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Academic Qualifications:

- ***Ph. D. – Physics*** ***(2008-2013)***
  School of Physics, University of Hyderabad, Hyderabad - 500046, India
  Title of thesis: *"Synthesis, Characterization and Swift Heavy Ion Induced Modification of Semiconductor (Ge & Si) Nanocrystals". Degree awarded in November 2013.*
- ***M. Sc. Nuclear Physics;*** ***71.82%*** ***(2002-2004)***
  (Andhra University, AP, India)
- ***B. Sc. Maths, Physics, Chemistry;*** ***85.33%*** ***(1999-2002)***
  (Acharya Nagarjuna University, AP, India)
- **UGC-CSIR NET (CSIR JRF) qualified with Lectureship eligibility** **(2007)**

Work experience (Specific and detailed works enclosed in a separate sheet):

1. Postdoctoral Fellow

(a) Ultrafast Optics lab, School of Physics, University of Hyderabad. ***(Jan 2014-Present)***

- Ultrafast laser writing in semiconductors and metals for fabricating periodic structures
- SERS activity of plasmonic nanoparticles and the laser fabricated periodic structures
- Ultrafast and pulsed laser ablation synthesis and characterization of different semiconductor/metal nanoparticles in various liquids for photonic applications
- Nonlinear optical studies of different metal-semiconductor hybrid nanostructures
- Sol-gel synthesis of semiconductor nanostructures
- Micro-Raman spectroscopy of semiconductor nanoparticles

2. PhD Student ***(2008-2013)***

School of Physics, University of Hyderabad, Hyderabad. (Submitted in July 2013 and awarded in November 2013)

- Synthesis and characterization of semiconductor nanocrystals using RF sputtering followed by annealing.
- Study of the ion beam induced nanostructuring of the semiconductor (Ge and Si) nanocrystals.
- Synthesis of Silicon nanoparticles by laser ablation in liquids.
- Microraman spectroscopy of the quantum confinement in semiconductor nanocrystals.
- Ion beam induced modification and/or shaping of semiconductor nanocrystals using X-ray diffraction, Raman spectroscopy, TEM imaging.
- Study of reduction in the nanocrystal size with the irradiation fluence and the understanding of the mechanism of ion-solid interaction.
- Ion beam induced formation of Ge nanocrystals in GeO_2 nanocrystalline thin films.
- Studied the electronic excitation induced modifications in the Fe nanoparticle encapsulated MWCNTs.
- Utilized the accelerator facilities (Ion implantation, ion irradiation and RBS) for our work.

3. Lecturer ***(2005-2007)***

The Hindu College, Machilipatnam affiliated to Acharya Nagarjuna University, AP.

- Involved in teaching for B.Sc. and M.Sc. physics courses.
- Teaching and the development of the experimental labs for B.Sc. and M.Sc. physics courses.
- Optics and Modern physics labs.

Technical skills:

RF Magnetron Sputtering, and spin coating; X-ray diffraction; Spectroscopic and microscopic characterization techniques [UV visible, Micro-Raman, Fluorescence etc.]; Operation of femtosecond, picosecond and nanosecond lasers; nonlinear optics; laser direct writing; Nanoparticles preparation by laser ablation; Thin film deposition by spin coating; Pulsed Laser Deposition (PLD); Preparation of photonic crystals; E-beam evaporation equipment for film deposition; RTA and normal furnace annealing instruments operation. Accelerator (low and high energy) facilities accessible for users at IUAC, New Delhi and IGCAR Kalpakkam for RBS, ion irradiation and ion implantation experiments.

Computational skills:

Programming knowledge of C, FORTRAN programming, Origin Lab Data analysis and graphing software,

Honors and Awards:

- Our poster entitled "Femtosecond laser induced periodic subwavelength structures on Si in air and water" got the **BEST POSTER AWARD** at DAE NLS 23 conference, held in Sri Venkateswara University, Tirupathi during 3-6 December, 2014.
- Recipient of CANADIAN COMMONWEALTH GRADUATE STUDENT SCHOLARSHIP in the year 2012 and visited Advanced Materials laboratory, headed by Prof. G. S. Chang at Department of Physics and Engineering Physics, U of S, Canada.
- Qualified JRF in CSIR-UGC NET (Acquired eligibility of Lectureship with the same).
- Postdoctoral fellowship funded by Department of Science and Technology (DST).
- Qualified for University of Hyderabad (UoH) Ph.D., entrance test for the admission into Ph.D.,
- Referee to the Journals **Materials Research Express, Radiation effects and defects in solids.**

Research Publications:

1. "Electronic excitation induced modifications in Fe nanorod / nanoparticle encapsulated multi walled carbon nanotubes (MWCNTs) under ion irradiation" V. Saikiran, I Sameera, V Prasad, A P Pathak, G S Chang (In preparation)
2. "Femtosecond laser nanostructuring of titanium surface towards fabrication of low-reflective surfaces" Mudasir H. Dar, R. Kuladeep V. Saikiran and D. Narayana Rao ***Appl. Surf. Sci. 2015 (accepted 2015).***
3. "Gold film assisted femtosecond laser fabrication of periodic surface structures on semiconductor substrates for SERS applications" V. Saikiran, Mudasir H. Dar, R. Kuladeep and D. Narayana Rao ***Appl. Surf. Sci. 2015 (under review).***
4. "Structural studies of Ge nanocrystals embedded in high-k dielectric (HfO_2) matrix" V. Saikiran, N. Manikantha Babu, N. Srinivasa Rao, S. V. S. Nageswara Rao and A. P. Pathak ***Advanced Mat Lette2015 (under review).***
5. "Optical, structural and third order nonlinear optical properties of Ge nanoparticles in acetone prepared by laser ablation" V. Saikiran, V. Sreeramulu, D. Narayana Rao ***Asian Jour of Physics (2015) accepted.***
6. "Optical properties of Germanium nanoparticles synthesized by pulsed laser ablation in acetone" V Saikiran, V Sreeramulu, D Narayana Rao ***Frontiers in Physics: Optics and Photonics 2 (2014) 57, 1-9.***
7. "Synthesis of Ultra-small Silicon Nanoparticles by Femtosecond Laser Ablation of Porous Silicon" V S Vendamani, V Saikiran, S V S Nageswara Rao, A P Pathak ***J. of Mat. Science 50 (2015) 1666.***
8. "150 MeV Au ion induced modification of Si nanoparticles prepared by laser ablation" V Saikiran and A P Pathak ***Nucl. Inst. Meth B 333, (2014) 99-105.***
9. "SHI irradiation fluence and energyloss dependence effects on Ge NCs with different initial sizes embedded in SiO_2" V Saikiran and A P Pathak ***Nucl. Inst. Meth B 323, (2014) 14-18.***
10. "Ion beam irradiation effects on Ge nanocrystals synthesized by using RF sputtering followed by RTA" V Saikiran, N Srinivasa Rao, G Devaraju, G S Chang and AP Pathak Nucl***. Inst. Meth B 315, (2013) 161-164.***
11. "Formation of Ge nanocrystals from ion-irradiated GeO_2 nanocrystals by swift Ni ion beam" V Saikiran, N S Rao, G Devaraju, G S Chang and A P Pathak ***Nucl. Inst. Meth B 312, (2013) 1-6.***
12. "SHI irradiation induced effects in functionalized MWCNTs" V Saikiran, A P Pathak et.al, ***Radiation Effects and Defects in Solids, Vol 167 (2012) 569.***
13. "Synthesis, characterization and radiation damage studies of high-k dielectric (HfO_2) films for MOS device applications" N M Babu, V Saikiran, A P Pathak, S V S N Rao ***Radiation Effects and Defects in Solids, 170, 207-218 (2015).***
14. "Anharmonic effects on positron channeling angular scans and dechanneling due to stacking faults and platelets" V S Vendamani, S Balamuragan, V Saikiran, A P Pathak and S V S Nageswara Rao ***Radiation Effects and Defects in Solids, Vol 167 (2012) 594.***
15. "Synthesis and Tailoring of GaN nanoparticles by RF magnetron sputtering at Room Temperature" G Devaraju, A P Pathak V Saikiran et al ***Radiation Effects and Defects in Solids, Vol 167 (2012) 659.***
16. "Synthesis and Characterization of Ge nanocrystals prepared by using microwave annealing" N Srinivasa Rao, A P Pathak, G Devaraju and V Saikiran, ***Vacuum 85 (2011), 927.***

17. "Synthesis of Ge nanocrystals by atom beam sputtering and subsequent rapid thermal annealing" N Srinivasa Rao, A P Pathak, N Sathish, G Devaraju, V Saikiran, P K Kulriya, D C Agarwal, G Sai Saravanan and D K Avasthi, ***Solid State Communications 150 (2010), 2122.***

Conference Proceedings:

1. "Gold film assisted femtosecond laser fabrication of periodic surface structures on semiconductor substrates for SERS applications" V. Saikiran, Mudasir H. Dar, R. Kuladeep and D. Narayana Rao *NLS 24 Proceedings (2015) Article 6.14.*

2. "Influence of solvent on the optical and structural properties of Germanium nanoparticles synthesized by nanosecond laser ablation in liquids" V Saikiran, R Kuladeep, D Narayana Rao *International Conference on Fibre Optics and Photonics 2014 (Photonics) Proceedings.*

3. "Optical properties of Germanium nanoparticles synthesized by pulsed laser ablation in acetone" V Saikiran, V Sreeramulu, D Narayana Rao *NLS 23 Proceedings (2014).*

4. "Characterization of GeO_2 Nanocrystals Prepared By Microwave Annealing" V Saikiran, N Srinivasa Rao, G Devaraju and A P Pathak, *AIP Conf. Proc, 1336, 264 (2011).*

5. "SHI Effects On Ge+SiO_2 Composite Films Prepared By RF Sputtering" N Srinivasa Rao, A P Pathak, G Devaraju, V Saikiran, S V S Nageswara Rao, *MRS Proceedings, 1354 (2011).*

6. A P Pathak, N. Srinivasa Rao, G. Devaraju, V. Saikiran and S. V. S. Nageswara Rao, *MRS Proceedings, 1354 (2011).*

7. N Srinivasa Rao, A P Pathak, N Sathish, G Devaraju, V Saikiran, *AIP Conf. Proc, 1336, 341 (2011).*

Conferences:

1. "Gold film assisted femtosecond laser fabrication of periodic surface structures on semiconductor substrates for SERS applications" presented as a **POSTER** at DAE-National Laser Symposium-24 held at RRCAT, Indore during 2-5 December 2015 (24th DAE NLS).

2. "Influence of solvent on the optical and structural properties of Germanium nanoparticles synthesized by nanosecond laser ablation in liquids" presented a **POSTER** at International Conference on Fibre Optics and Photonics 2014 held at IIT Kharagpur India during 13-16 December 2014 (PHOTONICS 2014).

3. "Optical properties of Ge nanoparticles synthesized in different liquids by pulsed laser ablation" **POSTER** presentation at International Conference on Frontiers in Nano Science, Technology and Applications (FiNSTA 2014) held at SSIHL, Puttaparthi during 20-22, December 2014.

4. "Optical properties of Germanium nanoparticles synthesized by pulsed laser ablation in acetone" **POSTER** presentation at DAE-National Laser Symposium-23 held at Sri Venkateswara University Tirupathi during 3-6 December 2014 (23rd DAE NLS).

5. "Structural and optical properties of Ge nanocrystals embedded in SiO_2 prepared by1 MeV Ge implantation" **ORAL PRESENTATION** at 22nd International Conference on the Application of Accelerators in Research and Industry (CAARI 2012), held at Fort Worth, Texas, USA during August 5-10, 2012.

6. "Effects of Ion irradiation on GeO_2 nanocrystals-fluence dependence study" **POSTER** presentation at 22nd International Conference on the Application of Accelerators in Research and Industry (CAARI 2012), held at Fort Worth, Texas, USA during August 5-10, 2012.

7. "Synthesis of Si nanocrystals embedded in SiO_2 matrix" **POSTER** presentation as a young researcher at International Conference on Nanoscience and Nanotechnology (ICONSAT 2012) in Hyderabad during January 20-23 2012.

8. "SHI irradiation induced effects in functionalized MWCNTs" **POSTER** presentation at winter school on physics and chemistry of materials" held at JNCASR Bangalore during 5-10 Dec 2011.

9. "Ion beam irradiation effects on Ge nanocrystals synthesized by using RF sputtering followed by RTA" **POSTER** presentation at 25th International Conference on Atomic Collisions in Solids (ICACS 2012), held at Kyoto Japan during October 21-25, 2012.

10. "Synthesis, Characterization and Dense Ionization effects on Ge nanocrystals embedded in SiO_2" **POSTER** presentation at 21st International Conference on Ion Beam Analysis (IBA–2013), held at Seattle, WA, USA during August 23-28, 2013.

11. "Study of swift heavy ion irradiation effects on Si nanoparticles synthesisized by picosecond laser ablation in liquids" **POSTER** presentation at 21st International Conference on Ion Beam Analysis (IBA–2013), held at Seattle, WA, USA during August 23-28, 2013.

Books and book chapters:

- A book entitled ***"Ion beam Induced Modification of Semiconductor Nanocrystals – Si & Ge Nanocrystals"*** published on 18-11-2014 by Scholar's Press Publishing Group. ISBN: 978-3-639-66861-2.

Present and past research experience:

Current Post-Doctoral Research outline:

My ongoing post-doctoral research project is aimed at ultrafast laser micro/nanostructuring for integrated optical devices in semiconductors and metals. The fabricated nano/microstructures by laser ablation in liquids have many applications in optical lighting and optical field confinement. High intensity pulses on a material under controlled pressure and temperature conditions can lead to the generation of nanoparticles of the material in the solution. Laser ablation in liquids has an advantage as it can be performed at room temperatures and simultaneously the control on the properties of the nanoparticles can be achieved by varying the liquid properties and laser ablation parameters. Fabrication of Ge and Si nanoparticles has been studied by laser ablation in various liquids such as water, acetone, chloroform and toluene. The optical and structural properties of the fabricated nanoparticles and the influence of the solvent on the optical and structural properties have been investigated in detail. The laser fabricated structures on the bulk substrate have also been characterized by different methods. Further, the application of these structures for the optical emitting and optical field enhancement have also been investigated. The characteristic properties in the nanostructuring of Si and Ge surfaces as a function of laser parameters such as wavelength, polarization, superimposed pulse number, fluence and the medium under which the irradiation is performed (air or liquid) have been studied. As a result, two Publications (Front. Phys. 2014 and Asia. J. Phy 2015) have been obtained from this significant work. However, some of the other progressive works are under preparation (accepted and under review/preparation). We are working on the synthesis of metal nanoparticles by laser ablation method for applications in SERS. We are also studying the response of CNTs and Graphite for the fs laser irradiation and the formation of nanostructures of graphene, graphene nanoribbons, and graphitic carbon quantum dots.

PhD Thesis Summary:

In my PhD work, we have studied the synthesis of semiconducting (Si and Ge) NCs and investigated the heavy ion irradiation induced effects on the synthesized NCs. The electronic energy loss and fluence dependence studies were carried out in tailoring the size and shape of the NC's. The highlight of the work is as follows. We have reported for the first time that the average NC size reduces in size and gets partially amorphized with the increase in fluence. The TEM results suggest that the formation of new smaller nanoparticles in the vicinities of bigger nanocrystals. We have synthesized Ge NCs in SiO_2 matrix by RF co-sputtering, followed by Rapid Thermal Annealing (RTA). We have used these annealed samples to study the effects of heavy ion irradiation (120 MeV Ag and 80 MeV Ni at different fluences) on the Ge NCs. We have observed from XRD, Raman and TEM measurements that the size of the Ge NCs decreases with the increase in ion fluence. This is due to the interaction of tracks formed in SiO_2 during irradiation with the embedded Ge NCs. Owing to this interaction, some of the Ge atoms might have diffused from the larger Ge NCs and dissolved into SiO_2. We have also synthesized Ge NCs embedded in HfO_2 by using RF sputtering and subsequent RTA or heavy ion irradiation. GeO_2 nanocrystal (NC) thin films were deposited on Si substrate using the magnetron sputtering method and

irradiated with swift heavy ions of 80 MeV Ni at various fluences. The results suggest that GeO_2 NCs are also reduced in size and few of them are transformed into Ge NCs due to the effects of electronic energy deposition by the irradiating ions. This formation of Ge NCs in the ion-irradiated GeO_2 NC thin films has been understood on the basis of irradiation-induced separation of oxygen from GeO_2 NCs. Finally, we have studied the effects of SHI irradiation on the Si nanoparticles synthesized by laser ablation. Here we have observed that along with reduction in size additionally at higher fluences the nanoparticles gets amorphous and a formation of smaller NCs in the vicinities of bigger nanoparticles. (around 7 publications have come out from the results of the thesis). In my PhD, we have also studied the electronic excitation induced effects by heavy ion irradiation on the MWCNTs and the understanding of the buckling nature of CNTs and the influence of irradiation on the Fe NPs or NRs inside the CNTs.

References:

1. Prof A P Pathak,
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   University of Hyderabad,
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   School of Physics,
   University of Hyderabad,
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