Saurabh Kumar Gupta

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ABOUT ME

I am a dedicated materials researcher specializing in additive manufacturing, mechanical behavior, and advanced materials characterization, including tribocorrosion. My research spans biomedical and aerospace materials, focusing on optimizing the mechanical and tribological properties of titanium alloys. Currently, as a Research Associate at IISc Bangalore, I am investigating microtextured region (MTR) formation, static creep, and dwell fatigue in Ti-6242 alloy. My doctoral research on additively manufactured titanium alloys led to clinical validation and real-world patient applications. My ability to work across diverse research domains - from fluid dynamics modeling of mechanical heart valves to developing patient-specific implants - highlights my adaptability, strong problem-solving skills, and commitment to impactful research.

EDUCATION

PhD, Materials Engineering *Aug 2018 - Dec 2024*
Indian Institute of Science (IISc), Bangalore, India **CPI:** [8.4/10]

M.Tech, Materials Science *Aug 2015 - July 2017*
Indian Institute of Technology (IIT) Kanpur, Kanpur, India **CPI:** [8.28/10]

B.Tech, Mechanical Engineering *Aug 2011 - May 2015*
DR. A.P.J. Abdul Kalam Technical University (AKTU), Kanpur, India **Percentage:** [78.76]

RESEARCH EXPERIENCE

Indian Institute of Science (IISc) **Bangalore, Karnataka, India**
Research Associate, Materials Engineering Sep 2024 - Present

- **Supervisor:** Prof. Dipankar Banerjee
- **Detail:** We are investigating the origin of microtextured region (MTR) formation in Ti-6242 alloy through hot compression. This research involves analyzing the microstructural evolution during thermomechanical processing and its impact on mechanical properties, aiming to identify the factors contributing to MTR formation and their influence on the performance of Ti-6242 alloy in aerospace applications. Additionally, we are exploring the static creep effects in Ti-6242 alloy at temperatures ranging from room temperature (RT) to 200°C, alongside dwell fatigue within this range.

Indian Institute of Science (IISc) **Bangalore, Karnataka, India**
PhD, Materials Engineering Aug 2018 - Dec 2024

- **Supervisors:** Prof. Satyam Suwas, Prof. Kaushik Chatterjee
- **Detail:** My doctoral thesis focuses on the additive manufacturing of titanium alloys, namely Ti-6Al-4V ELI ($\alpha + \beta$) and Ti-35Nb-5Ta-7Zr (β), specifically designed for orthopedic applications. I have extensively studied the mechanical behavior of these alloys and characterized them using techniques such as electron back-scattered diffraction (EBSD), electron channelling contrast imaging (ECCI), and transmission electron microscopy (TEM). Additionally, my research includes tribocorrosion studies to evaluate the wear and corrosion behavior of additively manufactured titanium alloys for biomedical applications. Through innovative efforts, we have developed advanced heat treatment methodologies to enhance the biomechanical properties of these alloys. The translational phase of my research has achieved clinical validation and has been successfully applied to human subjects, particularly in treating upper limb deformities.

Indian Institute of Technology (IIT) Kanpur **Kanpur, Uttar Pradesh, India**
M.Tech, Materials Science Aug 2015 - July 2017

- **Supervisor:** Prof. Kamal K. Kar
- **Detail:** Using the ALE method, I modeled the fluid dynamics of a mechanical heart valve and accurately reproduced the asymmetric leaflet closure observed in experiments. My analysis showed that the shear stress level was much lower than in other studies, indicating a high durability of the design.

AREA OF SPECIALIZATIONS

- **Additive Manufacturing**
- **Orthopedic Implants**
- **Titanium Alloys**
- **Electron Backscatter Diffraction (EBSD)**
- **Characterization of Materials**
- **Mechanical Behavior of Materials**

EXPERIMENTAL SKILLS

Processing:	Additive manufacturing (LPBF, DED, and WAAM), Vacuum arc melting, Thermo-mechanical processing, Conventional Rolling, Hot deformation, Surface mechanical attrition treatment (SMAT)
Characterization:	Scanning Electron Microscopy (SEM), Electron back scattered diffraction (EBSD), Transmission Electron Microscopy (TEM), Focused Ion Beam (FIB), Electron Channeling Contrast Imaging (ECCI), X-Ray Diffraction (XRD), X-Ray tomography, X-Ray texture measurements, Elastic modulus measurements (impulse excitation technique), Corrosion, Tribocorrosion
Techniques/Testings:	Tensile/Compression, Fracture Toughness, High-Cycle fatigue, Low-Cycle fatigue, Dwell fatigue, Creep, Digital Image Correlation (DIC)

SOFTWARE TOOLS

Languages: C, FORTRAN
Simulation and Analysis: Materialise Mimics Innovation Suite (Patient specific CT scan data analysis and implant design), TSL (Orientation imaging mapping of EBSD data), Avizo (Analysis of X-Ray tomography data), Labotex (Texture analysis), VPSC (simulation of crystal plasticity and texture), MTEX (Texture analysis), MATLAB

WORK EXPERIENCE

Indian Institute of Technology (IIT) Kanpur — **Kanpur, Uttar Pradesh, India**
Project Associate — August 2017 - May 2018

- I designed and developed a testing setup to assess the flow performance of the mechanical heart valve designed in our lab.

SELECTED CONFERENCES AND SEMINARS ATTENDED

- **The 6th International Conference on Tribo-corroion (ICTC-2024)**, held in IIT Delhi, Dec 10th - 11th, 2024
  Oral presentation: Enhanced Tribocorrosion Performance of Additively Manufactured Ti-6Al-4V ELI.
- **The 20th International Conference on Textures of Materials (ICOTOM 2024)**, held in Metz, France, July 01st - 06th, 2024
  Poster presentation: Enhanced Fracture Toughness of Selectively Laser Melted Ti-6Al-4V ELI.
- **The 15th World Conference on Titanium 2023 (Ti-2023)**, held in Edinburgh, UK, June 12th - 16th, 2023
  Oral presentation: Enhanced biomechanical performance of additively manufactured Ti-6Al-4V bone plates and their clinical performance.
- **Indian Institute of Metals 75th Annual technical meeting (IIM ATM 2021)**, online, Nov 13th - 15th, 2021
  Oral presentation: Directed energy deposition of a low modulus TNZT alloy for biomedical applications.
- **Bioactive & Composites in Healthcare: Current Technological Trends 2021 (BIOCOM'21)**, online, 27 - 28 May, 2021
  Poster presentation: Enhanced biomechanical performance of additively manufactured Ti-6Al-4V bone plates.

FELLOWSHIPS, AWARDS AND RECOGNITION

- DST-SERB International Travel Grant by Department of Science and Technology, Govt. of India, for attending 20th International Conference on Textures of Materials (ICOTOM 2024)
- International Travel Grant (GARP) by Indian Institute of Science, Bengaluru, for attending the 15th World Conference on Titanium 2023 (Ti-2023)
- Secured 2nd price in poster presentation in BIOCOM'21
- Secured 98.8 Percentile out of 194496 candidates in GATE 2018 conducted by IIT Guwahati
- Secured 1st position in college ranking in B-Tech after completion of the program

SELECTED PUBLICATIONS

JOURNAL PUBLICATIONS

2025

- **S.K. Gupta**, N. Holla, S. Suwas, K. Chatterjee, S. Vamsi Krishna, Application of 3D printing for customised treatment of upper limb disorders, J. Hand Microsurg. 17 (2025) 100284.
- **S.K.Gupta**, P. Singh, K. Chatterjee, S. Suwas, Enhanced Fracture toughness of Additively Manufactured Ti-6Al- 4V ELI (Int J Fract 2025: In-press)
- S. Dixit, B.B. Dash, **S.K.Gupta**, A. Bhattacharjee, S. Sankaran, Effect of microstructure and cryoallographic texture

on high-temperature dynamic deformation behaviour of Ti-6Al-4 V alloy: a post-test analysis on texture evolution and deformation mechanism, Philos. Mag. (2025) 1–45.

2024

- **S.K.Gupta**, S.B. Gugulothu, E. Ivanov, S. Suwas, K. Chatterjee, Additive manufacturing of a low modulus biomedical Ti–Nb–Ta–Zr alloy by directed energy deposition, Bioprinting. 41 (2024) e00349.
- A. Dutta, **S.K. Gupta**, A. Gumaste, R.S. Haridas, S. Suwas, R.S. Mishra, S.S. Nene, Excellent work hardening ability in a novel compositionally complex alloy by hierarchical microstructuring, Appl. Mater. Today. 39 (2024) 102300.

2023

- D. Baruah, K. V. Vaishakh, S.A. Sreedhar, **S.K.Gupta**, S. Suwas, R. Narasimhan, Notch sensitivity of combined mode I–II fracture behaviour of a rolled magnesium alloy, Philos. Mag. Lett. 103 (2023).
- D. Baruah, S.A. Sreedhar, **S.K.Gupta**, S. Suwas, R. Narasimhan, Effect of temperature on the mixed-mode (I&II) fracture response of a rolled magnesium alloy, Mater. Sci. Eng. A. 881 (2023) 145406.
- A. Gupta, **S.K.Gupta**, S. Shukla, D. Mahadule, R.K. Khatirkar, Correlation of strain path and crystallographic texture with electrochemical behavior of Ti-15V-3Cr-3Sn-3Al alloy, J. Alloys Compd. 936 (2023) 168252.

2022

- A. Dutta, **S.K.Gupta**, H. Tsai, S. Nene, Room temperature super-formability in novel as-cast high entropy alloy during compressive loading, Adv. Eng. Mater. 13 (2022) 287–288.
- N. Nadammal, M. Rajput, **S.K.Gupta**, E. Ivanov, A.S. Reddy, S. Suwas, K. Chatterjee, Laser Powder Bed Fusion Additive Manufacturing of a Low-Modulus Ti–35Nb–7Zr–5Ta Alloy for Orthopedic Applications, ACS Omega. (2022).
- S. Acharya, V. Gopal, **S.K.Gupta**, S. Nilawar, G. Manivasagam, S. Suwas, K. Chatterjee, Anisotropy of Additively Manufactured Co-28Cr-6Mo Influences Mechanical Properties and Biomedical Performance, ACS Appl. Mater. Interfaces. (2022).
- D. Mahadule, R.K. Khatirkar, **S.K.Gupta**, A. Gupta, T.R. Dandekar, Microstructure evolution and corrosion behaviour of a high Mo containing $\alpha + \beta$ titanium alloy for biomedical applications, J. Alloys Compd. 912 (2022) 165240.
- R. Soni, S. Jhavar, S. Tyeb, **S.K.Gupta**, S. Suwas, Wire Arc Additive Manufacturing of Zinc as a Degradable Metallic Biomaterial, J. Funct. Biomater. 13 (2022) 212.
- S. V. Krishna, **S.K.Gupta**, N. Holla, K. Chatterjee, Resection of Osteoid Osteoma Using Three - Dimensional (3D) Printing, Indian J. Orthop. (2022) 1–5.
- A. Roy, **S.K.Gupta**, S. Suwas, The Significance of Crystallographic Texture in Dry Etching of Titanium to Engineer Bioinspired Nanostructured Bactericidal Surfaces, JOM. (2022).

2021

- **S.K.Gupta**, N. Shahidsha, S. Bahl, D. Kedaria, S. Singamneni, P.K.D.V. Yarlagadda, S. Suwas, K. Chatterjee: "Enhanced biomechanical performance of additively manufactured Ti-6Al-4V bone plates" Journal of the Mechanical Behavior of Biomedical Materials 2021, 119: 104552

CONFERENCE PUBLICATIONS

- **S.K.Gupta**, S.V.Krishna, S. Suwas, K. Chatterjee: Enhanced biomechanical performance of additively manufactured Ti-6Al-4V bone plates and their Clinical Applications, In 15th World Conference on Titanium Chapter 3: Biomedical & Healthcare Applications. F1000Research 2024, 13:1127 (document)

MANUSCRIPT UNDER REVIEW/PREPARATION

- **S.K.Gupta**, S. Suwas, K. Chatterjee, Augmenting Tribocorrosion Performance of Additively Manufactured Ti-6Al-4V for Biomedical Applications (manuscript under review in "Tribology International")
- **S.K.Gupta**, N. Holla, S. Suwas, K. Chatterjee, Effects of Isothermal Aging on Microstructure Evolution, Hardness and Wear Properties of Additively Manufactured Co-Cr-Mo Alloy for biomedical applications (Manuscript ready for submission)

REFERENCES

1. **Dr. Satyam Suwas**
   Professor
   Department of Materials Engineering
   Indian Institute of Science (IISc) Bangalore
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2. **Dr. Kaushik Chatterjee**
   Professor
   Department of Materials Engineering
   Indian Institute of Science (IISc) Bangalore
   kchatterjee@iisc.ac.in

3. **Dr. Dipankar Banerjee**
   Emeritus Professor
   Department of Materials Engineering
   Indian Institute of Science (IISc) Bangalore
   dbanerjee@iisc.ac.in