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Current research interests: Synthesis of Piezoelectric Ceramics, Multiferroics, Thermoelectric Ceramics and Microwave dielectrics. Characterisation Methods: LCR, impedance spectroscopy, d33 meter for piezoelectric coefficient, Vibrating Sample Magnetometer for magnetic properties, XRD Analysis, SEM/ EDX , ferroelectric testing, etc.

Academic Career

- **Ph.D.** (Functional Materials and Devices), The University of Sheffield, Sheffield, England, UK, in 2017.

***Ph.D. Synopsis:** 'KNN based lead free piezoelectric ceramics have been studied from the perspective of optimising their performance for multilayer actuators, potentially for energy harvesting applications. To this end, the defect chemistry of KNN has been investigated under different sintering conditions, dopants (acceptors: Mn^{2+} , Ti^{4+} , Sn^{4+} in KNN_50/50 ratio; Donor: Sr^{2+} in KNN_50/50 ratio; Ta^{5+} as an isovalent in KNN-51/49 ratio; and co-dopants: Bi^{3+} and Zr^{4+} in KNN_50/50 ratio) have been incorporated into KNN to enhance the piezoelectric performance and prototype multilayers of 10 and 16 layers with inner Pt electrodes have been fabricated to demonstrate the potential of $0.942KNN-0.058BNZ+ZrO_2$ for the fabrication of multilayer actuators. This lead-free composition has the potential to replace PZT-4 and PZT-8 in piezoelectric devices for room temperature applications. To fabricate the multilayers, a novel Wet-Multilayer-Method (WMM) was also developed to overcome the issues of delamination during firing of MLCCs'.*

- **M.E.** (Materials Engineering) from NED University of Engineering & Technology Karachi Pakistan in 2009.
- **B.E.** (Metallurgy) from Mehran University of Engineering & Technology, Jamshoro Pakistan in 2003.

Teaching Experience

- Associate Professor in Materials Engineering Department of NED University of Engineering and Technology, Karachi (from 04th August 2020 to date).
- Assistant Professor in Materials Engineering Department of NED University of Engineering and Technology, Karachi (from 22nd June 2010 to 04th August 2020).
- Lecturer in Materials Engineering Department of NED University of Engineering and Technology, Karachi (from 2nd July 2007 to 21st June 2010).

Taught the following subjects:

- **MM-204: ‘Engineering Ceramics and Refractory Materials’**
- MY -204: ‘Refractory Materials in Metallurgical Industries’
- **MM-302: ‘Crystallography and X-ray Diffraction Techniques’**
- MM-402: ‘Design and Selection of Materials’
- **MM-406: ‘Electronic, Magnetic and Optical Materials’**
- **MM-409: ‘Biomedical and Functional Materials’**
- MM-502: ‘Production of Ferrous and Non-Ferrous Materials’
- **MM-532: ‘Ceramic Engineering’**

Job Experience

Assistant Manager: Melting Shop (Ladle Furnace) Peoples Steel Mills Ltd.

From June 2004 to June 2007:

- Experience of alloying and refining of different types of Steel Alloys, i.e. extra low carbon, low carbon, medium carbon, high carbon, low alloy, medium alloy and high alloy steels.

Q.C Engineer: (ultrasonic testing), Shashi Steel Pipe Works Pvt. Ltd. From March 2004 to June 2004:

- worked to check the lamination, internal flaws, voids etc. of steel pipes of different dia.

Research

Interest

- Piezoelectric Ceramics in general
- Multilayers Capacitors and Actuators
- Battery Materials
- Multiferroic Materials

Trainings and Workshops Attended

- Operational and maintenance training on '**Vibrating Sample Magnetometer**' (VSM-EZ9) from Expert of MicroSense USA, 2019.
- Training on Laser Particle Analyser and Photospectrometer from China, Dec. 2010
- Three Days Certificate course on Solar Energy from CCEE, NED, Dec. 2010.
- Training on Hardness testers of various kinds from Shanghai China, January 2008
- Certificate course on Cathodic Corrosion protection 2009 from NED University
- Certificate course on MATLAB from NED University
- 2- Days Workshop on "Smart Materials" at NCP Islamabad in 2009.
- One Day Workshop on "Nanomaterials and Characterization Techniques" GC University Lahore in 2010.
- 2- Days workshop on "Vacuum and Thin Film Technology" NINVAST, NCP Islamabad in 2010.

Seminar / Conference / Symposia

- **Fayaz Hussain**, Iasmi Sterianou, Derek C Sinclair, Ian M Reaney, *Properties of $K_{0.50}Na_{0.50}NbO_3$ Sintered in N_2 and Air*, Ferroelectrics UK, 17-18 January 2013, IOP, University of Sheffield, Sheffield, UK.

- **Fayaz Hussain**, Iasmi Sterianou, Derek C Sinclair, Ian M Reaney, *Semiconductor Behaviour of $K_xNa_{(1-x)}NbO_3$ ($0.49 \leq x \leq 0.51$) as a function of $P(O_2)$* , Electroceramics-XIV Conference, 16-20 June 2016, Bucharest, Romania.
- Shunsuke Murakami, Amir Khesro, **Fayaz Hussain**, Dawei Wang, Derek C Sinclair and Ian M Reaney, "*Doping Effects in Lead-free Piezoelectric BT-BF based Ceramics*", Sustainable Functional Materials April 2016, Scarborough, UK
- Dawei Wang, **Fayaz Hussain**, Amir Khesro, Antonio Feteira, Ye Tian and Ian M Reaney, "*Composition and Temperature Dependence of Piezoelectricity in KNN-based Lead-free Ceramics*". 2016 Joint IEEE International Symposium on the Applications of Ferroelectrics, European Conference on Applications of Polar Dielectrics, Darmstadt Germany.
- **Fayaz Hussain**, Ashraf Ali, "*Elastic and Plastic Properties of Soda Lime Glass by Micro Indentation*", ISAM 2009, Pakistan.

Publications

- Last five Years: **148 Citations, H-index 6, i10-index 3**
- W. Lou, K. Song, **F. Hussain**, B. Liu, H. B. Bafrooei, H. Lin, W. Su, F. Shi, and D. Wang, "Bond characteristics and microwave dielectric properties of $(Li_{0.5}Ga_{0.5})^{2+}$ doped $Mg_2Al_4Si_5O_{18}$ ceramics," *Ceramics International*, 2020.
- D. Han, C. Wang, D. Lu, **F. Hussain**, D. Wang, and F. Meng, "A

temperature stable $(\text{Ba}_{1-x}\text{Cex})(\text{Ti}_{1-x/2}\text{Mgx}/2)$ O3 lead-free ceramic for X4D capacitors,” *Journal of Alloys and Compounds*, vol. 821, pp. 153480, 2020.

- S.-Z. Hao, D. Zhou, **F. Hussain**, W.-F. Liu, J.-Z. Su, D.-W. Wang, Q.-P. Wang, Z.-M. Qi, C. Singh, and S. Trukhanov, “Structure, spectral analysis and microwave dielectric properties of novel x $(\text{NaBi})_{0.5}\text{MoO}_4-(1-x)\text{Bi}_2/3\text{MoO}_4$ ($x=0.2\sim 0.8$) ceramics with low sintering temperatures,” *Journal of the European Ceramic Society*, 2020.
- **F. Hussain**, A. Khesro, Z. Lu, N. Alotaibi, A. A. Mohamad, G. Wang, D. Wang, and D. Zhou, “Acceptor and donor dopants in potassium sodium niobate based ceramics,” *Frontiers in Materials*, vol. 7, 2020.
- **F. Hussain**, A. Khesro, Z. Lu, G. Wang, and D. Wang, “Lead Free Multilayer Piezoelectric Actuators by Economically New Approach,” *Frontiers in Materials*, vol. 7, pp. 87, 2020.
- **F. Hussain**, A. Khesro, R. Muhammad, and D. Wang, “Effect of Ta-doping on functional properties of $\text{K}_{0.51}\text{Na}_{0.49}\text{NbO}_3$,” *Materials Research Express*, vol. 6, no. 10, pp. 106309, 2019.
- D. Ahmad, M. Sohail, **F. Hussain**, H. Siddiqui, and M. Yasir, “Synthesis of Cuprous Oxide nano cubes and platelets using both electrodes of copper,” *Mehran University Research Journal of Engineering & Technology*, vol. 38, no. 2, pp. 415, 2019.

- **F. Hussain**, M. Sohail, M. U. Baig, S. Arif, and M. D. Ahmed, “Fabrication of Ultrathin Graphene Oxide Membrane for water purification using Ink-jet printing,” *Journal of Space Technology*, vol. 9, no. 1, 2019.
- S. H. Abro, M. S. Hanif, and **F. Hussain**, “On the Effect of γ -phase transformation kinetics upon microstructure response of Cold Heading Quality Steel,” *NUST Journal of Engineering Sciences*, vol. 11, no. 2, pp. 51-55, 2018.
- **Hussain, F.**, et al., *p-Type/n-type behaviour and functional properties of $KxNa(1-x)NbO_3$ ($0.49 \leq x \leq 0.51$) sintered in air and N_2* , *Journal of the European Ceramic Society* (2018), <https://doi.org/10.1016/j.jeurceramsoc.2018.03.013>, **IF=3.794**
- Kausar Harun, **Fayaz Hussain**, et al., *Sol–gel synthesized ZnO for optoelectronics applications: a characterization review*, *Materials Research Express*, 2017.04(12).
- Wang, D., **Hussain, F**, Khesro, A, et al., *Composition and temperature dependence of piezoelectricity in $(1-x)(K_{1-y}Na_y)NbO_3-x(Bi_{1/2}Na_{1/2})ZrO_3$ lead-free ceramics*. American Ceramic Society, 2016: p. 1-9
- Khesro, A., Wang, D, **Hussain, F**, et al., *Temperature Stable and Fatigue Resistant Lead-free Ceramics for actuators*, *Applied Physics Letters*, 2016. 109(14).

- S. Sami-Ullah, S.M.H. Waqar, **F. Hussain**, A. Ali, "*Synthesis of Single and Multi-Walled Carbon Nanotubes by Improved Arc Discharge Method*", Key Engineering Materials, Vols. 510-511, pp. 124-131, 2012.
- **F.Hussain**, Ashraf Ali, "*Elastic and Plastic properties of Soda lime Glass by MicroIndentation*", Key Engineering Materials Vol. 442 (2010) pp 294-300, Trans Tech Publications, Switzerland.
- Danial Ahmad, Muhammad Sohail, **Fayaz Hussain**, Humair Siddiqui, and Muhammad Yasir "*Effect of pH and Conductivity of Electrolyte on the Synthesis of Cuprous Oxide Nano Cubes and Platelets Using Both Electrodes of Copper*", accepted (Mehran Univeristy of Engineering and Technology Journal) (2018).
- Muhammad Sohail, A. D. Chandio, **Fayaz Hussain**, Maryam Sheikh, "*High-Temperature Effectiveness of Ginger Extract as Green Inhibitor for Corrosion in Mild Steel*", accepted, NUST Journal of Engineering Sciences (2018).
- Muhammad Ali, **Fayaz Hussain**, Muhammad Sohail Hanif, Ahmad Azmin Mohamad1, Muhammad Tufail, "*Effect of calcination and sintering temperatures on physical properties of barium titanate ceramic*", accepted, International Journal of Electroactive Materials, (2018).