Dr. Sandeep Gairola (PhD)

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Area of Interest

Manufacturing Technology, Natural fiber polymer composites, Processing of lignocellulosic materials to value-added products, Fire retardancy of polymers, Bio-based flame retardant.

Education Qualifications

Year	Degree/Examination	Institution/Board	CGPA/ Percentage
2019-24	Ph.D.	Indian Institute of Technology, Roorkee	8.429
2017-19	Postgraduate (PG)	National Institute of Technology Uttarakhand	8.350
2013-17	Graduate (UG)	THDC Institute of Hydropower Engineering and Technology	75.06 %
2012-13	Intermediate (XII)	Shri Bharat Mandir Inter College Rishikesh	86.00 %
2010-11	Matriculate (X)	Shri Bharat Mandir Inter College Rishikesh	83.00 %

Experience

1. ***Junior Engineer (JE) | Track Machine Organization | Indian Railways*** **June 2023 – Present**
   Specializing in materials testing and characterization at "Track Machine Maintenance Depot, Tughlakabad, New Delhi", responsible for ensuring material quality and equipment reliability.

2. ***Senior Research Fellow (SRF) | Indian Institute of Technology Roorkee*** **August 2021 - September 2022**
   A project SRF on the title "Conceptualization, Design, and Development of Forest Waste Based Sustainable Composite Materials" funded by NMHS (National Mission on Himalayan Studies) Implemented by the Ministry of Environment, Forest & Climate Change (MoEF&CC) under project grant no NMH-1336-DMC.

3. ***Junior Research Fellow (JRF) | Indian Institute of Technology Roorkee*** **August 2019 - August 2021**
   A project JRF on the title "Conceptualization, Design, and Development of Forest Waste Based Sustainable Composite Materials" funded by NMHS (National Mission on Himalayan Studies) Implemented by the Ministry of Environment, Forest & Climate Change (MoEF&CC) under project grant no NMH-1336-DMC.

Internships

1. *Practical Training | Uttrakhand Transport Corporation, Uttrakhand, India* **January 2015**
2. *Implant Training | Central Institute of Tool Design, Hyderabad, India* **July 2015-August 2015**
3. *Implant Training | Bharat Heavy Electricals Limited, Ranipur, Haridwar, India* **June 2016 - July 2016**

Projects

1. *Development and Characterization of Pistachio Shell Filler Based Epoxy Composites | National Institute of Technology Uttrakhand, India (Master of Technology Dissertation)* **July 2018 – June 2019**
2. *LPG Refrigeration System | THDC Institute of Hydropower Engineering and Technology, Uttrakhand, India (Bachelor of Technology Project)* **July 2016 - June 2017**

Awards / Scholarships / Academic Achievements

- A National Level Exam "Graduate Aptitude Test in Engineering (GATE)" is qualified.
- Attended TEQIP III sponsored one week online short-term course on Microwave Material Processing: Opportunities and Challenges organized by the Department of Mechanical Engineering, NIT Uttarakhand, Srinagar (Garhwal) during 14-18
  December 2020.
- Attended TEQIP III sponsored one week online short-term course on "Sustainable Composites: Processing, Characterization & Applications", 22nd 26th February 2021. NITUK/STC/SCPCA/2021/023.
- Attended TEQIP III sponsored one week online short-term course on "Recent advances in optical and magnetic materials", 22nd 26th February 2021. NITUK/PHY/2020/02/C-27.
- Attended TEQIP III sponsored one week online short-term course on "Microwave Material Processing: Opportunities and Challenges", 14 18 December 2020. NITUK/STC/MMPOC/2020/051.
- Attended TEQIP III sponsored one week online short-term course on "Recent Advancements in Micro-manufacturing" 23 27 November 2020. NITUK/STC/RAM/2020/031.
- Attended Online Short-term course on "Material Characterization Techniques" (24 to 28 August 2020). NITJ/IIC/0820/MCT349.
- Attended One week online short-term course on Recent Advances In Optical And Magnetic Materials sponsored by TEQIP-III jointly organized by Department of Physics NIT Uttarakhand and Sliet Longwal held during 14-18 December 2020.
- Attended workshop on Product and process innovation: Concepts, Protection and Commercialization June 21-25, 2021.
- Attended workshop on Indo-US virtual workshop: "Resource Efficient processing using Microwaves", 19-21 February 2021.
- Presented a Research Paper in International Conference on Advancements in Polymeric Materials APM-2022.
- Presented a Research Paper in Internation Conference on Advances in Materials & Processing: Challenges & Opportunities 17 - 19 October 2022
- Presented a Research Paper in Internation Conference on In All India Manufacturing Technology, Design and Research Conference.
- Awarded with merit certificate by INSPIRE by virtue of performance within top 1% of the school board at Class XII level Examination in March 2013.

Skills

Computer languages	C, C++, Java, HTML, DHTML, Basic CNC Programming (Milling and Turning)
Software Packages	AutoCAD, PRO-E, Ansys, Origin Pro, Microsoft: Word, Excel, Power-Point
Research Expertise/Hand on Experience/Analysis	**Fire testing techniques:** UL-94 burning tester, Limiting Oxygen Index (LOI) tester, Cone Calorimeter, as well as thermal analysis such as Thermogravimetry (TGA) and Heat Distortion Temperature (HDT) tester. **Mechanical testing techniques:** Universal testing machine (UTM), Dynamic Mechanical Analyzer (DMA), Scanning Electron Microscope (SEM). **Thermal testing techniques:** Differential scanning calorimetry (DSC), Thermogravimetric analysis (TGA), and Hardness tests (Durometer).

Positions of Responsibility & Extra Curriculars

1. *Teaching Assistant | National Programme on Technology Enhanced Learning (NPTEL), IIT Roorkee*
January 2023 - November 2023

2. *Placement Co-Ordinator at Department/Centre Level | Career Development Cell, CoEDMM, IIT Roorkee*
July 2022 - June 2023

Research Publications

1. **Gairola, Sandeep,** Shishir Sinha, and Inderdeep Singh. (2024). "Improvement of flame retardancy and anti-dripping properties of polypropylene composites via ecofriendly borax cross-linked lignocellulosic fiber". **Composite Structures**: 118822. https://doi.org/10.1016/j.compstruct.2024.118822
2. **Gairola, S.,** Naik, T. P., Sinha, S., & Singh, I. (2024). Environment aging of lignocellulosic fibers and their composites: Visual, mechanical, and microstructural aspects. ***International Journal of Biological Macromolecules***, 137722. https://doi.org/10.1016/j.ijbiomac.2024.137722
3. Sharma, H., Gairola, S., Mishra, J. P., & Singh, I. (2024). Preliminary studies into polypropylene composites reinforced with fruit waste biomass: A choice towards sustainability. ***Physica Scripta***. https://doi.org/10.1088/1402-4896/ad9649
4. Singh, G., **Gairola, S.,** & Singh, I. (2024). Mechanical, thermal, and flammability behavior of chitosan-modified date palm leaf-based polypropylene composites. ***Biomass Conversion and Biorefinery***, 1-10. https://doi.org/10.1007/s13399-024-06085-0
5. Sharma, H., **Gairola, S.,** Misra, J. P., & Singh, I. (2024) Epoxy composite dust reinforced novel polypropylene composites: An eco-friendly approach toward sustainable resource management. ***Polymer Engineering & Science***. http://doi.org/10.1002/pen.26968
6. Mahajan, A., **Gairola, S.,** Singh, I., & Arora, N. (2024). Optimized random forest model for predicting flexural properties of sustainable composites. ***Polymer Composites***, 45(12), 10700-10710. http://doi.org/10.1002/pc.28501
7. **Gairola, S.,** Chaitanya, S., Kaushik, D., Sinha, S., & Singh, I. (2024) Static and dynamic mechanical behavior of intra-hybrid jute/sisal-reinforced polypropylene composites: Effect of stacking sequence. ***Polymer Composites***. https://doi.org/10.1002/pc.28247
8. Kumar, K. S., **Gairola, S.**, & Singh, I. (2024). Waste Coffee Silverskin as a potential filler in sustainable composites: Mechanical, thermal, and microstructural analysis. ***Industrial Crops and Products***, 210, 118088. https://doi.org/10.1016/j.indcrop.2024.118088
9. Naik, T. P., **Gairola, S.**, Singh, I., & Sharma, A. K. (2024). Microwave-assisted alkali treatment of sisal fiber for fabricating composite as non-structural building materials. ***Construction and Building Materials***, 411, 134651. https://doi.org/10.1016/j.conbuildmat.2023.134651
10. Kumar, K. S., **Gairola, S.**, & Singh, I. (2023). Sustainable polymers and sisal fibers based green composites: A detailed characterization and analysis. ***Express Polymer Letters***, 17(10). https://doi.org/10.3144/expresspolymlett.2023.74
11. Chaudhary, S., **Gairola, S.,** & Sharma, H. (2023). Influence of fruit waste fillers on the thermal, mechanical, and morphological properties of flax/epoxy composites. ***Proceedings of the Institution of Mechanical Engineers, Part L: Journal of Materials: Design and Applications***, 14644207231192474. https://doi.org/10.1177/14644207231192474
12. Naik, T. P., **Gairola, S.,** Singh, I., & Sharma, A. K. Microwave-assisted molding of sisal/HDPE composites: Water absorption, diffusion kinetics and tribological behavior. ***Polymer Composites***. https://doi.org/10.1002/pc.27556
13. **Gairola, S.,** Sinha, S., & Singh, I. (2023). Thermal stability of extracted lignin from novel millet husk crop residue. ***International Journal of Biological Macromolecules***, 242, 124725. https://doi.org/10.1016/j.ijbiomac.2023.124725
14. **Gairola, S.,** Naik, T. P., Sinha, S., & Singh, I. (2023). Waste biomass and recycled polypropylene based jute hybrid composites for non-structural applications. Journal of Material Cycles and Waste Management, 1-14.
15. **Gairola, S.,** Sinha, S., & Singh, I. (2022). Novel millet husk crop-residue based thermoplastic composites: Waste to value creation. ***Industrial Crops and Products***, 182, 114891. https://doi.org/10.1016/j.indcrop.2022.114891
16. **Gairola, S.,** Naik, T. P., Sinha, S., & Singh, I. (2022). Corncob waste as a potential filler in biocomposites: A decision towards sustainability. ***Composites Part C: Open Access***, 9, 100317. https://doi.org/10.1016/j.jcomc.2022.100317
17. Kaushik, D., **Gairola, S.,** Varikkadinmel, B., & Singh, I. (2022). Static and dynamic mechanical behavior of intra-hybrid jute/sisal and flax/kenaf reinforced polypropylene composites. ***Polymer Composites***. https://doi.org/10.1002/pc.27114
18. Naik, T. P., **Gairola, S.,** Singh, I., & Sharma, A. K. (2022). Microwave Hybrid Heating for Moulding of Sisal/Jute/HDPE Composites. ***Journal of Natural Fibers***, 19(16), 13524- 13538. https://doi.org/10.1080/15440478.2022.2100553.

Conference Papers

1. **Gairola, S.,** Gairola, S., Sharma, H., & Rakesh, P. K. (2019, July). Impact behavior of pine needle fiber/pistachio shell filler-based epoxy composite. In Journal of Physics: Conference Series (Vol. 1240, No. 1, p. 012096). IOP Publishing. https://10.1088/1742-6596/1240/1/012096
2. **Gairola, S.,** Gairola, S., & Sharma, H. (2020). Environment Effect on impact strength of pistachio shell filler-based epoxy composites. In Advances in Applied Mechanical Engineering: Select Proceedings of ICAMER 2019 (pp. 801-808). Springer Singapore. https://doi.org/10.1007/978-981-15-1201-8_85
3. Naik, T. P., **Gairola, S.,** Patowari, P. K., & Singh, I. (2021). Wire electrical discharge machining of AA6063/B4C composite fabricated by stir-casting process. Materials Today: Proceedings, 46, 10845-10853. https://doi.org/10.1016/j.matpr.2021.01.806
4. **Gairola, S.,** Naik, T. P., Sinha, S., & Singh, I. (2022). Sliding wear performance of novel millet husk reinforced polypropylene composites. Materials Today: Proceedings. https://doi.org/10.1016/j.matpr.2022.12.209
5. **Gairola, S.,** Sharma, H., & Singh, I. (2022). Characterization and Optimization of Pistachio Shell Filler-Based Epoxy Composites Using TOPSIS. In Advances in Micro and Nano Manufacturing and Surface Engineering: Proceedings of AIMTDR 2021 (pp. 267-281). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-19-4571-7_24
6. **Gairola, S.,** Sinha, S., & Singh, I. (2022, October). Thermal and Flame Retardancy Behavior of Eggshell Filler Reinforced Polypropylene Composites. In International Conference on Advances in Materials Processing: Challenges and Opportunities (pp. 201-206). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-99-1971-0_30
7. Kaushik, D., **Gairola, S.**, Singh, I. (2024). Investigating the Influence of Chemical Treatment on the Mechanical Behavior of Kenaf/PP Composite. In: Sahu, R., Prasad, R., Sahoo, K.L. (eds) Advancements in Materials Processing Technology, Volume 1. AMPT 2023. Springer Proceedings in Materials, vol 48. Springer, Singapore. https://doi.org/10.1007/978-981-97-4958-4_8

Book Chapters

1. **Gairola, S.**, Kaushik, D., Mahajan, A., & Singh, I. (2025). Degradation Studies of Biodegradable Composites. In Biocomposites and the Circular Economy. Elsevier Publishing.

2. Kaushik, D., Varikkadinmel, B., **Gairola, S.**, & Singh, I. (2025). Advanced Machining Processes of Polymer Matrix Composites: An Overview. Forming and Machining of Polymers, Ceramics, and Composites, 84-97.

3. Melese, K. G., Naik, T. P., **Gairola, S.**, & Singh, I. (2022). Joining techniques for polymer matrix composites. In Joining Processes for Dissimilar and Advanced Materials (pp. 11-32). Woodhead Publishing.

References

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