 18-20 July)

2008: Chemical Engineering Department, Universiti Teknologi Petronas, Tronoh, Malaysia.

- Workshop on ionic liquids: Queens University ionic liquid laboratories (QUILL) “**Ionic Liquid: The Future Solvent for Oil and Gas Industries**” (2 weeks: 30 June-11 July)

2008: Chemical Engineering Department, Universiti Teknologi Petronas, Tronoh, Malaysia.

- Technical workshop/Users Training on “**Gas Chromatograph (GC) and TotalChrom Software (TC)**” (one day: 24 January)

2006: Chemical Engineering Department, Universiti Teknologi Petronas, Tronoh, Malaysia.

- Seminar on “**Advanced Process Control; The Enabler for Superior Performing Assets**” (13th March)

2004: Higher Education Commission, Islamabad, Pakistan

- Faculty development training on **“Teaching and Learning in Higher Education”** (3 months: 19 July- 15 October)

2003: Institute of Environmental science & Engineering NUST, Islamabad, Pakistan

- A Short course on **“Recent Advancements in Air Pollution, Monitoring &Control”** (2 days: 8-9 September)

2003: Institute of Chemical Engineering & Technology, University of the Punjab Lahore, Pakistan.

- A Workshop on **“Information Handling Techniques”** (03 days)

2002: Institute of administrative Sciences, University of the Punjab Lahore, Pakistan

- Orientation Program on **“Faculty Development and Growth”** (2 weeks: 12-23 August)

2000: Institute of Chemical Engineering & Technology, University of the Punjab Lahore, Pakistan

- A training course on **“Introduction to ISO 9000 Certification”** (4 weeks: 15 June-14 July)

1999: Pak Arab Fertilizer Company, Multan, Pakistan

- Industrial training on **“Urea and Ammonia Sections of the Fertilizer Plant”** (6 weeks: 1 July-10 August)

II. CONDUCTED

2010: Institute of Chemical Engineering & Technology (ICE&T), University of the Punjab Lahore, Pakistan

- A Seminar on **“Selling yourself through RESUME”** for 8th semester Chem. Engg. Sts. (One day: 7thDecember)

2010: Institute of Chemical Engineering & Technology (ICE&T), University of the Punjab Lahore, Pakistan

- A Seminar on **“CV Preparation and Interviewing Skills”** for 4th & 8th semester Chem. Engg. Sts. (One day: 6th December)

2010: Institute of Chemical Engineering & Technology (ICE&T), University of the Punjab Lahore, Pakistan

- A Seminar on **“Industrial Internship learnings and outcomes”** for 6th semester Chem. Engg. students (Two days: 26 Oct. & 29 Oct.)

2010: Institute of Chemical Engineering & Technology (ICE&T), University of the Punjab Lahore, Pakistan

- A Seminar on **“Orientation and Importance of Industrial Internship”** for 6th semester Chem. Engg. students (One day: 27 June)

2004: Institute of Chemical Engineering & Technology (ICE&T), University of the Punjab Lahore, Pakistan

- A Workshop on “**Students Counseling and Essentials of job Hunting for Career Planning**”

(2 days: 15-16 April)

RESOURCE PERSON/INVITED SPEAKER/TALKS/LECTURES

2011: Communication Skills Development Center (CSDC), ICE&T, PU, Lahore, Pakistan.

- Invited Speaker for “**Managing Time for Multitasking**” at Workshop/Seminar on “Communication Skills” (Two days: 2nd and 3rd August)

2010: Institute of Chemical Engineering & Technology, University of the Punjab, Lahore, Pakistan.

- Resource Person for “**Energy Conservation & Sustainability**” at Professional development Workshops (14 days: 28th July-10th August)

2010: National Cleaner Production Center in Collaboration with ENERCON, Holiday Inn, Lahore, Pakistan.

- Invited Speaker for “**Energy Scenario of Pakistan; An overview**” at Workshop/Seminar on “Energy conservation” (One day: 25th May)
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ACADEMIC AWARDS & ACHIEVEMENTS

- Earned scholarship as Graduate Assistant (GA) Scheme at UTP during Ph.D research work (Jan. 2006-July 2009)
 - Earned TWO gold Medals for obtaining 1st position in M.Sc. (Chem Eng.) at I.C.E&T-PU
 - Faculty tuition fee award for M.Sc. (Chem Eng.) at I.C.E&T-PU (2002-2003)
 - Merit scholarships for 2nd, 3rd and final year for B.Sc. (Chem. Eng.) degree at I.C.E&T-PU (1996-2001)
 - Merit scholarships for secondary and higher secondary schooling at Pakistan steel cadet college, Karachi, and Government college, Multan, Pakistan
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PROFESSIONAL AFFILIATIONS

- International Association of Engineers (IAENG), Member, since 2008
 - Pakistan Engineers Forum (PEF), Member, since 2002
 - Pakistan Engineering Council (PEC), Professional Engineer, since 2001(Life time)
 - Pakistan Institute of Chemical Engineers (PICH), Member, since 2001, Executive member, since 2011
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COMPUTER SKILLS

Application Software

MS Office, Fortran, Hysys, ICON, Matlab, Endnote, Labview, ChemCAD

Operating Systems

Windows 98, 2000, XP, 2003, 2007, 2010.

COUNTRIES VISITED

Malaysia, Egypt, Thailand