

## Brief Profile

### Mr. KALEEM AHMED

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### Personal Profile

- Versatile hands on research experience with academic excellence through teaching UG and PG students, analytical and management skills in simulation and fabrication of plasmonic devices with potential applications biological and chemical (gas) sensing.

### Vision

- Initiate a study and a research program with the help of government research laboratories and universities.
- To conduct a study and teach in an academically free and honest environment. To commit to excellence in all aspects of its research and teaching activities, as well as to continuous improvement through internal and external reviews.
- To provide a skill-based education system that will help students become more employable and career-focused. Collaboration with surrounding universities to explore project-based learning opportunities for students, staff, and faculty.
- Organize invited guest lectures from industry and research institutes to create a repository of knowledge experts.

### Synopsis

- Expertise in design and fabrication of nanoplasmonic devices
- Extensive experience in synthesis and characterization of plasmonic nanoparticles (**Nanospheres, Nanostars, Nanorods, Nanocubes, Nanowires, Nanohexagon**)
- Hands on experience in electromagnetic simulation tools (Finite Difference Time Domain, **FDTD**, Rigorous Coupled Wave Analysis, **RCWA**)
- Familiar with material characterization instruments such as **Ellipsometry, TEM and AFM**.

### Key research skills with experiences

- Expert in EM simulation and analysis tools like Finite Difference Time Domain, FDTD (Lumerical, RSoft) and Rigorous Coupled Wave Analysis, RCWA (RSoft).
- Expert user and operator for Ellipsometer (J. A. Woolam) at Nanoscale Research Facility (NRF), IIT Delhi

- Regular user in clean room class 1000 (Nanoscale Research Facility, IIT Delhi) and operating advanced device fabrication tools like E-beam evaporation, Thermal evaporation, Atomic Layer Deposition (ALD), Pulsed Laser Deposition (PLD).
- Expert user and operator for characterization tools like Atomic Force Microscopy (AFM), UV-VIS spectrometer, Ellipsometer.

### Research Area/Interests

- Nanoplasmons, Photonics, Fiber Optics, Condensed Matter Physics.
- **Plasmonic Sensors:** Fabrication techniques for design of plasmonic Sensors for biological and chemical (gas) sensing applications using plasmon based approach
- **Metal nano-particles synthesis:** Chemical synthesis of plasmonic nanoparticles and their application in photovoltaic devices, biological and chemical sensing
- **Plasmon waveguides**

### Education

- Ph.D. ( Pursuing ), IIT Delhi
- M. Tech. (Optoelectronics and Optical Communication, 2012-14), IIT Delhi
- M. Sc. (Physics), University of Delhi, Delhi, India (2009-11)
- B. Sc. (Physics hons.), University of Delhi, Delhi, India (2006-09).

### Professional Experience

- Research - 8 years
- Teaching - 8 years

### Teaching Experience

- Currently work as an Assistant Professor in the Department of Physics, D.A-V. (P.G.) College, Kanpur (U.P), India (2019-ctd)
- Working as Lecturer in RGUKT Hyderabad (2014-2016).

### Scholastic Achievements

1. National Fellowship/Scholarship
  - Junior Research Fellowship (JRF) and Senior Research Fellowship (SRF) by Council of Scientific & Industrial Research (CSIR), Government of India
  - Ministry of Education (Formerly MHRD), Government of India
  - Industrial Research & Development (IRD), IIT Delhi
2. National level qualifying examination
  - Assistant Professor in Govt Aided Degree College conducted by UPHESC, 2014.
  - Graduate Aptitude Test in Engineering (GATE) in Physics 2012, Score-488
  - Council of Scientific & Industrial Research (CSIR) UGC JRF and National Eligibility Test (NET).

3. Mtech Thesis
  - Design Study of Ultra Low Bend Loss Optical fiber for Fiber-to-the-Home (FTTH) Application.
4. Participation
  - Attended International Conference on Optics and Photonics ( SPIE ) at San-Francisco (USA) in February 2019.
5. Technical expertise and credentials
  - C, C++, MATLAB
  - Hands-on expertise in Class 1000 cleanroom as TA in Ellipsometry for fabrication and characterization of thin films

### **Workshop/FDP/Refereshes**

- 4-Week Induction/Orientation Programme for "Faculty in Universities/Colleges/Institutes of Higher Education" conducted by Teaching Learning Centre, Ramanujan College, University of Delhi.
- Science Academies' Refereshes Course in Experimental Physics conducted by Indian Academy of Sciences, Bengaluru(IASc), Indian National Science Academy, New Delhi (INSA), The National Academy of Sciences, India, Prayagraj (NASI).
- Electron Beam Lithography
- Atomic Force Microscopy
- Ellipsometer

### **Fabrication & Characterization tools**

- E-beam and thermal evaporation to deposit thin film of metal and oxides
- ALD and PLD to deposit thin film of different metal and oxides
- Hot plate with stirrer to synthesize nanoparticles and to make a precursor for thin films
- Ultrasonicator to clean the samples and to prevent the nanoparticles from agglomeration
- UV-ozone cleaner to remove the organic dust from the sample
- UV-VIS spectrometer for the resonance wavelength of the nanoparticles and to calculate the absorption and transmission spectra of the thin films and other transparent oxide materials (MoO<sub>3</sub>, TiO<sub>2</sub>, ZnO)
- Ellipsometer to calculate the dielectric constant and thickness of the thin films
- Atomic force microscopy (Nanosurf) for surface topology of thin films
- Transmission Electron Microscopy (TEM) to characterize the metallic nanoparticles

### **Simulation tools**

- Finite Difference Time Domain (FDTD): Lumerical and RSoft
- Rigorous Coupled Wave Analysis (RCWA): RSoft

### Papers published in International Journals

1. **Kaleem Ahmed**, and Anuj Dhawan, "Cross-shaped nanoaperture nanoantennas inside plasmonic nanorings for large SERS enhancement and multiple hotspots," *Physica Scripta* 99, 045969 (2024).

### Papers published in International Conferences

1. Dhawan, Anuj, Priten B. Savaliva, and **Kaleem Ahmed**. "Plasmonic Nanostructures on Tips of Tapered Optical Fibers for Large EM Enhancement." In *2018 IEEE 18th International Conference on Nanotechnology (IEEE-NANO)*, pp. 1-4. IEEE, 2018.
2. **Ahmed, Kaleem**, Ajay Kumar Agrawal, Senthil Subramanian, Abhijit Das, and Anuj Dhawan. "Plasmonic nanostructured chips for chemical and biological sensing in the UV-regime." In *Label-free Biomedical Imaging and Sensing (LBIS) 2019*, vol. 10890, pp. 239-244. SPIE, 2019.
3. Ghosh, Rajib Ratan, Arun Thomas, Priyanka Bhardwaj, Senthil Subramanian, **Kaleem Ahmed**, and Anuj Dhawan. "Design of long-range hybrid plasmonic waveguides." In *Optical Components and Materials XVI*, vol. 10914, pp. 361-367. SPIE, 2019.
4. Agrawal, Ajay Kumar, Nitin Gupta, Abhijit Das, **Kaleem Ahmed**, and Anuj Dhawan. "Nanostructured plasmonic gold films for enhanced sensitivity of SPR biological sensing and imaging." In *Plasmonics in Biology and Medicine XVI*, vol. 10894, pp. 73-80. SPIE, 2019.
5. Sharma, Yashna, Rajib R. Ghosh, Vaibhav Sapra, Vipul Jalal, **Kaleem Ahmed**, and Anuj Dhawan. "Plasmonic switches based on arrays of plasmonic nanostructures surrounded by VO<sub>2</sub> thin films." In *Quantum Sensing and Nano Electronics and Photonics XVI*, vol. 10926, pp. 349-358. SPIE, 2019.
6. Kumawat, Uttam K., Kamal Kumar, Pankaj Das, **Kaleem Ahmed**, Priyanka Bhardwaj, and Anuj Dhawan. "Enhanced performance of InGaN thin-film solar cells containing plasmonic and dielectric nanostructures." In *Physics, Simulation, and Photonic Engineering of Photovoltaic Devices VIII*, vol. 10913, pp. 222-229. SPIE, 2019.