

Azhar Ali Ayaz PIRZADO

Device and Materials Engineer

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| Google Scholar URL: <https://scholar.google.com/citations?hl=en&user=Vv2wF4QAAAAJ>

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PROFILE & SKILLS: I have more than seven years of experience in project management, prototyping, automation, circuit design, fabrication, and packaging of semiconductor electronics devices, and scalable thin film growth.

Device fabrication, electrical characterization, thin-film deposition, patterning, transfer, and contacts

- ◆ E-beam | photolithography | wet etching | printing | vacuum deposition | sputtering | MBE | electrode design |
- ◆ Blade coating | slot die | hot spray | sputtering | spin coating | atomic layer deposition | graphene transfer |
- ◆ PeLEDs | Photodetectors | Organic FETs, Solar Cells | MOSFETs | Lasers |

Thin film characterization

- ◆ Optical-electronic: Property modification: band gap | PL | doping | surface modification | ASE lasing | UV-Vis. | Steady-state and Time-resolved Photoluminescence (PL/TRPL) | Raman Spectroscopy |
- ◆ Structure-surface-thickness-temperature: X-Ray Diffraction (XRD) | Transmission Electron Microscope (TEM) | X-Ray/Ultra-Violet Photoelectron Spectroscopy (XPS/UPS) | Fourier-transform infrared spectroscopy (FTIR) | Dektak Profiler | Atomic Force Microscope (AFM) | 3D Microscope | Scanning Electron Microscope (SEM) | Thermogravimetric Analysis (TGA) | Temperature-Programmed Desorption-Mass Spectrometry (TPD-MS) |

Modelling, simulation, data analysis, project management, programming, writing and language skills

- ◆ ATLAS | Athena | COMSOL | LabVIEW | Python | Arduino | PMP | Beginner to intermediate |
- ◆ MS Office | Origin | Endnote | Latex | Expert | ◆ English | Advanced | French | Intermediate | Chinese | Basic |

Materials science

- ◆ Synthesis of graphene/functionalized graphene: liquid methods | zinc oxide: sputtering | titanium oxide: sol-gel |
- ◆ Thermal annealing in the furnace: reduction | calcination | desorption | crystal-lattice improvement |
- ◆ Single-crystal thin films/quantum dots of perovskites: size/thickness-control | room-freezing-temperature |

EDUCATION, ACHIEVEMENTS, AND SCHOLARSHIPS

University of Strasbourg (ICPEES and ICUBE, ENSPS), France

2010-2015

PhD in Engineering Sciences (Microelectronics and Photonics) |

- ◆ Developed set-ups for i) scalable spray-coating graphene (FLG), ii) mechanical ablation and improved yield of FLG and lateral size by up to 40%, iii) designed electrodes for the Hall effect and four probes to study charge transport, iv) Improved sheet resistance of and transmittance of FLG films two orders of magnitude and ~150%, respectively
- ◆ Optimized ZnO thin film deposition via r.f. magnetron sputtering and fabricated organic solar cells and

Master's Engineering Sciences (Micro-nanoelectronics)

- ◆ Semiconductor Physics | MEMS | optoelectronics | organic electronics | nanomaterials and characterizations |

University of Sindh, Pakistan

Master's Information Technology

(2007-2009)

- ◆ Third position | ~3.7/4.0 CGPA | Courses: Computer vision and artificial Intelligence | neural networks |

Bachelor of Science in Electronics

(2001-2005)

- ◆ First position in the final year | 3.9/4.0 GPA | third position overall | 3.68/4.0 CGPA |

EXPERIENCE

University of Strasbourg (ICPEES)

Mar 2024- Till date

Postdoc Researcher: Photodetectors and supercapacitors based on mechano-synthesized lead-free Perovskites

Oxford University (Oxford Suzhou Centre for Advanced Research, OSCAR)

Oct 2021-July 2022

Visiting Researcher lasers (Co-PI Dr Jingsong Huang): Achieved ultra-low thresholds ($\sim 7 \mu\text{J cm}^{-2}$) for ASE

Monash University, China

July 2022-till date

◆ Surface-active nano functional materials (collaboration with Dr Kamran Khan)

University of Sindh, Pakistan

Oct 2009-Present

Assistant/Associate Professor Electronics, | 08/2022-to present and | 08/2016 to 08/2019 |

Managed funded projects in various roles: PI | Co-PI | Collaborator |

◆ CMOS-based IR sensor based on graphene | HEC-NRPU 13.5 Mil. PKR (80000 USD) | 2021-2023 |

◆ Structure colour-based fabric printing | HEC-LCF 17.5 Mil. PKR (100000 USD) | 2021-2023 |

◆ Graphene-based sensors | HEC-START-UP | 2018-2019 |

◆ Interface layer engineering of graphene/ metal oxide for electron transport and transparent electrodes for solar cells | HEC-NRPU 4.2 Mil. PKR (30000 USD) | 2017-2018 |

Supervision of students' projects

◆ Detectors (Perovskites and graphene) | robotics | Internet of Things | Filtration membranes: graphene, MXenes
Teaching undergraduate and graduate courses

◆ Optoelectronics | Microcontrollers | MEMS | applied physics | solid-state electronics | nanotechnology | amplifiers and oscillators | integrated circuits |

Soochow University, China

2019-2022

Postdoc Researcher

◆ Optimized device construction and structure of organic and perovskite single crystal-based devices: Light-Emitting Diodes (LEDs) | UV Photodetectors | Organic Field-Effect Transistors (OFETs) |

◆ Developed a method for single-crystal thin films in confined space to achieve a low trap density of $2.15 \times 10^9 \text{ cm}^{-3}$

◆ Modified structural | optical | electrical | properties of organic and perovskite semiconductors

ICUBE Lab, University of Strasbourg, France

Master Internship | six months |

◆ Studied the validity of the model of 'Nanowire Junctionless Double Gate Transistor' using ATLAS, Silvaco

REFERENCES

1. Dr. Izabela Janowska, Researcher, ICPEES, University of Strasbourg,
Email: janowskai@unistra.fr, Tel: +33368852633

2. Prof. Jiansheng Jie, Professor, FUNSOM, Soochow University,
Email: jsjie@suda.edu.cn, Tel: +8651265881265

3. Prof. Fabien Pregaldiny, Dean Telecom Physics, University of Strasbourg,
Email: f.pregaldiny@unistra.fr, Tel: +33368854336

4. Prof. Luc Hebrard, Professor and Director of Microelectronics, ICUBE, University of Strasbourg,
Email: luc.hebrard@unistra.fr Tel: +33388106259

List of selected publications of Azhar Ali Ayaz Pirzado

Book Chapter

Pirzado, A.A.A., Mahar, F., Hakro, A.A., Zhang, X., Jie, J. (2021): Solution-Processable Carbon and Graphene Quantum Dots Photodetectors. In: Tong X., Wu J., Wang Z.M. (eds) Quantum Dot Photodetectors, **2021**, vol 30. 157–214 pp. **Springer**, https://doi.org/10.1007/978-3-030-74270-6_4

A) Publications with the peer review process

1. **Pirzado, A. A. A.**, Wang, C. Q., Huanyu, Z., Yu, T. X., Jia, R., Wu, D., Zhang, X. J., Zhang, X. H., Jie, J. (2023): Room-Temperature Growth of Perovskite Single Crystal Thin Films towards High-Luminescence Light-Emitting Diodes, **Nano Energy**, Vol. **118**, **2023**, **108951**, ISSN 2211-2855, <https://doi.org/10.1016/j.nanoen.2023.108951>.

1. Huanyu, Z., Yu, T. X., Wang, C. Q., Jia, R., **Pirzado, A. A. A.**, Wu, D., Zhang, X. J., Zhang, X. H., Jie, J. (2023): Highly Efficient Single-Crystal Perovskite Light-Emitting Diodes Enabled by Composition Fine-Tuning. In: **Laser Photonics Rev** **2023**, 17, 2200904.

2. Ghaffar, A. Mehdi, M.*, Hussain, S., **Pirzado, A. A. A***, Shah, S. A.*, Alataway, A., Dewidar, A. Z., and Elansary, H. (2023): Plant Extracted Natural Fluorescent Protein C-phycoyanin Doped in PVA-Nanofibers for Advanced Apparel Application. In: **Materials Research Express**. (**corresponding author**). 10.1088/2053-1591/acd50f

3. Mahar, I., Memon, F. H., Mahar, F. K., Mahar, N., **Pirzado. A. A. A.***, Memon, A. A. *, Khatri, Z., Thebo, K. H. * (2023): Fabrication and Characterization of MXene/Carbon Composite-Based Nanofibers (MXene/CNFs) Membrane: An Efficient Adsorbent Material for Removal of Pb+2 and As+3 Ions from Water. In: **Chemical Engineering Research and Design** (**corresponding author**). <https://www.sciencedirect.com/science/article/pii/S0263876223000680>

4. Jia, R., Li, J., Zhang, H., Zhang, X., Cheng, S., Pan, J., Wang, C., **Pirzado, A. A. A.**, Dong, H., Hu, W., Jie, J., & Zhang, X. (2022): Highly Efficient Inherent Linearly Polarized Electroluminescence from Small-Molecule Organic Single Crystals. In: **Advanced Materials**. <https://doi.org/10.1002/adma.202208789>

5. Malo, T. A., Lu, Z., Deng, W., Sun, Y., Wang, C., **Pirzado, A. A. A.**, Jie, J., Zhang, X., Zhang, X. (2022): Suppressing the Multiple Nucleation for the Uniform Growth of Perovskite Single-Crystal Microplates Arrays toward High-Performance Optoelectronic Devices. In: **Adv. Funct. Mater.** <https://doi.org/10.1002/adfm.202209563>

6. Huanyu, Z., Yu, T. X., Wang, C. Q., Jia, R., **Pirzado, A. A. A.**, Wu, D., Zhang, X. J., Zhang, X. H., Jie, J. (2022): High-Luminance Micro-sized CH₃NH₃PbBr₃ Single Crystal-Based Light-Emitting Diodes via a Facile Liquid-Insulator Bridging Route. In: **ACS Nano**. <https://doi.org/10.1021/acsnano.2c00488>

7. Lu, Z. J., Deng, W., Fang, X. C., Xiao, J., Lu, B., Zhang, X. W., **Pirzado, A. A. A.**, Jie, J. S., Zhang, X. J. (2021): Wafer-Scale Growth of Aligned C60 Single Crystals via solution-phase Epitaxy for High-Performance Transistors. In: **Adv. Funct. Mater.** <https://doi.org/10.1002/adfm.202105459>

8. Chandio, I., Janjhi, F. A., Memon, A. A., Memon, S., Ali, Z., Thebo, K. H., **Pirzado, A. A. A.**, Hakro, A. A., Khan, W. S.: Ultrafast ionic and molecular sieving through graphene oxide-based composite membranes. In: **Desalination**. <https://doi.org/10.1016/j.desal.2020.114848>

9. Janjhi, F. A., Chandio, I., Memon, A. A., Ahmed, Z., Thebo, K. H., **Pirzado, A. A. A.**, Hakro, A. A., Iqbal, M. (2021): Functionalized graphene oxide-based membranes for ultrafast molecular separation. In: **Separation and Purification Technology** <https://doi.org/10.1016/j.seppur.2020.117969>

10. **Pirzado, A. A. A.**, Le Normand, F., Romero, T., Paszkiewicz, S., Papaefthimiou, V., Ihiawakrim, D., Janowska, I. (2019): Few-layer graphene from mechanical exfoliation of graphite-based materials:

11. **Pirzado, A. A. A.**, Dalmas, G., Komissarov, I., Le Normand, F., Janowska, I. (2016): The Electrical Property of Large Few-Layer Graphene Flakes Obtained by Microwaves Assisted Exfoliation of Expanded Graphite. In: **Current Microwave Chemistry**. <https://doi.org/10.48550/arXiv.2210.07627>
12. **Pirzado, A. A. A.**, Jouane, Y., Le Normand, F., Akilimali, R., Papaefthimiou, V., Ghimbeu, C. M., Janowska, I. (2014): Electrical transport in “few-layer graphene” film prepared by the hot-spray technique: the effect of thermal treatment. In **Journal of Physical Chemistry C**. <https://doi.org/10.1021/jp4103433>
13. **Pirzado, A. A. A.**, Truong-Phuoc, L., Papaefthimiou, V., Ghimbeu, C. M., Le Normand, F., Ba, H., Thanh-Tung, T., Pham-Huu, C., Janowska, I. (2015): Activation of few-layer graphene by μ W-assisted oxidation in water via formation of nanoballs – Support for platinum nanoparticles. In: **Journal of Colloid and Interface Science**. <https://doi.org/10.1016/j.jcis.2015.03.063>.
14. **Pirzado, A. A. A.**, Dintzer, T., Janowska, I. (2016): Macronization/densification of graphene via vibratory compaction. In: Powder Technology. <https://doi.org/10.1016/j.powtec.2016.03.050>.

B. Conferences and invited talks

1. E-MRS Fall Meeting, Warsaw, | 2023 |

Accepted Oral Presentation: Room-Temperature Growth of Perovskite Single Crystal thin films via Antisolvent-Assisted Confinement for High-Performance Optoelectronic Devices

A.A.A. Pirzado*, J. Jie 3*, J. Hunag, E. Akman, X. Zhang, T.A. Malo, C. Wang, L. Jie, R. Jia, G. He, H. Zhang.

2. E-MRS Spring Meeting, Strasbourg | 2013 |

Oral presentation: Few-Layer Graphene (FLG) and FLG/Carbon Nanotubes (CNTs) Transparent Conductive Films (TCF) prepared by hot-spray technique

Pirzado, Y. Jouane, F. Le Normand, I. Janowska

3. GDR Conference, Lille | 2013 |

Poster presentation: Investigation of Electronic properties of few layers graphene (FLG) prepared by hot spray technique

Pirzado, Y. Jouane, F. Le Normand, I. Janowska

4. Oxford Suzhou Center for Advanced Research (OSCAR) | 2021 |

Invited talk on perovskite single-crystal-based optoelectronic devices

Pirzado, A. A., Zhang, H., Yu, T. X., Wang, C. Q., Jie, J.

Further publications:

A) Publications under peer review process

1. **Pirzado, A. A. A.**, Wang, C. Q., Huanyu, Z., Yu, T. X., Jia, R., Wu, D., Zhang, X. J., Zhang, X. H., Jie, J. (2023): High Responsivity Deep-ultra-violet Photodetectors based on Perovskite Single-crystals