

## **Dr. RANA TABASSUM**

### **Contact details**

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### **Career Objective**

The current area of my research is modelling, simulation and experimentation of terahertz (THz) detection systems for medical diagnostics and security imaging applications. In the doctoral degree, my work was focused on the theoretical and experimental studies of fiber optic surface plasmon resonance (FOSPR) sensors. It includes the fabrication, characterization and testing of thin films and nanostructures for various sensing applications. I wish to diversify my research in the areas of FOSPR and THz detection systems for several chemical, biological and imaging applications.

### **Technical Qualification**

- **DST Inspire faculty award (Aug 2017-Till date):** Centre for Nanoscience and nanotechnology, JamiaMilliaIslamia, New Delhi.  
*Topic: Carbon nanomaterials based Terahertz detector for defence and security imaging applications.*
- **SERB, National Post-Doctoral Position (Jan 2017-July 2017):** Centre for Nanoscience and Nanotechnology, Jamia Millia Islamia, New Delhi.  
*Topic: SPR based fiber optic SPR biosensors using gel entrapment and molecular imprinting techniques.*
- **Ph.D (July 2012-Jan 2017):** Fiber optics group, Physics Department, I.I.T. Delhi, India.  
Supervisor- Prof. Banshi Dhar Gupta  
*Thesis Title: Zinc oxide based fiber optic SPR sensors using thin films and nanostructures: Theoretical and experimental Studies.*
- **M. Tech (2009-2011):** Specialization Nanotechnology, Aligarh Muslim University (AMU), India (**80.26%**)  
*Project Title: Magnetic nanoparticles based sensing using Magneto Optical relaxations.*
- **B. Tech (2005-2009):** Electronic and communication Engineering, Integral University, India (**80.58%**)  
*Project Title: Experimental realization of 'Electronic Nose'*

### **Educational Qualification**

- 12<sup>th</sup>, U.P. BOARD (**80.20%**), (2005)
- 10<sup>th</sup>, U.P. BOARD (**75.50%**) (2003)

### Academic Brightness and Extra Curricular Activities

- **Silver Medal**, B.Tech (Electronics and Comm. Engineering), Integral University, Lucknow(2009).
- **Gold Medal**, M.Tech,(Nanotechnology), AMU, Aligarh (2011)
- Member, **Optical Society of America (OSA)**, I.I.T-Delhi, Chapter

### Fellowships and Awards

- **DST 'INSPIRE' JRF/SRF** fellowship (Reg. No. IF120526) (2012-2016).
- **National Post-Doc fellowship, SERB-DST** (Reg. No.PDF/2016/1684) (2017).
- **DST INSPIRE FACULTY** (IFA17-ENG207) (2017 to till date )

### Research Work/Interest

- Modelling, simulations and experimentation of horizontally aligned carbon nanomaterial onto Si/SiO<sub>2</sub> substrate for THz photodetector applications.
- Fabrication and characterization of trichalcogenides/dichalcogenides 2D material.
- Modelling, simulations and experimentation of horizontally aligned trichalcogenides/dichalcogenides 2D material onto Si/SiO<sub>2</sub> substrate for NIR-visible photodetector applications.
- Influence of bimetallic layer and high index oxide overlayer on the performance of the fiber-optic SPR sensor
- SPR based Fiber optic sensor for hazardous and pollutant gas detection. [Hydrogen sulphide (H<sub>2</sub>S)and hydrogen (H<sub>2</sub>)]
- Fiber optic water impurity sensor utilizing SPR technique by zinc oxide and conducting polymer.
- SPR fiber optic chemical sensor utilizing nanocomposites, core-shell nanostructure, nanofibers, nano-hybrid structures.
- SPR based fiber optic biological sensor for uric acid, sorbitol, caffeine, xanthine employing enzymatic interactions.
- SPR based fiber-optic Multichannel-multianalyte sensor for biomedical applications.
- SPR based fiber-optic refractive index sensor in phase interrogation module

### Teaching Assignments :

- Control System (EL-304), MSc (Electronics) Department of Applied Science and Humanities, Jamia Millia Islamia, New Delhi
- Digital signal Processing (EL-306), MSc (Electronics) Department of Applied Science and Humanities, JMI, New Delhi.
- Science and Technology of Semiconductors lab-5 (EL-307), MSc (Electronics) Department of Applied Science and Humanities, JMI, New Delhi.
- Communication (Electronics) lab-6 (EL-308), MSc (Electronics) Department of Applied Science and Humanities, JMI, New Delhi.
- Properties of Nanomaterials, M.Tech (Nanotechnology), Jamia Millia Islamia, New Delhi

- Nanomaterials for Energy Applications (MTN 2-05), M.Tech (Nanotechnology), Jamia Millia Islamia, New Delhi.

#### Contributed book chapter:

Banshi D. Gupta and **Rana Tabassum** (2016) "Surface plasmon resonance based fiber optic sensors utilizing Zinc oxide thin films and nanostructures", Editor: C. Geddes, Springer.

**P.G Dissertation Completed** (Department of Applied Science and Humanities and Centre for Nanoscience and Nanotechnology and, Jamia Millia Islamia, New Delhi): **30**

**PhD Ongoing : 01**

#### Complete list of publications (Sorted year wise):

1. **Rana Tabassum**, Satyendra K. Mishra and Banshi D Gupta, "Surface plasmon resonance-based fiber optic hydrogen sulphide gas sensor utilizing Cu–ZnO thin films", *Physical Chemical Chemical Physics*, **15**, 11868-11874 (2013).
2. **Rana Tabassum** and Banshi.D. Gupta, "Surface plasmon resonance based fiber optic hydrogen gas sensor utilizing palladium supported Zinc oxide thin films and their nanocomposites", *Applied Optics*, **54**, 1032-1040 (2015).
3. **Rana Tabassum** and Banshi.D. Gupta, "Surface plasmon resonance based fiber optic detection of chlorine utilizing polyvinylpyrrolidone supported Zinc oxide thin films", *Analyst*, **140**, 1863-1870 (2015)
4. **Rana Tabassum** and Banshi D. Gupta, "Performance analysis of bimetallic layer with zinc oxide for SPR based fiber optic sensor", *IEEE Journal of Lightwave Technology*, **33**, 4565-4571 (2015)
5. **Rana Tabassum** and Banshi D. Gupta, "Fiber optic manganese ions sensor using SPR and nanocomposite of ZnO- polypyrrole", *Sensors and Actuators B: Chemical*, **220**, 903-909 (2015)
6. **Rana Tabassum** and Banshi D. Gupta, "Tailoring the field distribution of ZnO by polyaniline for SPR based fiber optic detection of hardness of the drinking water", *Plasmonics* **11**, 483–492. (2016).
7. **Rana Tabassum** and Banshi D. Gupta, "Fiber optic hydrogen gas sensor utilizing surface plasmon resonance and native defects of zinc oxide by palladium", *J. of Optics: Pure and Applied Optics* **18**, 015004 (2016) **(Adjudged as cover page of the journal and paper of the week (Dec 14-24, 2015) )**.
8. **Rana Tabassum** and Banshi D. Gupta, "Surface plasmon resonance based fiber-optic sensor with enhanced electric field intensity and figure of merit", *Optics Communications*. **367**, 23-34 (2016)
9. **Rana Tabassum**, Parvinderkaur and Banshi D. Gupta "Tuning the field distribution and fabrication of Al@ZnO core shell nanostructure for SPR based fiber-optic phenyl hydrazine sensor", *Nanotechnology*, **27**, 215501 (2016)
10. **Rana Tabassum**, and Banshi D. Gupta, "Simultaneous estimation of vitamin K1 and heparin with low limit of detection using cascaded channels fiber optic surface plasmon resonance technique", *Biosensors and Bioelectronics* **86**, 48-55 (2016)

11. Ravi Kant, **Rana Tabassum** and Banshi D. Gupta, "Fiber optic SPR based Uric Acid Biosensor using Uricase Entrapped Polyacrylamide Gel", *IEEE Photonics Technology Letters* **28**, 2050-2053 (2016)
12. **Rana Tabassum** and Banshi D. Gupta, "Influence of oxide overlayer on the performance of a fiber optic SPR sensor with Al/Cu layers", *IEEE J. Sel. Topics in Quantum Electronic* **23**, 4600408 (2017).
13. Ravi Kant, **Rana Tabassum** and Banshi D. Gupta, "A highly sensitive and distinctly selective D-sorbitol biosensor utilizing SDH enzyme entrapped Ta<sub>2</sub>O<sub>5</sub> nanoflowers assembly coupled with fiber optics and SPR" *Sensors and Actuators B : Chemical*, **242**, 810-817 (2017)
14. **Rana Tabassum** and Banshi D. Gupta, "Simultaneous tuning of field intensity and structural properties of ZnO:Graphene nanostructure for FOSPR based nicotine detection", *Biosensors Bioelectronics*, **91**, 762-769 (2017)
15. Ravi Kant, **Rana Tabassum** and Banshi D. Gupta, "Integrating nanohybrid membranes of reduced Graphene oxide: chitosan:silica sol gel with fiber optic SPR for caffeine detection", *Nanotechnology*, **28**, 195502 (2017).
16. Ravi Kant, **Rana Tabassum** and Banshi D. Gupta, "SPR based fiber optic caffeine sensor utilizing Ta<sub>2</sub>O<sub>5</sub> nanostructure entrapped with Xanthine oxidase", *Biosensors and Bioelectronics*, **99**, 637-645 (2018)
17. **Rana Tabassum**, V. S. Pavelyev, A. S. Moskalenko, K. N. Tukmakov, S.S. Islam, "A Highly Sensitive Nitrogen Dioxide Gas Sensor Using Horizontally Aligned SWCNTs Employing MEMS and Dielectrophoresis Methods", *IEEE Sensor Lett.*, **2**, 276-280, (2018)
18. Mohammad Talib, **Rana Tabassum**, Sheikh Saiful Islam, "Influence of growth temperature on titanium sulphide nanostructures: from trisulphide nanosheets and nanoribbons to disulphide nanodiscs, *RSC Advances*, **9**, 645-657 (2019).
19. Mohammad Talib, **Rana Tabassum**, Sheikh Saiful Islam "Improvements in the visible NIR photodetector based on horizontally aligned TiS<sub>3</sub> nanoribbons", *ACS Omega*, **4**, 6180-6191 (2019).
20. Jyoti Bansal, **Rana Tabassum**, Sanjay Kumar Swami, Swati Bishnoi, Pargam Vashishtha, Govind Gupta, S. N. Sharma & A. K. Hafiz, "Performance analysis of anomalous photocatalytic activity of Cr-doped TiO<sub>2</sub> nanoparticles [Cr<sub>(x)</sub>TiO<sub>2(1-x)</sub>]", *Applied Physics A*, **126**, 363 (2020).
21. **Rana Tabassum** and Ravi Kant, "Recent trends in surface plasmon resonance based fiber-optic gas sensors utilizing metal oxides and carbon nanomaterials as functional entities", *Sens. Actuators B*, **310**, 127813 (2020).
22. **Rana Tabassum** and Ravi Kant, "Laser-ablated core-shell nanostructures of MWCNT@Ta<sub>2</sub>O<sub>5</sub> as plasmonic framework for implementation of highly sensitive refractive index sensor", *Sens. Actuators A*, **309**, 112028 (2020).
23. **Rana Tabassum** and Ravi Kant, "Mechanistic understanding of excitation of surface plasmons in a fiber-optic SPR sensor utilizing Al/Cu bimetallic configuration: mode field approach", *Physica Scripta* **24**, 12 (2020)
24. Ravi Kant and **Rana Tabassum**, "Mechanistic Modeling for Performance Engineering of SPR-Based Fiber-Optic Sensor Employing Ta<sub>2</sub>O<sub>5</sub> and Graphene Multilayers in Phase Interrogation Scheme, *Plasmonics*, **15**, 647-659 (2020)

- 25. Rana Tabassum** and Ravi Kant, Cascaded wavelength multiplexed refractive index sensors in optical fibers based on surface plasmon resonances", J. Apl. Phys. **128**, 073101 (2020)
26. Jyoti Bansal , Sanjay Kumar Swami, **Rana Tabassum**, Shailesh Narain Sharma & Aurangzeb Khurram Hafiz, "Encapsulation of Cu-doped TiO<sub>2</sub> nanocomposites with the understanding of weak photocatalytic properties for sunscreen applications", Journal of Dispersion Science and Technology, <https://doi.org/10.1080/01932691.2020.1841653>
27. **R. Tabassum** et al, "ZnO and Graphite based tricomposite Nanoflowers structures for photonic and electronic applications ", (communicated) **2021**
28. **R. Tabassum** et al, "Enhanced refractive index performance using graphite and Ta<sub>2</sub>O<sub>5</sub> based tricomposite nanoflower structure", (Communicated), **2021**
29. **R. Tabassum et al**, "Understanding of thermal electron trapping over defects level of a wide band gap tricomposite nanoflower structure of Si<sub>x</sub>ZnO<sub>(1-x)</sub>:Graphite", (Communicated), **2021**.
30. **R. Tabassum** et al, " THz Based detection systems using femto second laser based technology " (Communicated), **2021**.

Conferences / symposium/ Invited Talks/ Workshop			
S. No.	Title of the Paper	Conference name	Agency
1	Fiber optic hydrogen sulfide gas sensor utilizing surface plasmon resonance of Cu/ZnO thin films, Proc of SPIE, Vol. 8794, 8794E1-E5, (2013)	5 <sup>th</sup> European workshop on fiber optic sensors, Krakow Poland	Proc. of SPIE
2	Surface plasmon resonance based fiber optic detection of toxic ions Mn <sup>++</sup> in drinking water utilizing ZnO and polypyrrolenanocomposites,	4 <sup>th</sup> international conference on Biosensing Technology, Lisbon Portugal, May 10-13, 2015	Elsevier
3	Surface plasmon resonance (SPR) based fiberoptic detection of hardness of drinking water	4 <sup>th</sup> international conference on Biosensing Technology, Lisbon Portugal, May 10-13, 2015	Elsevier
4	Fiber optic chlorine sensor utilizing surface plasmon resonance of Ag/PVP thin films	Photonics 2014: 12th International Conference on Fiber Optics and Photonics, Kharagpur (India), December 13-16 (2014).	Optical Society of America (OSA)
5	Performance Investigation of Fiber-optic SPR Sensor Utilizing Zinc Oxide in Phase Interrogation Scheme	International Conference on Advanced materials (ICAM) 2019	American Institute of Technology
6	Analysis of electric field distribution in SPR refractive index sensor using different conducting metal oxides	Frontiers in Optics: The 99th OSA Annual Meeting and Exhibit/Laser Science XXXI, held at San Jose, California, USA (18- 25 October, 2015).	Optical Society of America (OSA)

<b>7</b>	Plasmonic Probing of Refractive Index Variations Using MWCNT@Ta <sub>2</sub> O <sub>5</sub> Core-shell Nanoparticles	International conference on atomic, molecular, optical and nano physics with applications (CANMP-2019), 18-20 Dec 2019. Proceedings of Springer ( <i>In press</i> )	Springer
<b>8</b>	Towards Detection of Flavonoid Quercetin Using Ta <sub>2</sub> O <sub>5</sub> Nanoparticles Embedded rGO and Chitosan Matrix	International conference on atomic, molecular, optical and nano physics with applications (CANMP-2019), 18-20 Dec 2019. Proceedings of Springer	Springer
<b>9</b>	Studies on Magneto Optical Relaxations	Aligarh Nano-I, Workshop on Nanoscienc and nanotechnology, 26&27 march 2011	
<b>10</b>	Use of Brownian motions on studies of Magneto Optical Relaxations	Aligarh Nano 2	
<b>11</b>	Invited as Coordinator	Robotics Society Workshop -12-20 Sept 2008	
<b>12</b>	Electronic Circuit design	Inter college technical literary and artistic festival, 28feb and 1 march 2007	
<b>13</b>	Studies on SPR based biosensing techniques for medical diagnostics	Biosensors and bioelectronics symposium 2018, Sweden	
<b>14</b>	Techniques of report writing	One week faculty deelopment program on "Research Methodology", 26 sept 2nd oct, 2020	
<b>15</b>	Surface plasmon resonance based fiber optic caffeine biosensor utilizing reduced graphene oxide entrapped chitosan modified silica sol gel nanohybrid membrane	5 <sup>th</sup> International Conference on Bio-SensingTechnology 2017, 7-10 May 2017, Riva Del Garda, Italy	