Professor Kuldeep Kumar,
Department of Physics,
S.G.T.B Khalsa College,
University of Delhi, Delhi
+91- 8826076455
kuldeep@sgtbkhlsa.du.ac.in

Prof. Kuldeep Kumar

Material Science Research Laboratory

Material Science Research Laboratory at SGTB Khalsa College support study of new generation materials and perform experiments to support theoretical concepts and it works with universities, industry, standards bodies, and other government laboratories to improve materials measurements and standards. Material Science Research Laboratory is equiped with Thermal Evaporation (Diffusion Pump and Terbomolecular Pump), Vacuum furnace (Tube and Muffled) for single crystal growth, Spin coating unit and characterization tool such as Solar Simulator for solar cell characterization, UV-visible spectroscopy, Photoluminiscence spectroscopy, Key Sight IV measurement equipment, Resistivty measurement (van der pauw method), etc.

- Material Science (Thin Film fabrication and Characterization).
- Nanotechnology (Nano Material Processing using Bioysnthsis).
- Band Structure Calculations (First prinicple calculations using Abinit, MindLab, Quantum Espresso and Wien-2K). Physics Education (Basic Experiments and Analysis in Physics)
- Surface Plasmon Resoance in Nano Science (Mie Theory, Discrete Dipole Approximation based Theoritical Modelling and Simulation for core-shell nanoparticles, Mathematical Modelling in Nano Science)
- Solar Cells (Fabrication and Characterization and 1D calculations for solar cell simulation using python and mathematica)
- Data Analysis of X-ray photoelectron spectroscopy, Raman Spectroscopy, UV-Visible Spectroscopy, Ellipsometriy, SEM, TEM and X-ray Diffraction.

Education

2008–2015 **G. G. S. Indraprastha, University, Dwarka, New Delhi**, *Ph.D.*, *Material Science*

2005–2007 **C. C. S. University, Meerut**, *M.Phil.*, *Material Science*

2002–2004 **C. C. S. University, Meerut**, *M.Sc.*, *Physics with Electronics*

1999–2002 **C. C. S. University, Meerut**, *B.Sc.*, *Physics, Chemistry, Mathematics*

Technical Skills

Coding & Tools	C++, Mathematica, Python, R, MATLAB, Latex, MS office, Excel
Packages	Band Structure Calculation (Abinit, Quantum Esspresso, Wien-2k), Electronic Circuit Simulator (QUCS), Nano-particles Absorption based Calculations on Discrete Dipole Approximation (DDSCAT)
Computational Skills	Atomistic modelling-DFT, and multi-scale modelling.
Experimental Skills	Nanostructured materials fabrication, Thin films, Sensors and Advanced characterization techniques (XRD, SEM, TEM, EDS, UV-visible spectroscopy, Raman Spectroscopy, Photoluminisence Spectroscopy etc.)

Professional Recognitions

Member of American Chemical Society (ACS) & Royal Society of Chemistry (RSC)

Masters Thesis

Title *Optical properties of CsCl Thin Films Deposited by Thermal Evaporation Method*

Supervisors Professor R. Kumar (CCSU) & Professor P. Arun (DU)

Description This thesis is based on the structural and optical properties of Thin films of CsCl of various thickness. A relationship was estabilised between optical and structural properties of CsCl thin films

Ph.D. Thesis

Title *A Study of Optical properties of Alkali Halides (CsX, X = Cl, Br & I) Thin Films Deposited by thermal Evaporation Method*

Supervisors Professor C. R. Kant (GGSIP University) & Professor P. Arun (Univesity of Delhi)

Description It was explained why cesiun chloride does not form SPR easily while other halide like CsI and CsBr can? it was also explained how F-center transform to metal cluster or metal nanoparticles via volume diffusion and surface diffision along with parameters that control this transformation.

Work Experience-19 years

July 2006 – July 2019 **Assistant Professor**, Department of Physics, S.G.T.B. Khalsa College, University of Delhi

July 2019 – Augest 2023 **Associate Professor**, Department of Physics, S.G.T.B. Khalsa College, University of Delhi

July 2022 — **Professor**, Department of Physics, S.G.T.B. Khalsa College, University of Delhi

Academic Projects: Completed

1^{st} March 2008– 31^{st} March 2010 **Study of Characterization of Some Alkali Halide Thin films (PI)-UGC Rs 90000/-**

1^{st} March 2010– 31^{st} March 2013 **Study of Surface Plasmon in Nano-composite Thin Films (Co-PI) DST-Rs 12,81,000/-**

1^{st} March 2013– 31^{st} March 2014 **Bio-synthesis of Silver Nano Particles (PI) DBT-Star-College Rs-30,000/-**

1^{st} March 2013– 31^{st} March 2015 **Role of Nano Crystals in Energy Harvesting using SnS Thin Films (PI) DU Innovation Project Rs-6,00,000/**

1^{st} March 2015– 31^{st} March 2016 **To Fabricate and Study Solar Cells with SnS Nano-crystalline and ZnO Nano-rods (PI) DU Innovation Project-Rs 5,00,000/**

Position of Responsibility

April 2012-15 **Language Mentor**, *Mentoring Hindi-midium student by addressing transition of culture*
Adminstrative Responsibility, *Convener (Physics), Convenor (Maintenance), Memebr (Purchase and Mantenance), Member (Admission and Examination), Convenor (Discipline)*

Extra Curricular

26 Jan-2016 **IInd Award, Physics Quiz Contest**, – *Maharaj Singh College, Saharanpur.*

International Journals

- Sanjeev Kumar, Manveer Singh, Siddhartha, **Kuldeep Kumar**, Bhawani Shankar, Nimmi Singh, Synthesis of novel Ce^{3+} doped $NaLi_2PO_4$ UV-A emitting phosphor, In Press, Journal Pre-proof. https://doi.org/10.1016/j.jphotochem.2025.116289.
- T Mounika, SL Belagali, I Singh, N Singh, **Kuldeep Kumar**, P Arun, Optimizing Spin-Coat Speed for Fabrication of P3HT: PCBM Solar Cells, Journal of Material Sciences & Manufacturing Research. SRC/JMSMR-201, 2024.
- S Kumar, **Kuldeep Kumar**, D Jain, M Singh, Investigation of elastic scattering cross-sections of electron with neon atoms, Chemical Physics Impact 8, 100503, 2024. doi: https://doi.org/10.1016/j.chphi.2024.100503.
- R Kaur, S Singh, I Jhamb, N Singh, **Kuldeep Kumar**, Mathematical Model of Star Formation in the Presence of External Perturbations, Bulgarian Astronomical Journal, vol.41, 2024.
- T Mounika, SL Belagali, I Singh, N Singh, **Kuldeep Kumar**, P Arun, Optimizing Spin-Coat Speed for Fabrication of P3HT: PCBM Solar Cells, Journal of Material Sciences & Manufacturing Research. SRC/JMSMR-201. doi: doi.org/10.47363/JMSMR/2024 (5)
- T Mounika, SL Belagali, I Singh, **Kuldeep Kumar**, P Arun, An Experimental Insight into the Reasons for Deterioration of P3HT: PCBM Bulk Heterojunction Solar Cells, Applied Solar Energy 59 (4), 410-415, doi: https://doi.org/10.3103/S0003701X23600509.
- M Kumar, R Kumar, **Kuldeep Kumar**, U Verma, R Kaushik, Electron impact ionization cross-sections for CH3 and SiH3 radical targets, Chemical Physics Impact 6, 100210 doi: https://doi.org/10.1016/j.chphi.2023.100210.
- Shivangi Dubey, **Kuldeep Kumar** and P. Arun, Surface Plasmon Resonance in Metal Nano-spheres Explained with LCR Circuits, Phys. Chem. Chem. Phys., 2023. doi. https://doi.org/10.1039/D3CP00589E
- Manoj Kumar, Rajeev Kumar, **Kuldeep Kumar**, Updesh Verma, Rajeev Kaushik, Electron Impact Ionization Cross-Sections for CH_3 and SiH_3 Radical Targets, Chemical Physics Impact, Volume 6, June 2023, 100210. https://doi.org/10.1016/j.chphi.2023.100210.
- Sanjeev Kumar, Garima Jain, **Kuldeep Kumar**, B. P.Singh & S. R. Dhkate; A Review on Polymeric Photoluminiscent Nanofibers: Inorganic, Organic and Perovskites Additives for Solid-State Lighting Application. Polym. Sci. Ser. A 64, 367–392 (2022). https://doi.org/10.1134/S0965545X22700213
- S Kumar, G Jain, **K Kumar**, A. Gupta, J. S. Tawale, B.P. Singh, S.R. Dhakate, P.D. Sahare, Stress-Induced Structural Phase Transition in Polystyrene/$NaYF_4$:Eu^{3+} Photoluminescent Electrospun Nanofibers, Journal of Nanomaterials, 10 (2022).
- S Kumar, G Jain, **K Kumar**, AGupta, BP Singh, SR Dhakate, A facile fabrication of poly(methyl methacrylate)/ α-$NaYF_4$:Eu^{3+} tunable electrospun photoluminescent nanofibers, Applied Nanoscience 10 (10), 3857-3864 (2020).
- RK Khurana, I Singh, **K Kumar**, P Arun, D Madhwal, Luminescence behavior of CsI: Ag thin films, Materials Science in Semiconductor Processing 110, 104881 (2020).
- S Kumar, G Jain, **K Kumar**, A Gupta, BP Singh, SR Dhakate, A novel fabrication of electrospun polyacrylonitrile/ $NaYF_4$: Eu^{+3} light emitting nanofibers, RSC Adv., 10, 24855-24861 (2020).
- A Singh, **K Kumar**, J Kaur Wadhwa, P Arun, Effect of Life Expectancy on Technological Development, Technium Social Sciences Journal 5 (March), 225-237 (2020).
- Y Gupta, A Palakkandy, S V. Syrotyuk, **K Kumar**, S Arora, A Novel Route for Fabrication of Stable $CsPbI_3$ Perovskite Thin Film by Thermal Evaporation, ChemistrySelect 4 (17), 5091-5096 (2019).
- **K Kumar**, P Arun, SPR in Cesium Halide Thin Films Due to Embedded Elliptic Cesium Metal Nano-Particles, Ukrainian Journal of Physics 63 (9), 824-824 (2018).
- VK Tulasidas, SL Belagali, A Palakkandy, **K Kumar**, Photoluminescence and applications of Ni: ZnS in photovoltaic cells, Japanese Journal of Applied Physics 57 (5), 052302 (2018).
- **K Kumar**, P Arun, Defect diffusion assisted formation of cesium metal clusters in cesium halide thin films, Journal of Taibah University for Science, 11 (6), 1238-1244 (2016).
- Lovkush, Chhaya Ravikant, P. Arun, **Kuldeep Kumar**, SPR sensitivity of silver nanorods in CsBr-Ag Nanocomposite thin films, Material Research Express (2016).
- **Kuldeep Kumar**, P. Arun, Chhaya Ravi Kant, Bala Krishna Juluri, Metal Cluster's effect on the Optical

Properties of thin films, Apllied Physics latters 100, (2012) 243106.
- P. Arun, **Kuldeep Kumar**, Mamta, Considerations for Anderson-Bridge Experiment, Resonance, March 2010.
- **Kuldeep Kumar**, Mamta, P. Arun, Jaswinder Singh, Whither Pure Science in India: a survey of graduate physics students of a representative University of Delhi college, Current science, Vol No. 9, 10 Nov 2010.
- **Kuldeep Kumar**, P. Arun, Chhaya Ravi Kant, N. C. Mehra, Vincent Mathew, The effect of cesium metal clusters on the optical properties of cesium iodide thin films, Appl. Phys A (2010) 99; 305-310.
- **Kuldeep Kumar**, P Arun, Chhaya Ravi Kant, N. C. Mehra, L. Makinistian, E. A. Albanesi, Effect of residual stress on the optical properties of CsCl thin films, J Phys. Chem. Solids (2010), Vol 71, Issue 3, March 2010, 163-169.

International Conference Proceedings

- Vikram S Yadav, Devendra K Sahu, Manveer Singh, Kuldeep Kumar, D. C. Dhubkarya and Yashpal Singh, Characterization of Nano-Crystalline Diamond like Carbon (DLC) Films with Substrate Temperature Using Dense Plasma Focusing Method AIP Conf. Proc. 1247, 363 (2010), Conference date:20–22 October 2009.

Books

- A Study of Surface Plasmon Resonance: Cesium Halide Thin Films
  Author: Kuldeep Kumar,Publisher: Scholars' Press (July 17, 2015) (Germany) ISBN:978-3-639-76775-9.
- Synthesis & Characterization : Infrared Quantum Dot Detector
  Authors: Devendra Kumar Rana and Kuldeep Kumar, Publisher: Scholars' Press (August 18, 2016) (Germany) ISBN: 978-3-639-86186-0

National Conference & Workshop

- Bio-inspired, Reaction-Coupled Supramolecular Polymers since 31th Jan 2022 to 31th Jan 2022, DBT and National Academy of Science.
- Future of the Internal Combustion Engines and Existential Threat from Battery Electric Vehicles? since 28th Jan 2022 to 28th Jan 2022, DBT and National Academy of Science.
- Metamaterials open new horizons in electromagnetism since 26th Jan 2022 to 26th Jan 2022, DBT and National Academy of Science.
- Evolution of Darwin's Finches from Ecology to Genomics since 24th Jan 2022 to 24th Jan 2022, DBT and National Academy of Science
- Organic-Inorganic Hybrid Materials for Capture, Separation and Chemical Conversion of CO2 since 21th Jan 2022 to 21th Jan 2022, DBT and National Academy of Science.
- Alzheimer's Disease: Diagnostics to Therapeutics since 19th Jan 2022 to 19th Jan 2022, DBT and National Academy of Science.
- 8th BerkeleyGW Tutorial Workshop, since 10th Jan 2022 to 12th Jan 2022, Lawrence Berkeley National Laboratory, Berkeley, California.
- 3rd Berkeley Excited States Conference (BESC2022), since 13th Jan 2022 to 14th Jan 2022, Lawrence Berkeley National Laboratory, Berkeley, California
- Advances in Polymer Nanocomposites since 18th Oct 2021 to 19th Oct 2021, ACS Seminar, Indian Institute of Technology Roorkee.
- Understanding Plagiarism Detection Software Ouriginal since 6th April 2021 to 6th April 2021, University of Delhi.
- Online Refresher course on Blended Learning & Flipped Classroom since 8th March 2021 to 22nd March 2021, Teaching Learning Centre, Ramanujan College, University of Delhi.
- FDP on Global Economy, Finance, Industry and Business: Emerging Trends and Challenges since 24th Feb 2021 to 3rd March 2021, Teaching Learning Centre, Ramanujan College, University of Delhi.
- Online Refresher course in Nanoscience, Batch X since 9th Oct 2020 to 22nd Oct 2020, University of Madras, Chennai.
- A Voyage through time: Dynamics at molecular length and time scales since 8th Oct 2020 to 8th Oct 2020, DBT and National Academy of Science.

- A New Measure: The Reform of the International System of Units Nobel Laureate William D. Phillips since 6th Oct 2020 to 6th Oct 2020, DBT and National Academy of Science.
- FDP on Transforming governance in india: issues and concerns, since 21th Sept 2020 to 27th Sept, 2020, Teaching Learning Centre, Ramanujan College, University of Delhi.
- Mastering in the Publishing Process since 28th July 2020 to 28th July 2020, DST & ACS.
- Digital Kranti and Hindi since 24th Oct 2019 to 25th Oct 2019, Uttar Pradesh Bhasha Sansthan, Lucknow & SGTB Khalsa college, University of Delhi.
- Traninig on Workshop Nanofabrication Technologies since 3 rd Feb 2015 to 12 th Feb 2015, INUP, CENSE, IISc, Bangalore.
- Seminar on Youth, Adventure & Nation Building since 21th May 2015 to 21th May 2015, SGTB Khalsa College, University of Delhi, Delhi.
- Workshop on COMSOL Multiphysics 5.0, since 19 th Dec 2014 to 19 th Dec 2014 COMSOL, New Delhi.
- A Short Course on Spectroscopic Ellipsometry since 28 th October 2014 to 29 th October 2014, J. A. Woollam Co.Inc,. CSIR-CSIO, Chandigrah.
- Workshop on Nano Fabrication Technologies since 21 st May 2014 to 23 rd May 2014 CeNSE, IISc., Bangalore.
- Workshop on Microcontroller 8051 since 19 th Dec 2013 to 20th Dec 2013 Department of Electronics, SGTB Khalsa College, University of Delhi, Delhi.
- Conference on FRONTIER NANOMATERIALS FOR ENERGY (FNE-2012) since 9th Jan 2012 to 11th Jan 2012, Sharda University sponsered by Ministry of New and Renewable Energy/Ministry of Earth Sciences of India/ Indian National Science Academy/ Ministry of Defence/ CSIR.
- Workshop on Research Methodology Workshop since 27th Jan 2010 to 6 th Feb 2010, Department of Adult, Continuing Education, Extinction, Faculty of Social Sciences, University of Delhi. (ICSSR & MHRD)