

Dr. Kapil Saxena

Assistant Professor

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Research Interest

Raman Spectroscopy, Optical Properties of Materials, Nanoscience and Nanotechnology, Semiconductor nanostructures/nanowires, Carbon Nanostructures, Ion-implantation, Electron Field emission.

Educational Details

Doctor of Philosophy (Ph.D)

Indian Institute of Technology Delhi (2015)

Master of Science (M.Sc.) in Physics,

M.J.P. Rohilkhand University, Bareilly (2005)

Fellowships, Scholarships and Awards

- National eligibility Test (NET).
- Junior/ Senior Research Fellowship (JRF / SRF) & scholarship by CSIR, India for carrying out Ph.D. in India (2007).
- 2011 - Travel scholarship from IIT Delhi to attend the ICAVS-6 conference in the USA.
- National Post-Doctoral Fellowship (NPDF) by SERB-DST, India (2016).

About PhD Thesis

Thesis title "Raman Study of Disorder in the graphite-based systems". Supervisor's name **Prof. V.D. Vankar and Prof. A.K. Shukla**, Department of Physics IIT Delhi, India. (2015)

Post Doctoral Experience

- Project entitled "Graphene/silicon nanowires based structures for sensing and energy harvesting applications" under the guidance of **Prof. Vinay Gupta** in Department of Physics and Astrophysics, University of Delhi, India. (July 2016 to December 2017)

Technical Skills

- **Raman Spectrometer:** Micro-Raman spectrometer (Horiba Jobin-Yvon T64000 Triple monochromator).
- **Argon ion& He-Ne laser:** COHERENT laser. Other laser (He-Ne) is also used in the lab. These lasers are used for different purposes including the laser induced etching experiments, Raman and PL spectroscopic studies.
- **CO₂ Laser and Laser Deposition Setup:** 400 watts high power CO₂ laser used in Laser Deposition Setup. It is used for fabrication of single wall CNT and semiconductor nanostructures.
- **Sputtering and Thermal evaporation setups:** These setups are used to deposit metal thin films.

- **Analyzing the characterizing tools:** Proficiency in analyzing the SEM, TEM, AFM, and XRD results for understanding the material behavior in nanoscale.
- **Others:** Vacuum pumps (Rotary, Root pump, Turbo-molecular etc.), Thermal evaporation setups.

Educational Involvement

- Served as Assistant Professor (permanent position) in Kamla Nehru Institute of Technology (KNIT), Sultanpur from December 14, 2017- till now.
- Served as Assistant Professor (Ad-hoc) in Acharya Narendra Dev College (University of Delhi) from August, 2013- July, 2014.
- Teaching Assistant – 4.5 years in IIT Delhi.
- Served as a teaching assistant in course PHL 120 (Physics of materials) to take tutorial classes of under graduate students (B. Tech.) for the academic year 2012-13
- Served as a teaching assistant in B. Tech. (Electronics) laboratory for the academic year 2009-12 for guiding the students to carry out experiments.

Publications

International Journals:

1. The correlation of resistivity with the crystal size present in silicon nanowires through confinement based models” Vikas Kashyap, Neeru Chaudhary, Navdeep Goyal and Kapil Saxena *Materials Letters*, 301. 130312 (2021)
2. “Porous graphene network from graphene oxide: Facile self-assembly and temperature dependent structural evolution” Anusuya T, Prakash J, Devesh K. Pathak, Kapil Saxena, Rajesh Kumar and Vivek Kumar*, *Materials Today Communications* 26, 101930 (2021).
3. “Back surface field approach and ITO/top electrode based structural optimization of high efficient silicon solar cell” Navraj Poudel, T Anusuya, Kapil Saxena, Rajesh Kumar and Vivek Kumar,* *Advances in Materials and Processing Technologies (Taylor & Francis)* 5, 338 (2019).
4. “Study of Porous Silicon Prepared Using Metal-Induced Etching (MIE): a Comparison with Laser-Induced Etching (LIE)” Shailendra K Saxena, Vivek Kumar, Hari M. Rai, Gayatri Sahu, Ravi K. Late, Kapil Saxena, A. K. Shukla, Pankaj R Sagdeo and Rajesh Kumar, *Silicon* 9, 483 (2017).
5. “Silicon nanowires prepared by metal induced etching (MIE): Good field emitters” Vivek Kumar, Shailendra K. Saxena, Vishakha Kaushik, Kapil Saxena, A.K. Shukla and Rajesh Kumar, *RSC Advances* 4, 57799 (2014).
6. “Raman and electron field emission studies of the order–disorder transition in Ar ion implanted graphite” Kapil Saxena, A K Shukla, D K Avasthi, D Kaviraj and V D Vankar, *Nuclear Instrument and Methods in Physics Research*, B 318, 276-280 (2014)
7. “Raman analysis of coupling of light to vibrational states of amorphous carbon”, K. Saxena, V. Kumar, A. K. Shukla *Ind J. of Physics*, 88, 10, 1099-1103 (2014).
8. “Size dependent photoluminescence in silicon nanostructures: Quantum confinement effect” Vivek Kumar, Kapil Saxena and A.K. Shukla, *Micro & Nano Letter* 8 6 311 (2013).

9. "Investigations of spatial disorder in the graphite by Raman lineshape analysis" Kapil Saxena, Vivek Kumar and A.K. Shukla, *Can. J. Phys.* 90, 975 (2012).

Conference Proceedings:

1. "Band gap modification for enhancement in optoelectronic properties with silicon nanowire" Vikas Kashyap, Neeru Chaudhary, Navdeep Goyal and Kapil Saxena, *Material Today Proceedings* 45 (6), 5221 (2021).
2. "Fabrication and Characterization of Silicon Nanowires with MACE Method to Influence the Optical Properties" Vikas Kashyap, Neeru Chaudhary, Navdeep Goyal and Kapil Saxena *Material Today Proceedings*, (2021).
3. "The Analysis Of Fabricated Silicon Nanowires With Various Techniques: A Roadmap To Energy Saving World" Vikas Kashyap, Neeru Chaudhary, Navdeep Goyal and Kapil Saxena, *IOP Conf. Ser.: Mater. Sci. Eng.* 1033, 012047 (2021).
4. "Cost Effective Synthesis of Semiconductor Nanowire" Vikas Kashyap, Neeru Chaudhary, Navdeep Goyal and Kapil Saxena *AIP Conf. Proceeding (AIP Conference Proceedings* 2162, 020165 (2019);
5. "Phonon Softening of Raman Modes in graphite as a Function of Spatial Disorder" Kapil Saxena, Vivek Kumar and A.K. Shukla, *AIP Conf. Proc.* 1536, 367 (2013).
6. "Degradation of Luminescence Stability in Laser Etched Silicon Nanostructures" Vivek Kumar, Kapil Saxena and A.K. Shukla, *AIP Conf. Proc.* 1536, 195 (2013).

Books:

1. Basic of Quantum Mechanics (Hardback), Auther: Kapil Saxena and Vikas Kashyap, ISBN 13 : 9789388854689 Publisher: Discovery Publishing House (New Delhi) (2021)

Book Chapters:

1. "The Study of Enhancement of Optoelectronic Properties with Vertically Aligned Silicon Nanowire" Vikas Kashyap, Neeru Chaudhary, Navdeep Goyal and **Kapil Saxena** book chapter *Editor: Dr Bhatu Y. Bagul " e- International conference ethical and quality aspect in nanoscience and nanotechnology (ICEQANNR) (2020)"*Page (300-304) [ISBN- 978-93-87098-56-5].
2. "Raman study of graphite by double resonance phenomenon" Kapil Saxena, A.K. Shukla and V. D. Vankar, book on *Synthesis and Characterization Nanostructured Materials*, Editors: V. Rajendranm, B. Hillbrands, K. Saminathan and K.E. Geckerler (Macmillan Publications India Limited, 2010) p 347, [ISBN13 : 978-0230-33193-8].
3. "Study of structural transformation from graphite to amorphous carbon by Raman spectroscopy" Kapil Saxena and A.K. Shukla, book on *"Advances in Nanoscience"*, *Nirmal Publications, Delhi, India, ISBN : 9788193175632*

International Conferences:

1. Presented a paper entitle "The Study of Enhancement of Optoelectronic Properties with Vertically Aligned Silicon Nanowire" in one day international e-conference Ethical And Quality Aspects in Nanoscience And Nanotechnology Research (ICEQANNR-2020) conducted by North Maharashtra University Jalgaon on 20th July 2020.

2. Attended a "2nd International Conference on Advanced Computing and Software Engineering (ICACSE-2019)", at Kamla Nehru Institute of Technology, Sultanpur (U. P.), February 08-09, 2019.
3. Presented a paper entitled "Raman investigation of Silicon structures: Phonon confinement effect" in 6th International Symposium on Integrated Functionalities (ISIF) held at Shangri - La's Eros Hotel, New Delhi during 10-13 December, 2017.
4. Presented a paper entitled "Thermodynamic study of low energy ion irradiation HOPG using Raman spectroscopy" in International Conference On Nanoscience and Nanotechnology (ICNN 2017) held at Babasaheb Bhimrao Ambedkar University, Lucknow, September 22-24, 2017.
5. "Phonon Softening of Raman Modes in Graphite as a Function of Spatial Disorder" Kapil Saxena, Vivek Kumar and A.K. Shukla, International Conference on Recent Trends in Applied Physics and Material Science, to be held at Government College of Engineering & Technology Bikaner, (India) (February 1 - 2, 2013), For *Poster presentation*.
6. "Degradation of Luminescence Stability in Laser Etched Silicon Nanostructures" Vivek Kumar, Kapil Saxena and A.K. Shukla, International Conference on Recent Trends in Applied Physics and Material Science, to be held at Government College of Engineering & Technology Bikaner, (India) (February 1 - 2, 2013), For *Poster presentation*.
7. "Raman and X-ray diffraction studies of polycrystalline graphite", Kapil Saxena and A.K. Shukla, Sixth International Conference on Advanced Vibrational Spectroscopy, ICAVS 6, Sonoma, California USA (June 12-17, 2011) For *Poster presentation*.
8. "Raman study of disorder in the polycrystalline graphite", Kapil Saxena, B.L. Sueeval and A.K. Shukla, XXXVI OSI Symposium on Frontier in Optics and Photonics (FOP11) held at IITD (Dec. 3-5, 2011) For *Poster presentation*.
9. "Raman study of graphite by double resonance phenomenon", Kapil Saxena, A.K. Shukla and V.D. Vankar, IUPAC-Sponsored International Conference on Nanomaterials and Nanotechnology, NANO-2010, held at Department of Physics, K.S. Rangasamy College of Technology (KSRCT), Tiruchengode, Tamilnadu, India (December 13-16, 2010) For *Oral presentation*.

National Conferences:

1. Attended two days National conference on "Equity: Achievements & Challenges in India" under the aegis of NPIU under TEQIP III at College of Engineering Pune (COEP), Maharashtra, 15-16 March, 2019.

Workshop / FDP / STC & Schools:

1. Attended one week FDP on "Python programming with industry Perspective" through NKN Winter Courses-2019-2020 at KNIT Sultanpur (Dec 2-6, 2019).
2. Attended AICTE sponsored two weeks FDP on "Process improvement Lean and Six sigma" at KNIT Sultanpur (Nov. 20 - Dec. 01, 2019).

3. Attended one week FDP through ICT mode on "Control and Automation" organized by NITTTR Kolkata at KNIT Sultanpur (Nov 18-22, 2019).
4. Attended one week FDP on "Mechatronics and Instrumentation" at KNIT Sultanpur (Oct. 18-22,2019)
5. Attended one day workshop on entitled on "NBA Accreditation: Regulations and Procedure" at MNNIT Allahabad, Prayagraj on July 27, 2019.
6. Attended one week Summer FDP entitled on "Robotics & AI" organized by E & ICT Academy at KNIT Sultanpur, June 24-28, 2019.
7. Attended one week short term course (STC) entitled on "Emerging Power Technologies & Management (EPTM-2019) at KNIT Sultanpur, 08-13 April, 2019.
8. Attended one day workshop entitled "Sensitization workshop on Equity Action Plan" at Punjab Engineering College Chandigarh organized by NPIU- SPIU in association with the World Bank, 19 November 2018.
9. Attended one week short term course (STC) entitled on "Lasers & Their Applications" at NITTTR Chandigarh, 06 -10 August 2018.
10. Attended two days workshop on "Outcome Based Accreditation For Undergraduate Engineering Programs" under the aegis of NPIU under TEQIP III at KNIT Sultanpur, India, March 19-20, 2018.
11. Attended one week faculty development program (FDP) on "Intellectual Property Right and Entrepreneurship" held at KNIT Sultanpur, India, Feb.13-17, 2018.
12. International Workshop on Surface Science and Engineering, Indian Institute of Technology Indore (India), (March 4 - 5, 2013).
13. - Given oral presentation on "Raman study of carbon nanostructures".
14. India Singapore Joint Symposium, held at Department of Physics, IIT Delhi (India) (February 20 - 22, 2012).
15. A Symposium on Nanoscience and Nanotechnology, held at IIT Delhi (India) (March 13, 2010).
16. EU-India Workshop and EICOON School on Nanomaterials for Sustainable Energy, held at India Habitat Centre, New Delhi (India) (November 1 - 4, 2010).

Organizer/Coordinator/Convener :-

1. Organized a Faculty Development Program on "ICT tools for Teaching, Learning Process & Institutes" through NKN Winter Courses-2019-2020 at KNIT Sultanpur (Jan 13-17, 2020).
2. Organized a one week short term course on "Operational Research: Techniques and Applications" at KNIT Sultanpur (Feb. 3-7, 2020).
3. Organized a one week short term course on "Numerical Techniques for Scientific Computation" at KNIT Sultanpur (July 15-19,2019).
4. Member of organizing committee in AICTE sponsored two weeks FDP on "Process improvement Lean and Six sigma" at KNIT Sultanpur (Nov. 20 - Dec. 01, 2019).

5. Organizing member in “2nd International Conference on Advanced Computing and Software Engineering (ICACSE-2019)”, at Kamla Nehru Institute of Technology, Sultanpur (U. P.), February 08-09, 2019.

Administrative work:-

1. Worked as an Equity Action Plan (EAP) Coordinator TEQIP III, KNIT Sultanpur, India from May 03, 2018-till date.
2. Worked as a Centre Controller for UPSEE-2018 at Future Institute of Management & Technology, Bareilly, U.P., India, 27-29 April 2018.
3. Working as Assistant Warden for Khosla Hostel, KNIT Sultanpur, India. From March 12, 2018 to till date.
4. Member in Departmental NBA/NAAC committee from 13/06/2018 onwards.