Himani Arora, Ph.D.

Postdoctoral Researcher
Specialization: *2D materials and their electronic applications*
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Education

2015–2020 **Ph.D., Applied Physics**
Technische Universität Dresden, Germany

2012–2014 **M.Sc., Advanced Functional Materials and Engineering**
Joint Degree: *University of Augsburg, Germany & Grenoble Institute of Technology, France*
GPA: 1.32 (Rank 2 in the program)

2007–2011 **B.Tech (Hons.), Metallurgical Engineering**
Indian Institute of Technology, Banaras Hindu University (IIT-BHU), India
GPA: 8.44/10 (Rank 4 in the institute)

Research Experience

2020–Present **Postdoctoral Researcher**, Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany

Title *Fabrication and characterization of highly stable and selective gas sensors based on black phosphorus. Funded by Federal Ministry of Education and Research (BMBF), Germany.*

2015–2020 **Ph.D. Thesis**, Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany

Supervisors PD Dr. habil. Artur Erbe & Prof. Dr. Gianaurelio Cuniberti

Title *Charge transport in two-dimensional materials and their electronic applications.*
Studied the charge transport mechanisms in 2D semiconductors under the influence of electric fields and/or laser illumination to comprehend the underlying physical phenomena and properties for successful implementation in electronic devices.

Feb–Sep 2017 **Visiting Scientist**, Dept. of Mechanical Engineering, Columbia University, New York, USA

Supervisors Prof. Dr. James Hone

Title *Encapsulation and electrical characterization of 2D materials and their heterostructures.*
Worked at their nano-fabrication facilities with a goal to integrate 2D semiconductors into (photo)transistors. Novel schemes of device fabrication were developed to passivate 2D materials that enhanced the lifetime and performance of the devices.

Jan–Jul 2015 **Research Assistant**, Fraunhofer Institute for Organic Electronics, Dresden, Germany

Description Responsible for the deposition and investigation of AlN and AlScN thin films using magnetron sputtering. Worked closely with the industrial partners; films were produced with required piezoelectric properties, stress levels, thickness, and composition.

Feb–Aug 2014 **Master's Thesis**, Group of Large Area Electronics, IMEC, Leuven, Belgium

Supervisors Dr. Pawel Malinowski & Prof. Dr. Paul Heremans

Title *Investigation of metal-oxides based electron transport layers for organic photodetectors.*
To understand the origins of the dark current or noise in organic photodetectors and to minimize them. Integrated a metal-oxide-based electron transport layer into photodetectors for the first time, and as a result, reduced the noise and improved their performance.

May–Jul 2010 **Undergraduate Internee**, RR&D of TATA Steel, India

Title *Metallurgical investigations of surface defects in cold rolled strips.*

Publications

h-index: 5, i10-index: 3

1. **H. Arora**, R. Dong, T. Venanzi, J. Zscharschuch, H. Schneider, M. Helm, X. Feng, E. Cánovas, and A. Erbe, "Demonstration of a Broadband Photodetector Based on a Two-Dimensional Metal-Organic Framework", Advanced Materials 32, 1907063 (2020). (Featured on the issue's back cover, in Optics and Photonics News and Solarify).
2. **H. Arora** and A. Erbe, "Recent progress in contact, mobility, and encapsulation engineering of InSe and GaSe", InfoMat, 10.1002/inf2.12160 (2020).
3. **H. Arora**, S. Park, R. Dong, and A. Erbe, "2D MOFs: A New Platform for Optics?", Optics and Photonics News 31, 36–43 (2020, Feature Article in October Issue).
4. T. Venanzi, **H. Arora**, S. Winnerl, A. Pashkin, P. Chava, A. Patanè, Z. D. Kovalyuk, Z. R. Kudrynskyi, K. Watanabe, T. Taniguchi, A. Erbe, M. Helm, and H. Schneider, "Photoluminescence dynamics in few-layer InSe", Physical Review Materials 4, 044001 (2020).
5. F. Kern, M. Linck, D. Wolf, N. Alem, **H. Arora**, S. Gemming, A. Erbe, A. Zettl, B. Büchner, and A. Lubk, "Autocorrected off-axis holography of two-dimensional materials", Physical Review Research 2, 043360 (2020).
6. **H. Arora**, Y. Jung, T. Venanzi, K. Watanabe, T. Taniguchi, R. Hübner, H. Schneider, M. Helm, J. C. Hone, and A. Erbe, "Effective Hexagonal Boron Nitride Passivation of Few-Layered InSe and GaSe to Enhance Their Electronic and Optical Properties", ACS Applied Materials & Interfaces 11, 43480–43487 (2019). Featured in Eurekalert.org.
7. T. Venanzi, **H. Arora**, A. Erbe, A. Pashkin, S. Winnerl, M. Helm, and H. Schneider, "Exciton localization in $MoSe_2$ monolayers induced by adsorbed gas molecules", Applied Physics Letters 114, 172106, (2019).
8. F. Kern, M. Linck, D. Wolf, T. Niermann, **H. Arora**, N. Alem, A. Erbe, S. Gemming, and A. Lubk, "Direct Correction of Residual Symmetric Aberrations in Electron Holograms of Weak Phase Objects", Microscopy and Microanalysis 25 (Suppl 2), 98–99, (2019).
9. R. Dong, P. Han, **H. Arora**, M. Ballabio, M. Karakus, Z. Zhang, C. Shekhar, P. Adler, P. St. Petkov, A. Erbe, S. C. B. Mannsfeld, C. Felser, T. Heine, M. Bonn, X. Feng, and E. Cánovas, "High-mobility band-like charge transport in a semiconducting two-dimensional metal-organic framework", Nature Materials 17, 1027–1032, (2018).
10. **H. Arora**, T. Schönherr, and A. Erbe, "Electrical characterization of two-dimensional materials and their heterostructures", IOP Conference Series: Materials Science and Engineering 198, 012002, (2017).
11. **H. Arora**, P. E. Malinowski, A. Chasin, D. Cheyns, S. Steudel, S. Schols, and P. Heremans, "Amorphous IGZO as electron transport layer in organic photodetectors", Applied Physics Letters 106, 143301, (2015).
12. **H. Arora**, A. Kumar, M. B. N. Raju, A. Dey, and S. Suresh, "Study of sliver defects on cold rolled coils: effect of casting process parameters", TATA Search 2, 209-214 (2012), ISSN-0971-5975.
13. T. Venanzi, **H. Arora**, S. Winnerl, A. Pashkin, A. Patanè, Z. D. Kovalyuk, Z. R. Kudrynskyi, A. Erbe, M. Helm, and H. Schneider, "Infrared induced photoluminescence quenching in few-layered InSe". (In preparation).

Technical skills

Expertise in fabrication and characterization of complex and hybrid device structures (transistors, photodetectors, p-n junctions).

Nanofabrication: e-beam and photo-lithography, metal deposition techniques (sputtering, thermal and e-beam evaporation), cleanroom (class 10) experience, handling of cryogenic liquids.

Characterization: Low temperature (liq. He & N_2) and high precision electrical measurements under strong magnetic fields and focused lasers, Raman spectroscopy, photoluminescence, scanning electron microscopy, atomic force microscopy, optical microscopy.

Software Skills: AutoCAD (Design & drafting software), OriginLab (Data analysis & graphing software, LaTeX (Typesetting & document preparation software.)

Professional Development: Courses on *"Project planning & management"*, *"Communication & presentation skills"*, *"Leadership & teamwork"* certified by University of Surrey, UK and Imperial College London, UK.

Awards / fellowships / honors

Oct 2020 **Best Student Award** at the Annual Workshop of the International Helmholtz Research School for Nanoelectronic Networks (IHRS NanoNet).

Aug 2018 **1st prize** in **Scientific Image Competition** organized by cfaed, TU Dresden.

Jun 2018 **3rd prize** in **Science Slam *"2D or not 2D"*** organized by Technische Sammlungen Dresden in collaboration with Silicon Saxony e.V.

Nov 2016 **INSPIRE cfaed Research Grant** for research stay at Columbia University, USA. Amount awarded 3.060 EUR.

Oct 2016 **Best Student Paper Award** at IEEE Radio 2016 Conference, out of many student entries.

2015–2018 **IHRS NanoNet Fellowship** for pursuing PhD degree at HZDR, Dresden. Stipend worth 50.000 EUR.

2012–2014 **Erasmus Mundus Scholarship** by the European Union for pursuing Master's studies. Stipend worth 48.000 EUR.

2011 **BHU Alumni Association Scholarship** for overall academic and curricula excellence during undergraduate studies, IIT-BHU.

International conferences

Talks:
- Falling Walls Labs 2018, Adlershof (Berlin), 2018.
- Flatlands beyond Graphene 2018, Leipzig (Germany), 2018.
- Annual Meeting of the DPG and Spring Meeting, Berlin (Germany), 2018.
- IEEE Radio 2016, Réunion Island, 2016.
- Invited talk at the Nanoelectronics Research Lab, UC Santa Barbara (USA).

Posters:
- MRS Spring Meeting 2017, Phoenix (USA), 2017.
- CECAM conference on *"Tailor-made 2D-materials and functional devices"*, Bremen (Germany), 2016.
- EFDS Workshop on Graphene, Dresden, Germany, 2015.

Summer Schools:
- *"Frontier research in 2D materials"* organized by Graphene & Co., Cargese, (Corsica), Apr 2–13, 2018.
- *"2D Layered Materials: synthesis, properties and applications"* organized by EPFL, Lausanne, Zermatt (Switzerland), Aug 22–26, 2016.

Teaching and mentoring experience

Apr–Aug 2016 **Laboratory supervisor, Faculty of Physics, TU Dresden**
Physikalische Grundpraktikum III, undergraduate level course
- Responsibilities included preparing and supervising the experiments and, grading students' tests and laboratory journals.

2016–2018 **Mentored six graduate students**
- Training them on laboratory procedures and equipment. Helping conceptualizing project ideas and experiments. Additionally training them on data analysis, scientific report writing and evaluation of the research results.

Languages

Hindi Mother tongue

English Proficient

German Fluent

French Beginner

Personal skills and competences

- Active member of the **International Peace Slam Dresden** to promote the idea of peaceful coexistence of cultures at schools and public festivals. https://peaceslam.com/himani/
  - Pitched the Peace slam initiative project at **TEDx Dresden 2018**.
  - Presented the peace slam at **Palais Sommer 2018**. The news coverage is available at: https://www.sachsen-fernsehen.de/peace-slam-beim-palais-sommer-in-dresden/
- Member of Centre for Advancing Electronics Dresden (cfaed),TU Dresden.
- Student representative, NanoNet fellowship program (2016–2017).
- Active Badminton player, associated with *TSV Dresden-Bühlau* Badminton Club.
- Former team player of Belgium National Women's Cricket (Feb–Aug 2014).
- Mountaineering expedition with TATA Steel as a part of Outdoor Leadership Program. Trekked to Surya Top in the Himalayas located at a height of 4200 meters from sea level under the leadership of Ms. Bachendri Pal (first Indian woman to climb Mt. Everest).
- **Pastime:** Sports (Swimming, Badminton), Cooking, Solving Puzzles.