

# Khurram Shahzad, Ph.D

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Institute of Chemical Engineering and Technology, University of the Punjab, Lahore. Pakistan  
+92 (042) 99231261  
khurram.icet@pu.edu.pk

## Education

**Post-Doctorate (2017), Ecole Polytechnique, University of Montréal, Quebec, Canada**

**Research Area:** Separation of Rare Earth Elements from the Raw Ore, Utilization of High Temperature Induction Heating Fluidized Bed for Combustion of Coal & REF

**Ph.D. (2013) University of the Punjab, Pakistan & University Twente, The Netherlands**

**Thesis Title:** Gaseous Emissions Control in Circulating Fluidized Bed Combustor Burning Pakistani Coal and Wheat Straw

Combustion mechanisms and effect of operating conditions on gaseous emissions during the co-combustion of Pakistani coal and wheat straw is being studied. Torrefaction of various biomasses is being done and different characteristics are investigated. Mathematical modelling of co-combustion in circulating fluidized bed combustor is also being done. A part of research is being carried out at University Twente, The Netherlands under the supervision of Prof. Dr. Gerrit Brem.

**M.Sc. Chemical Engg. (2007),** University of Engineering and Technology, Lahore.

**Thesis Title:** Recycling of Chromium (Trivalent) from Chromium Hydroxide Sludge

**B.Sc. Chemical Engg. (2004),** University of the Punjab, Pakistan.

**Research Report:** Development of Spherical Silica Gel.

**HEC Approved PhD Supervisor:** Since January 2017

## Research Interests

- ❖ Coal, Biomass Combustion, Co-combustion and Heat Transfer Studies in Fluidized Beds (Circulating Fluidized Bed was designed and operated for research work )
- ❖ Coal, Biomass Combustion, Co-combustion in Drop Tube Furnace (DTF was designed and operated for research work )
- ❖ Coal Gasification (Bubbling Fluidized Bed Gasifier was designed and operated)
- ❖ Biomass Pyrolysis Setup (Lab Scale Setup was designed and operated)
- ❖ Biomass Torrefaction (Lab scale setup was designed and operated)
- ❖ Modelling and Simulation

## Professional & Teaching Experience

### June 2016 – Present

Associate Professor at Institute of Chemical Engg. & Tech., University of the Punjab, Pakistan. Besides the teaching of B.Sc./M.Sc. Chemical Engineering teaching modules, I have supervised no. of students in M.Sc. research thesis in areas of Thermochemical Conversion Technologies.

### July 2010 – May 2016

Assistant Professor (Coal Technology) at Centre for Coal Technology, University of the Punjab, Pakistan. Besides the teaching of M.Phil/M.Sc. Coal Technology teaching modules, I have

supervised no. of students in M.Sc. research thesis in areas of Coal Cleaning, Coal/Biomass Combustion and Gasification, and Thermochemical Conversion of coal.

### September 2008 – July 2010

Lecturer at Chemical Engineering Department, COMSATS Institute of Information Technology, Pakistan.

- Industrial Liaison Manager
- In charge, Heat & Mass Transfer Lab.

### March 2005 – September 2008

Process Engineer in Technical and Environment Department at Dawood Hercules Chemicals Limited (1600 MT/day Urea Fertilizer), Pakistan, where I was responsible for:

- Generation of plant performance and energy audit reports for manager's meeting.
- Daily and weekly laboratory analytical reports monitoring related to plant operations.
- Log sheets study of Urea, containing critical parameters on daily basis.
- Monitoring & trouble shooting of Ammonia cylinders filling.
- Monitoring plant operations & provide guidelines for emergency and for process improvement.
- Calculating reactor performance on daily basis.
- Loading & unloading of catalysts of Ammonia plant.
- Conducting plant visits to various groups from educational institutions.

### August 2004 – December 2004

Management Trainee at Nishat Mills Limited (Textile Complex), Lahore.

### Publications

- ❖ N. Ali, M. Ashraf, **K. Shahzad**, M. Saleem, A. Chughtai, Fluidized Bed Fast Pyrolysis of Corn Stover: Effects of Fluidizing Gas Flow Rate and Composition, Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, <https://doi.org/10.1080/15567036.2019.1694105>
- ❖ Q.A. Rana, R. Arif, **K. Shahzad**, J. Akhtar, S. Munir, Upgradation of Mianwali Coal using Froth Flotation and Nitric Acid Leaching, *International Journal of Oil, Gas and Coal Technology*, Vol. 20 (4), 2019, pp:463-472, <https://doi.org/10.1504/IJOGCT.2019.099173>
- ❖ M.S. Khurram, J.H. Choi, I. Ahmad, S.A. Memon, **K. Shahzad**, M. Ghauri, S. Rafiq, Correlation for Predicting Solid Holdup in the Circulating Fluidized Beds Riser, *Journal of Engineering Technology*, Vol. 06 (1), 2018, pp:283-292.
- ❖ A. Khan, J. Akhtar, **K. Shahzad**, N. Sheikh, S. Munir, Co-pyrolysis and hydrogenation of waste tires and tar coal blends, Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, Vol. 39(15), 2017, pp:1664-1670.
- ❖ A. Farooq, M.S. Khurram, S. Rafiq, S.A. Memon, M. Ghauri, **K. Shahzad**, M. Jaffery, Biomass gasification for Energy Generation: Parametric Investigation on Continuous Updraft Gasifier, *Journal of Engineering Technology*, Vol. 06, 2017, pp:352-367.
- ❖ M. Zara, Z. Ahmad, J. Akhtar, **K. Shahzad**, N. Sheikh, S. Munir, Extraction and Characterization of Humic Acid from Pakistani Lignite Coals, Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, Vol. 39(11), 2017, pp:1159-1166.

- ❖ S. Hussain, N. Ali, R.M. Saleem, **K. Shahzad**, M. Saleem, Hydrodynamic Study Of Indigenous Biomass-Sand Mixtures in a Cold Fluidization Column, *Journal of Faculty of Engineering & Technology*, Vol. 24(1), 2017, pp: 107-116.
- ❖ M. Ghauri, **K. Shazhad**, M.S. Khurram, M.H. Jaffery, N. Ali, K.R. Cliffe, Development of a Temperature Programmed Identification Technique to Characterize the Organic Sulphur Functional Groups in Coal, *Energies*, Vol. 10(6), 2017, pp:1-17
- ❖ N. Ali, M. Saleem, **K. Shahzad**, S. Hussain, A. Chughtai, Effect of Operating Parameters On Bio-Oil Production from Fast Pyrolysis of Maize Stalk in Bubbling Fluidized Bed Reactor, *Polish Journal of Chemical Tech.*, Vol. 18 (3), 2016, pp:88–96
- ❖ **K. Shahzad**, M. Saleem, M. Kazmi, Z. Ali, S. Hussain, N.A. Akhtar, Hydrodynamic study of the Emissions of NO<sub>x</sub>, SO<sub>2</sub> and CO from Co-combustion of Wheat Straw and Coal Under Fast Fluidized Bed Condition, *Combustion Science and Technology*, Vol. 188 (8), 2016, pp:1303-1318.
- ❖ A. Anwer, M.A. Kazmi, Z.A. Khan, **K. Shahzad**, S. Hussain, Synthesis and Characterization Of Calcium Deficient Hydroxyapatite Nanocrystals, *Journal of Faculty of Engineering & Technology*, Vol. 23(2), 2016, pp: 101-109.
- ❖ M. Ghauri, **K. Shazhad**, A. Inayat, Z. Ali, W.A. Khan, J. Akhtar, K.R. Cliffe, High Pressure oxy-desulphurisation of Coal -Effect of Oxidizing Agent, Solvent, Shear and Agitator Configuration, *Energies*, Vol. 9(7), 2016, pp:1-15.
- ❖ N. Feroze, M. Kazmi, M.W. Iqbal, S. Yousaf, **K. Shahzad**, Removal of Zn(II) by modified *Rhizopus arrhizus*, *Desalination & Water Treatment*, 2016 (1-6).
- ❖ M. Ghauri, **K. Shazhad**, A. Inayat, Z. Ali, K.R. Cliffe, High Pressure oxy-desulphurisation of Coal Using KMnO<sub>4</sub> -Effect Of Coal Slurry Concentration, pH and Alkali, *Energies*, Vol. 9(4), 2016, pp:1-14.
- ❖ **K. Shahzad**, M. Saleem, N. Awan, N.A. Akhtar, An Experimental Study of Emissions of NO<sub>x</sub>, SO<sub>2</sub> and CO from Co-combustion of Wheat Straw and Coal Under Fast Fluidized Bed Condition, *Combustion Science and Technology*, Vol. 187, 2015, pp:1079-1092
- ❖ A. Mustafa, T. Ahmad, J. Akhtar, **K. Shahzad**, N. Sheikh, S. Munir, Agglomeration of Makarwal Coal using Soybean oil as Agglomerant, *Energy Sources, Part A, Recovery Utilization and Environmental Effects*, Vol. 38(24), 2016, pp:3733-3739 .
- ❖ N. Ali, M. Saleem, **K. Shahzad**, A. Chughtai, Bio-Oil Production from Fast Pyrolysis of Cotton Stalk in Fluidized Bed Reactor, *Arab Journal Sci Eng*, Vol. 40, 2015, pp:3019–3027
- ❖ E.M. Gucho, **K. Shazhad**, E.A. Bramer, G. Brem, N.A. Akhtar, Experimental study on dry torrefaction of Beech Wood and Miscanthus, *Energies*, Vol. 8, 2015, pp:3903-3923.
- ❖ J. Akhtar, N. A. S. Amin, **K. Shahzad**, A review on removal of pharmaceuticals from water by adsorption, *Desalination & Water Treatment*, 2015 (1-19).
- ❖ S. Hussain, A.A. Malik, **K. Shahzad**, N.A. Akhtar, N. Ali, A. Chughtai, Factors Influencing the Formation of Producer Gas from Coal and Biomass, *Journal of Pakistan Institute of Chemical Engineers*, Vol. 43(2), 2015, pp: 133-147.
- ❖ Z. Idress, M.A. Kazmi, M. Habib, Qasim Ali, **K. Shahzad**, Equilibrium and Kinetic study for the Uptake of a heavy metal, *Journal of Faculty of Engineering & Technology*, Vol. 21(3), 2014, pp: 97-109.

- ❖ **K. Shahzad**, M. Saleem, M. Ghauri, W.A. Khan, N.A. Akhtar Modelling and Analysis of SO<sub>2</sub> Emissions under Fast Fluidized Bed Conditions using One Dimensional Model, *Advances in Chemical Engineering and Science*, Vol. 4, 2014, pp:327-338.
- ❖ **K. Shahzad**, S. Kanwal, S. Nawaz, N. Sheikh., S. Munir, Effects of Moisture and Coal Blending on HGI of Pakistani Coal, *International Journal of Coal Preparation and Utilization*, Vol. 34(1), 2014, pp:1-9.
- ❖ **K. Shahzad**, J. Akhtar, N. Feroze, M. Ghauri, Effect Of Hydroxyl Ions On Recycling of Hexavalent Chromium From Chromium Hydroxide Sludge, *Science International (Lahore)*, Vol. 26 (2), 2014, pp: 717-720. (www.sci-int.com, ISI indexed).
- ❖ Hameed, W.A. Khan, S.K.R. Kazmi, M.A. Bhati, **K. Shahzad**, Reduction of Sulfur and Ash of Salt Range Coal by Froth Flotation Technique , *Journal of Pakistan Institute of Chemical Engineers*, Vol. 43(2), 2015, pp: 67-74.
- ❖ N. Ali, M. Saleem, **K. Shahzad**, R.M. Saleem, A. Chughtai, Effect of Temperature on the Bio Oil Yield from Pyrolysis of Maize Stalks in Fluidized Bed Reactor, *Journal of Pakistan Institute of Chemical Engineers*, Vol. 42(2), 2014, pp: 77-88.
- ❖ R. Haider, M.A. Ghauri, **K. Shahzad**, J.R. SanFilipo, E.J. Jones, Analytical Investigations of Liberated Organics after Biodegradation of Lignite Samples, *Journal of Pakistan Institute of Chemical Engineers*, Vol. 42(2), 2014, pp:101-106.
- ❖ Farooq, M. Ghauri, M.H. Jaffery, **K. Shahzad**, Effects of Catalysts (Mg and Fe) on Kinetics of Biomass Gasification Using CO<sub>2</sub> as Gasifying Agent, *J. Basic. Appl. Sci. Res.*, Vol. 4(3), 2014, pp: 31-41.
- ❖ W.A. Khan, **K. Shahzad**, J. Akhtar, M. Ghauri, A Model of Heat Transfer in a Circulating Fluidized Bed Combustor, *Science International (Lahore)*, Vol. 25 (4), 2013, pp-785-790. (www.sci-int.com, ISSN # 1013-5316).
- ❖ **K. Shahzad**, M. Saleem, W.A. Khan, N. Awan, N.A. Akhtar, Parametric Study of NO<sub>x</sub> Emissions in Circulating Fluidized Bed Combustor, *Journal of PICH E*, Vol. 40(1), 2012, pp-61-68.
- ❖ W.A. Khan, **K. Shahzad**, M. Ghauri, M. Saleem, N. A. Akhtar, Axial Heat Transfer Investigations in a Circulating Fluidized Bed Combustor Burning Makarwal Coal, *Science International (Lahore)*, Vol. 24(4), 2012, pp-153-157. (www.sci-int.com, ISSN # 1013-5316)
- ❖ **K. Shahzad**, M. Saleem, N.A. Akhtar, M. Ghauri, Emissions of NO<sub>x</sub> from Fast Fluidized Bed Combustor Burning Wheat Straw with Coal, *NUST Journal of Engineering Sciences*, Vol. 4(1), 2011, pp.21-24.
- ❖ W. A. Khan, **K. Shahzad**, N.A. Akhtar, Hydrodynamics of Circulating Fluidized Bed Combustor: A Review, *Journal of PICH E*, Volume 37, 2009, pp:81-88.

### Conference Proceedings

- ❖ **K. Shahzad**, M. Sohail, A. Hamid, Green Ethanol Production from Cotton Stalk 9<sup>th</sup> International Conference on Future Environment and Energy (ICFEE-2019), January 9-11, 2019, IOP Conf. Series: doi:10.1088/1755-1315/257/1/012025
- ❖ Z.G. Rasool, F. Sajid, **K. Shahzad**, J. Akhtar, S. Munir, Upgradation of Mianwali Coal using Froth Flotation and Hydrochloric Acid Leaching, 3<sup>rd</sup> Conference on sustainability in Process Industry (*SPI-2016*), October 19-20, 2016, University of Engineering and Technology, Peshawar, Pakistan.
- ❖ **K. Shahzad**, S. Munir, M. Shoaib, J. Akhtar, Bubbling Fluidized Bed Gasification of High Ash Pakistani Coal, *AIChE Annual Meeting*, November 16-21, 2014, Atlanta, GA, USA.

- ❖ S. Hussain, K.S. Akhtar, **K. Shahzad**, N.A. Akhtar, A. Chughtai, Thermochemical and Physical Characterization of Low-grade Coal and Agricultural Residue as Feedstock for Co-gasification, *1<sup>st</sup> International Young Engineers Convention (FEIIC IYEC-2014)*, April 18-20, 2014, University of Engineering and Technology, Lahore, Pakistan.
- ❖ **K. Shahzad**, S. Munir, S. Aslam, M. Mukhtar, J. Akhtar, Parametric Study of Coal Gasification Under Bubbling Fluidized Bed Conditions, *1<sup>st</sup> International Young Engineers Convention (FEIIC IYEC-2014)*, April 18-20, 2014, University of Engineering and Technology, Lahore, Pakistan.
- ❖ S. Munir, S. Mushtaq, S. Azam, J. Akhtar, N. Sheikh, **K. Shahzad**, Up-gradation of Duki Coal by Agglomeration with Xylene, *1<sup>st</sup> International Young Engineers Convention (FEIIC IYEC-2014)*, April 18-20, 2014, University of Engineering and Technology, Lahore, Pakistan.
- ❖ N. Awan, M. Saleem, A. Chughti, **K. Shahzad**, Experimental Study on Fast Pyrolysis of Pakistani Cotton Stalks in Fluidized Fluidized Bed Reactor, (Oral Presentation) 5<sup>th</sup> International Conference on Applied Energy (ICAE 2013), 1-4 July, 2013, Pretoria, South Africa.
- ❖ W.A. Khan, M.S. Tahir, **K. Shahzad**, M. Saleem, Burning of Pakistani Coal in a Circulating Fluidized Bed and Radial Heat Transfer Investigations (Oral Presentation) UK-Pakistan Coal Conference (UKPKCC 2012), 3-5 July, 2012, University of Leeds, UK.
- ❖ E. M. Gucho, **K. Shazhad**, E. A. Bramer, G.Brem, Parametric study on the torrefaction of beech wood and miscanthus for co-firing application (Oral presentation), ToTeM 37, 22-23 September, 2011, Technical University of Wroclaw , Poland.
- ❖ E. M. Gucho, **K. Shazhad**, E. A. Bramer, G.Brem, Parametric study on the torrefaction of beech wood and miscanthus for co-firing application (Poster presentation), October 10-11, 2011, Combura'11 symposium, ReeHorst, Ede, The Netherlands
- ❖ **K. Shahzad**, M. Saleem, N. A. Akhtar, M. Ghauri, Emissions of NO<sub>x</sub> from Fast Fluidized Bed Combustor Burning Wheat Straw with Coal, In the Proceedings of International Conference on Energy Systems Engineering (NUST) , ICESE-2010, 25-27 October, 2010, Rawalpindi, Pakistan.
- ❖ W.A. Khan, **K. Shahzad**, M. Saleem, N. A., Akhtar Radial Heat Transfer Investigations in a Circulating Fluidized Bed Burning Coal, In the Proceedings of International Conference on Energy Systems Engineering (NUST) , ICESE-2010, 25-27 October, 2010, Rawalpindi, Pakistan.

### Member Professional Societies

- ❖ Pakistan Engineering Council
- ❖ American Institute of Chemical Engineers ( Member # 9900177495)
- ❖ Member American Chemical Society ( Member # 30735169)
- ❖ Pakistan Institute of Chemical Engineers (Fellow)
- ❖ Executive Member (2017-2018), Pakistan Institute of Chemical Engineers
- ❖ International Society for Development and Sustainability (ISDS), Japan
- ❖ Society of Chemical Industry (SCI), UK

**Member Board of Studies**

- ❖ Postgraduate Research Committee, Department of Mining Engineering, University of Engg. & Technology, Lahore (since 2016)
- ❖ Department of Chemical Engineering, NFC-IET, Multan (since 2016)
- ❖ Postgraduate Research Committee, Department of Petroleum and Gas Engineering, University of Engg. & Technology, Lahore (since 2018)

***Program Designed (Team work)***

2014: M.Phil. Coal Technology

2017: M.Sc. (Engg.) Energy & Environmental Engineering

2018: Ph.D. Coal Technology / Ph.D Energy & Environmental Engineering

2018: B.Sc. (Engg.) Energy Engineering

***Research Supervision*****M.Phil./M.Sc**

- ❖ Co-Liquefaction of Coal and Rubber Tires at different operating conditions for value added fuel
- ❖ Synthesis and Characterization of Potassium Silicate Fertilizer using Lignite Coal and Fly Ashes of Bituminous and Sub bituminous Coal
- ❖ Study of Ash Fusion Temperatures, Fouling and Slagging Indices of Chakwal Coal before and after Froth Floatation
- ❖ Cleaning of High Sulphur Lakhra Coal by Heavy Media Separation
- ❖ Cleaning of Lakhra Coal by Agglomeration using diesel oil
- ❖ Up gradation of Khushab Coal by heavy media separation
- ❖ Effect of pH on Floatability of Chamalang Coal using Anionic and Nonionic Collectors
- ❖ Cleaning of Dukki (Baluchistan) coal by oil agglomeration process.
- ❖ Study of thermal behaviour of indigenous and imported coals using Thermogravimetric (TGA).
- ❖ Upgradation of Mianwali Coal by froth flotation using oleic acid as collector.
- ❖ Upgradation of Mianwali coal by combination technology (Froth Flotation and leaching)
- ❖ Effect of sodium silicate as depressant for mineral matter in flotation of Makerwal coal.
- ❖ Cleaning of Dukki Coal by agglomeration process using n-Hexane.
- ❖ Upgradation of Dukki Coal by using Combination Technology (Heavy Media Separation and Froth Flotation Techniques)
- ❖ Cleaning of Dukki Mines Coal by Agglomeration with n-Heptane.
- ❖ Desulfurization and Demineralization of flotation concentrate of Mianwali Coal by Leaching with Sodium Hydroxide.

- ❖ Steam Gasification of Coal in Locally Fabricated Bubbling Fluidized Bed Gasifier
- ❖ Extraction of Humic Acid from Coals
- ❖ Froth Flootation of Khushab Coal Using Saline Water

Journal Articles Reviewed,

- ❖ Canadian Journal of Chemical Engineering
- ❖ Energy & Fuels
- ❖ Applied Energy
- ❖ Current Alternative Energy
- ❖ Energy Conservation and Management
- ❖ Journal of Pakistan Institute of Chemical Engineers
- ❖ Biofuels, Bioproducts & Biorefining
- ❖ African Journal of Biotechnology
- ❖ Science of Total Environment