

## Curriculum Vitae



### **Muhammad Naziruddin Khan, Ph D**

Job Principal Researcher  
Rank Assistant Professor  
Institute King Abdullah Institute for Nanotechnology  
King Saud University, Riyadh-KSA

### Personal Details

Date of Birth 1<sup>st</sup> March 1972  
Nationality Indian  
Passport No. J5998550  
Marital Status Married  
Language Known English, Manipuri, Hindi, Urdu and Arabic (Able to read)  
Residence Usoipokpi Tamyai, P.O Lilong-795130, Dist-Thoubal,  
Manipur India.  
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### Educational Qualification

Qualification Ph.D Physics  
Ph.D Thesis *Spectroscopic characterisation of PAHs and their radical ions trapped in glasses* (Awarded May **2003**), Jamia Millia Islamia (JMI-Central University) New Delhi, India.  
M.Sc. Physics Laser Spectroscopy, Department of Physics, JMI, **1996**  
B.Sc (Hon.) Physics Department of Physics, JMI, **1994**  
P.U.Science PCM-B, Manipur University, **1989**

### Experience

Teaching 3 years  
Research 14 years  
Papers Publication 24 (22-International, 03-National Journals, 10-Conferences)  
Patent 01-USA  
Book 01-Nova Publishers, USA

### Research

Specialization Laser Spectroscopy and Nanophysics  
Interest(s) Bright Luminescent Si Nanocrystals and Quantum Dots (QDs) use in sol-gel and polymer hosts, Perovskites materials for optoelectronic applications, Organic dye lasers for SSDL by sol gel technology

### Teaching Experience

Assistant Researcher	Assisted to the project work of some Graduate and Undergraduate students, since <b>2008-2016</b> , Laser and Photonics lab, Department of Physics, King Saud University, Riyadh.
Lecturer	Department of Applied Science, Al-Falah School of Engineering & Technology, Faridabad, India, ( <b>19<sup>th</sup> July 2004 - Feb. '06</b> ). <b>Courses taught:</b> Applied Physics
Guest Lecturer	Department of Physics, JMI, New Delhi, ( <b>2003-2005</b> ). <b>Courses taught:</b> Electromagnetic Theory, B. Sc and M.Sc Practical
Teaching Assistant	Department of Physics, JMI, New Delhi, ( <b>1997-2001</b> ). <b>Courses taught:</b> Molecular spectroscopy, M. Sc Practical and Project

### Research Experience

Researcher	King Abdullah Institute for Nanotechnology, King Saud University- Riyadh, KSA, (1st <b>August 2008 to Feb 2017</b> ).
Researcher	Worked on project " <i>Laser dyes in sol gel technology</i> " ( <b>Feb '06- July'08</b> ). Department of Physics, College of Science, King Saud University, Riyadh, KSA.
JRF	Defence Research and Development Organization (DRDO) sponsored project " <i>Development of diffusive reflective optical pump cavities for solid state lasers</i> " ( <b>13<sup>th</sup> Apr. 2000 -30<sup>th</sup> Nov. 2002</b> ). Department of Physics, JMI, New Delhi.
Project Assistant	UGC sponsored project " <i>Spectroscopic characterisation of polycyclic aromatic hydrocarbons and their ions trapped in glasses</i> " ( <b>28<sup>th</sup> Aug. 96 -14<sup>th</sup> Sept .1999</b> ). Department of Physics, JMI, New Delhi.

### Techniques Known

Spectroscopy	UV-VIS-NIR Spectrophotometer (Jasco- 570, 670, Perkin Lamda) Spectrofluorimeter (Models: F-4500 Hitachi) LS-45 Luminescence Spectrometer (Perkin Elmer) Lumina Fluorescence Spectrophotometer (Thermo Scientific) FT-IR (Model-Impact 410, Nicolet), FT-IR (Perkin Elmer) Raman HR-50 Spectrometer, StellarNet Inc, USA.
Laser Systems	(i) High Power Pico second Mode Locked Nd: YAG Laser system with Autocorrelation and OPG, ( <i>LOTIS TII</i> ) with QE65 Pro Detector- Ocean Optic, ICCD Camera (MS257 Oriol), (ii) Solar Laser System (1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> Harmonic laser), (iii) Brilliant Laser System (Quantel), Monochrometer (M266) with CCD Camera, (iv) CNI Model with PSU-III Light Emitting Diode, (v) Nd: Glass laser system-(Fabricated System),

## Research Achievements

### 1. *Patent*

SILICON –BASED NANOSILICON COMPOSITES AND FABRICATION METHODS. Patent No.: US 8, 36,779 B2, Date Of Patent: Feb. 5, 2013 (**Co-author**)

### 2. *Book*

Nanoparticles: Properties, Classification, Characterization, and Fabrication, **Co-Authors, Nova Publishers**

### 3. *Best Poster Award*

Porous silicon embedded sol gel and polymer nanocomposites for optical applications. The NanoThailand 2012 Conference, KHON KAIN, Thailand, April 9-11, 2012.

### 4. *International Publications*

1. *Infrared spectroscopic studies of polycyclic aromatic hydrocarbons in solid wax films: Anthracene and Phenanthrene, M. Naziruddin Khan et al.* Spectroscopy Letters (UK), 35(4), 489-500, 2002. Publisher: Taylor & Francis
2. *ECR Plasma Etching of GaAs in CCl<sub>2</sub>F<sub>2</sub>/Ar discharge, LSS Singh, KP Tiwary, M. Naziruddin Khan, RK Purohit, ZH Zaidi, SPIE proceedings series, P-1386-1389, 2002, Publisher: Society of Photo-Optical Instrumentation Engineers*
3. *Flow Rate Effect of CCl<sub>2</sub>F<sub>2</sub>/Ar on the Wafers of IH-V Group Compounds by ECR Plasma Etching, KP Tiwary, LSS Singh, RK Purohit, M Naziruddin Khan, M Husain, ZH Zaidi, Disordered Materials, p-273, 2003, Publisher, Alpha Science Intl. Ltd.*
4. *Infrared spectroscopic analysis of chrysene and 1.2- benzanthracene in wax film, M. Naziruddin Khan, A. S. Al Dwayyan, Z. H. Zaidi, Chinese Physics Letters, 23(9), 2407, 2006. Publishers: Institute of Physics (IOP-China)*
5. *Effect of DCCA on the optical and lasing properties of dye doped Silica gels/ORMOSILs, A. S. Al Dwayyan, M. Naziruddin Khan, A. A. Ghamdi, Canadian Journal of Pure & Applied Sciences 2(1), 221, 2008. Publisher: SA, Canada*
6. *Influence of solvent on the physical and lasing properties of dye doped sol gel host, M. Naziruddin Khan, A. S. Al Dwayyan, Journal of Luminescence 128(11), 1767-1770 2008. Publisher: Elsevier, Holland*

7. *Neutral benz [a] pyrene and its radical ion in solid films by Infrared Spectroscopy*, **M. Naziruddin Khan**, A.S. Al Dwayyan, Canadian Journal of Pure & Applied Sciences 3(2), 833-838, 2009. Publisher: Sendra Academic, Canada
8. *Properties of luminescent silicon nanocrystallines doped sol gel for laser applications*. A. S. Al Dwayyan, **M. Naziruddin Khan**, M. S. Al Salhi, A. Al Dukhail, M. Al Hoshan, Journal of Materials Science and Engineering 3(12), S-25, 44-52, 2009. Publisher: David Pub. Company-USA
9. *Investigation of Photophysical and lasing properties of 597 Pyromethene in Ormosils*, **M. Naziruddin Khan** et al., Journal of King Saud University, Vol 1, Science (special Issue), pp. 193-198, 2009
10. *Nanomaterials as Analytical Tools for Genosensors*, Khalid Abu Salah, Salman Al rokyan, **M. Naziruddin Khan**, Anees Ahmad Ansari, Sensors, 10, 963-993, 2010.
11. *Optical and electrical properties of electrochemically deposited polyaniline/CeO<sub>2</sub> hybrid nanocoposite film*. A. A. Ansari, M. A M Khan, **M. Naziruddin Khan**, Salman A. Rokyan, M. Al Hoshan, M. S Alsalhi, Journal of Semiconductor, vol. 32, No.4, April 2011(IOP)
12. *Study on characteristics of silicon nanocrystals within sol gel host*. **M. Naziruddin Khan**, A.S. AlDwayyan, M.S. Al Salhi, Mansoor Al Hoshain Journal of Experimental Nanoscience, Vol. 7, No. 2, 120, 2012 (T and F)
13. *Optical studies of chemically synthesized nanocrystals silicon incorporated in sol- gel matrix*, **M. Naziruddin Khan**, A.S. Al Dwayyan, M.S.Alsalhi, Journal of Nanomaterials, Vol. 2012, Article ID 713203, 2012 (Hindawi)
14. *Influence on structural and PL property of nanocrystals silicon doped sol gel matrix*, **M. Naziruddin Khan**, A. S. Al Dwayyan, Journal of Optoelectronics and Advanced Materials, Vol.14, No.5-6, p-448 2012
15. *Morphology and optical properties of a porous silicon-doped sol-gel host* Electronic Materials Letters, **M. Naziruddin Khan**, A.S. Al Dwayyan, Electronic Materials letter, vol. 9, No.5, P-697, 2013. Publisher-Spinger
16. *Microstructure and blueshift in optical band gap of nanocrystalline Al<sub>x</sub>Zn<sub>1-x</sub>O thin films*. M.A.Majeed Khan, Shusil Kumar, **M. Naziruddin Khan**, Maqusood Ahamed, A.S. Al Dwayyan Journal of Luminescence, 155, 275, 2014.
17. *Comparative Study on Electronic, Emission, Spontaneous property of Porous Silicon in different Solvents*, **M. Naziruddin Khan**, M.A.Majeed Khan, A.S. Al

- dwayyan, J. P. Labis *Journal of Nanomaterials*, Volume 2014, Article ID. 682571, 2014
18. *Structural and spectroscopic characterization of some PM597 dye-silica core-shell nanoparticles*, Tahani R. Al-Biladi, A. S. Al Dwayyan, **M. Naziruddin Khan**, Saif M. H. Qaid, and Khalid Al Zahrani, *Journal of Spectroscopy*, Volume 2015, Article ID. 901032, 2015.
  19. *Light emitting composite rods based on porous silicon in ormosil and polymer matrices for optical applications*. **M Naziruddin Khan**, Ali Aldabahi, A. S. Al Dwayyan *Optics and Laser Technology*, 91, 203–211, 2017.
  20. *Composite rods based on nanoscale porous silicon in sol gel silica and ormosil matrices for light emitting applications*, **M Naziruddin Khan**, Ali Aldabahi, A. S. Al Dwayyan, *Journal of Sol Gel Technology*, 2017, 82 (2) 551–562.
  21. *Magnetic yolk-shell nanostructure-based probes for fluorescent analysis of potassium ion using guanine-rich oligonucleotides*, Na Lu, Yanli Wen, Gang Liu, Lei Ding, Caixia Zeng, Ali Aldabahi, Muhammad Naziruddin Khan, Govindasami Periyasami, Mostafizur Rahaman, Abdulaziz Alrohaili, Jiye Shi, Shiping Song, Lihua Wang, and Min Zhang *ACS Appl. Mater. Interfaces*, **2017**, 9 (36), pp 30406–30413.
  22. *Poly-Cytosine-Mediated Nanotags for SERS Detection of Hg<sup>2+</sup>*, Lin Qi, Mingshu Xiao, Fei Wang, Lihua Wang, Wei Ji, Tiantian Man, Ali Aldabahi, M. Naziruddin Khan, Govindasami Periyasami, Mostafizur Rahaman, Abdulaziz Alrohaili, Xiangmeng Qu, Hao Pei, Cheng Wang and Li Li, *Nanoscale*, 14184 , *Nanoscale*, 2017, 9, 14184–14191.
  23. *Evaluation of modification in nano structured ZnO film irradiated with Pico second laser at 355 nm wavelength*, **M. Naziruddin Khan**, M.A. Majeed Khan, W. A Farooq, Abdullah Al Muhammadi, *Materials Science-Poland (Under 1<sup>st</sup> Revised)*.
  24. *Synthesis of ZnO decorated graphene composite for photocatalytic degradation of methylene blue under UV light irradiation*, **M. Naziruddin Khan**, M. A Majeed Khan, M Javed Alam, Abdul Aziz AlHazza, *Journal of Modern Optics (Under Review)*
  25. *Investigation of Threshold Carrier Densities in Optically Pumped Amplified Spontaneous Emission of Formamidinium Lead Bromide Perovskite Using Different Excitation Wavelengths*, *Advanced Optical Materials (Under Re-modification)*

26. *Optical response of porous silicon fabricated by electroless chemical etching and their composites sol gel based solid media for optoelectronic applications*, **M. Naziruddin Khan**, Ali AL Dalbahi, Spectrochimica Acta: Part A (Under Submission).
27. *Pico second laser effect on nano structured Aluminum doped ZnO film synthesized by sol gel method*, **M. Naziruddin Khan**, W. A. Farooq, M. A. Majeed Khan, Advances in Materials Science and Engineering (Under Submission)
28. *Thickness dependent amplified spontaneous emission behavior in MAPbI<sub>3</sub> perovskite films*, (Under Submission)
29. *Effect of Pico second laser on structural and PL properties of Aluminum doped ZnO film prepared by sol gel method* (Under Preparation)
30. *Comparative optical studies of silicon nanocrystals and porous silicon in solvents* (Under preparation).
31. *CdS and CdSe QDs in sol gel solid active media for optoelectronics* (underway)

#### **4. National Journals**

1. *Importance of Spectroscopic information of Polycyclic Aromatic Hydrocarbons in Phytochemistry*. **M. Naziruddin Khan et al.**, Universities Journal of Phytochemistry and Ayurvedics Heights (India), Vol. 1, No.2, P-40-46, Sept. 2003
2. *Studies of pyrene doped in solid wax film by Infrared Spectroscopy* **M. Naziruddin Khan et al.**, Bulletin of Pure and Applied Science (India) vol. 22D (No.2) P-159-163, 2003.
3. *Carcinogenic Polycyclic Aromatic Hydrocarbon by Infrared Spectroscopy* **M. Naziruddin Khan et al.**, Universities Journal of Phytochemistry and Ayurvedics Heights (India) Vol. 1, No.2, P-24-27, 2004.

#### **5. Conferences/ Seminars / Workshop Attended**

1. *Characterization of anthracene molecule in solid wax film by Infrared Spectroscopy*. National Seminar on Materials and Devices (MD-2002), March 9-10, 2002, M.J.P. Rohilkhand University, Bareilly (UP) India.
2. *Infrared Spectroscopic Studies of Phenanthrene Molecule Doped in Wax Film*.

National Symposium in Condensed Matter Physics (Condensed Matters-2002), 29-31, August, 2002, Department of Physics, T.M. Bhagalpur University, Bhagalpur (Bihar) India.

3. *Investigation of Photophysical and lasing properties of 597 Pyromethene in ORMOSILS.* 3<sup>rd</sup> Saudi Science Conference on "New Horizon of Science and their Applications" 10-13 March 2007. King Saud University, Riyadh-KSA.
4. *IR Solid State Dye Laser by Polymerisation.* 3<sup>rd</sup> Saudi Science Conference on "New Horizon of Science and their Applications" March 10-13, 2007. King Saud University, Riyadh-KSA.
5. *Stability of silicon nanoparticle in organosilicon sol-gel.* "International Conference on Nanotechnology: Opportunities and challenges" June 17-19, 2008. King Abdul Aziz University, Jeddah-KSA
6. *Preparation of luminescent silicon nanoparticles doped sol gel rod as a laser media.* Nanostructured Advance Materials, University of Jordan in Amman, Jordan. National Science Foundation, Washington DC, November 10-13, 2008.
7. *Properties of green luminescent silicon nanocrystallines doped sol gel media for laser application.* The International Conference for Nanotechnology Industries, KSU, Riyadh-KSA. April 5-7, 2009.
8. *Preparation of dye doped silica nanoparticles by sol gel process for bio application.* The International Conference for Nanotechnology Industries, KSU, Riyadh-KSA. April 5-7, 2009.
9. *Porous silicon embedded sol gel and polymer nanocomposites for optical applications.* The NanoThailand 2012 Conference, KHON KAIN, Thailand, April 19-11, 2012.
10. *Porous silicon in sol gel silica, Ormosils and polymer hosts for optoelectronic applications,* 3<sup>rd</sup> International Advances in Applied Physics and Materials Science Congress, Antalya, Turkey, April 24-28, 2013.

### **Country Visited**

1. Khon Kain, NanoThailand-2012 (4days)
2. Antalya, APMS-2013, Turkey (5days)

### **KACST-NPST Projects**

1. *Silicon nanoparticles in sol gel based active media for optoelectronic applications*

*Role & Status: Principal Investigator* and successfully completed (Proj. No. 10NAN-1037-02)

### **Established**

#### ***Laser spectroscopy Lab. from KACST sponsored project under NPST, KSU***

1. High Power Pico Second Mode Locked Nd: YAG Laser system with Autocorrelator and OPG (*LOTIS TII*) with QE65 Pro Detector, Spectrograph (M266).
2. CNI Model with PSU-III-Light Emitting Diode
3. UV-VIS. Spectrophotometer (Models- 570 Jasco).
4. Lumina Fluorescence Spectrophotometer (Thermo Scientific).
5. FT-IR (Spectrum RX I, Perkin Elmer).
6. Polishing System and Diamond cutter.
7. Vacuum Oven and Centrifuge

### **Ongoing Research Work**

Nanoparticle of semiconductors such as Si nanoparticles, Quantum Dots in transparent media have especially in sol-gel glasses, received a great attention due to their promising applications in non-linear optics, optoelectronics, photonic etc. In fact, nanocrystalline silicon (nc-Si) or quantum dots can be embedded in silica, ormosils and polymer matrix fabricated using sol-gel methods. Due to the possibility of stabilization of such nanoparticles in solid media, the photoluminescence properties are great interest for optical devices. Therefore, optical, mechanical, electrical and photo stability properties of Si or Quantum Dots, with different concentration and sizes distribution of Si-nanoparticles, are still important in order to have the optimum conditions for Si, QD based laser source to be use in applications.

Organo-metallic lead halide (OMLH) perovskites ( $\text{CH}_3\text{NH}_3\text{PbX}_3$ ) is considered as a new inexpensive and efficient class of photo-voltaic materials. Due to its large absorption coefficient, long in range of balanced electron and hole transport lengths, and very few non-radiative decay which pathways strengthen it for optical gain applications. Indeed, OMLH materials are able to convert high percentage of absorbed light into emitted light. A design for optically pumped Perovskites-based semiconductor laser system which does not need complex mode control or complicated fabrication technique with little power dissipation may lead to a possible high optical power output. Low cost, small, efficient source, large optical cavity design and room temperature continuous wave (CW) operation laser will be achievable. Electrically driven new class of semiconductor edge emitting laser will be realized.

Incorporation of dyes into glasses prepared by the sol-gel/polymer process enables the design of new types of stable solid lasers tunable in the visible range. The potential advantages of the sol-gel method for preparing optical materials include obtaining new chemical compositions, better purity and more convenient processing conditions.



Therefore, the laser performance of each material can attempt to characterize in a way which allow direct comparisons of their efficiency and photostability. Photostability is a feature of prime importance in selecting a laser dye as it ultimately governs the longevity of laser operation. However, some improvement was recently found in the fluorescence intensities, laser efficiencies and photostabilty by co-doping dyes (mixture of two dyes). Still, for applications that require high powers, at either cw or pulsed high-repetition-rate operation, the problem of heat dissipation is a serious impediment for their utilization.

Date: 13/11/2017

**(M. Naziruddin Khan)**

