

# Sanoj Kumar Karki

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## PROFILE SUMMARY

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- Four years of teaching and mentoring experience in materials and manufacturing processes, including additive manufacturing laboratories, hands-on machining fundamentals, design for manufacturing, and lab safety.
- Four years of research experience in advanced manufacturing and material processing, including powder metallurgy, additive manufacturing, heat treatment, metallography, materials characterization, and mechanical testing.

## EDUCATION

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<b>Ph.D. in Mechanical Engineering</b> Cleveland State University	<i>Aug. 2021 – Present</i> GPA: 3.9 / 4.0
<b>M.S. in Mechanical Engineering</b> Cleveland State University Relevant Coursework: <i>Manufacturing Systems Engineering, Production Planning &amp; Control, Thermodynamics</i>	<i>Aug. 2021 – May 2024</i> GPA: 3.88 / 4.0
<b>B.Eng. in Mechanical Engineering</b> Chhattisgarh Swami Vivekananda Technical University Relevant Coursework: <i>CAD/CAM, Product Design &amp; Development, C, C++, FEA</i>	<i>Aug. 2013 – Oct. 2017</i> GPA: 4.0 / 4.0

## TEACHING EXPERIENCE

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<b>Graduate Teaching Assistant</b>   MCE-286 Materials and Manufacturing Process Lab <i>Cleveland State University</i>	<i>Aug 2021 – Present</i>
• Instructed students on safely using Lathe, Universal Testing Machines, Rockwell Hardness Tester, and Milling machines; shop math and gauging measurements (vernier, micrometer, etc.); demonstrated diverse machining techniques; addressed operational queries.	
• Prepared the lab by ensuring the availability of materials and equipment; conducted pre-lab checks on machine functionality and troubleshooting technical issues.	
• Successfully managed and maintained the lab by ensuring materials and equipment availability.	
• Led students with their respective projects to achieve desirable results.	
• Supported grading by evaluating assignments and lab reports and providing constructive feedback.	
<b>Laboratory Assistant</b>   Additive Manufacturing (3D Printing) Lab <i>Cleveland State University, Cleveland, OH</i>	<i>Aug 2021 – Present</i>
• Guided undergraduate students in designing 3D-printable components using AutoCAD and SolidWorks, explaining best practices for manufacturability and dimensional accuracy. Instructed students on material selection and printer setup for FDM, SLA, and metal-based 3D printing, covering materials such as ABS, PLA, photopolymer resin, PEEK, SS316L, and nickel-based superalloys.	
• Demonstrated and supervised post-processing techniques, including support removal, surface finishing, and fitment evaluation, ensuring students understood quality control and safety protocols.	
• Facilitated hands-on lab sessions and troubleshooting, helping students interpret technical drawings, slicing settings, and machine parameters in real-world printing scenarios.	

## RESEARCH INTERESTS

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- **Manufacturing**  
**Additive Manufacturing:** Selective Laser Melting (SLM), Binder Jetting, FDM, SLA  
**Powder Metallurgy:** Spark Plasma Sintering (SPS), Hot Isostatic Pressing (HIP), Mechanical Alloying  
**Thermomechanical Processing:** Hot Rolling Mill, Rotary Hearth Furnace (RHF)
- **Characterization**  
**Mechanical:** Tensile, Compression, Hardness  
**Imaging:** Scanning Electron Microscopy (SEM/EDS), Optical Microscopy, ImageJ

**Spectroscopy:** X-ray Diffraction (XRD), Energy-Dispersive X-ray Spectroscopy (EDS)

- **Surface & Environmental Performance**

**Tribology:** Ball-on-disc and reciprocating tribometer testing

**Electrochemical Corrosion Testing:** Electrochemical Impedance Spectroscopy (EIS), Potentiodynamic Polarization, High-Temperature Oxidation and Decarburization

- **Materials**

Metallic Alloys, Metal Matrix Composites, Lightweight Alloys, High-Temperature Alloys, High-Entropy Alloys, Coatings

- **Computational Modeling & Data Analysis**

CAD-based Design and Manufacturing Modeling (SolidWorks; AutoCAD)

Finite Element Analysis and Process Simulation (ANSYS)

Data Analysis, Optimization, and Statistical Modeling (MATLAB; Minitab)

## RESEARCH EXPERIENCE

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**Graduate Research Assistant | Advanced Manufacturing and Material Processing Lab**

*Cleveland State University, Cleveland, OH*

Aug 2021 – Present

**Project 1:** Development of secondary phase reinforced Inconel 718 Composites for structural applications

- Investigated the effect of graphene nanoplatelets fraction ( $x=0, 0.1, 0.2, 0.5$ ) on the microstructure and mechanical properties of Inconel 718 Composites (IN718-xGNP) using Spark Plasma Sintering and studied various strengthening mechanisms.
- Developed and studied microstructure, mechanical, tribological, and corrosion properties of Spark Plasma Sintered multiwalled carbon nanotube reinforced Inconel 718 composites.

**Project 2:** Investigation of protective coatings for reducing high-temperature oxidation and decarburization of low-alloy AISI 4340 steels

- Evaluated various coatings for their oxidation and decarburization behavior on stainless steel (4340) alloy to reduce metal loss due to oxidation and enhance steel quality.
- Conducted testing on industrial specimens and prepared technical reports for companies, including Canton Drop Forge, Clifford-Jacobs Forging, and PC Forge.

**Project 3:** Study of microstructure and mechanical properties of Selective Laser Melted graphene nanoplatelets/carbon nanotubes reinforced Inconel 718 Composites

- Fabricated graphene/CNT-reinforced IN718 nanocomposites via Selective Laser Melting (SLM) using high-energy ball-milled powders, optimizing laser power and scan speed to achieve uniform melt pools with full densification.

**Project 4:** Utilization of Zinc-Rich Eggshell Nanoparticles Epoxy (ZENE) Coatings for Corrosion Protection of A36 mild steel

- Developed Zinc-rich epoxy (ZENE) coatings using chemically and thermally treated eggshell nanoparticles (ESNPs) for corrosion protection of A36 mild steel in saline environments.
- Conducted electrochemical impedance spectroscopy (EIS) and surface characterization to evaluate barrier performance at elevated temperatures.

**Project 5:** Microstructure, Mechanical Performance, and Biocompatibility of Spark Plasma Sintered Porous Titanium for Biomedical Applications

- Fabricated porous titanium structures via Spark Plasma Sintering (SPS) under both pressure-assisted and pressureless conditions to study effects on microstructure, density, and porosity.

## WORK EXPERIENCE

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**Manufacturing Engineer Intern**

May 2025 – Dec 2025

*Logan Clutch Corporation, Westlake, OH*

- Machined clutch components (pressure plates, hubs, pistons, flywheels, shafts) using Mazak Mazatrol CNC lathes and HAAS CNC mills, performing setup, tooling, turning/milling cycles, and managing G54/G55 offsets.

- Designed clutch parts in Creo and interpreted GD&T drawings to support manufacturable process planning.
- Performed dimensional inspection using micrometers, calipers, bore gauges, height gauges, and CMM.

**Graduate Research Assistant**

*Aug 2021 – Present*

Advanced Manufacturing and Material Processing Lab, Cleveland State University

- Evaluated microstructure, mechanical, tribological, and corrosion behavior of Inconel 718 composites processed via SPS and SLM.
- Supported additive manufacturing and rapid prototyping workflows including CAD design, printer setup, post-processing, and inspection.
- Collaborated with industry partners on high-temperature coatings and forging-related materials challenges.

**Mechanical Engineer**

*Jan 2018 – Jul 2021*

Aarti Strips Private Limited, Nepal

- Led commissioning of a Danieli hot rolling mill producing Fe550D TMT rebar (8–36 mm, 0.2 MTPA).
- Operated RHF (50 TPH), rolling mills, cooling beds, shears, and bundling systems while ensuring ISO/ASTM compliance.

**Mechanical Engineer Intern**

*Jun 2016 – Jul 2016*

Sanima Mai Hydropower Limited, Illam, Nepal

- Operated and maintained the Mai Hydropower Plant (22 MW) and Mai Cascade Hydropower Project (7 MW), including turbines, pumps, valves, fans, and control boards.
- Maintained operational logs and reports, troubleshooting issues related to turbines, generators, and transformers to ensure continuous plant operation.

**Mechanical Engineer Intern**

*Jun 2015 – Jul 2015*

Aarti Strips Pvt. Ltd., Biratnagar, Nepal

- Operated and monitored continuous multi-stand galvanizing and heat-treatment lines to ensure uniform zinc coating on steel strips and wires.
- Performed routine maintenance and calibration of process equipment, ensuring compliance with operational standards and minimizing downtime.

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**PEER-REVIEWED PUBLICATIONS**

- S. Karki, et al. “Microstructure and Mechanical Properties of Inconel-GNP Reinforced Composites: A Parametric Study on Ball Milling and Spark Plasma Sintering.” *Journal of Materials Research and Technology* (2025) DOI: 10.1016/j.jmrt.2025.08.134 ([link](#))
- S. Karki, et al. “Effect of Graphene Nanoplatelet Fraction on the Microstructure and Mechanical Properties of Inconel 718 Composites Prepared by Spark Plasma Sintering.” *Materials Science and Engineering: A* (2025) 940:148531 DOI: 10.1016/j.msea.2025.148531 ([link](#))
- M. Mugale, S. Karki, et al. “Investigation of Protective Coatings for Reducing High-Temperature Oxidation of Steels.” *JOM* (2024) 1–12 DOI: 10.1007/s11837-024-06912-9 ([link](#))
- M. Mugale, S. Karki, et al. “High Strength-Ductility Combination in Low-Density Dual Phase High Entropy Alloys.” *Journal of Alloys and Compounds* (2024) 177762 DOI: 10.1016/j.jallcom.2024.177762 ([link](#))
- A. Choudhari, S. Karki, et al. “Additive Manufacturing of AISI M2 Tool Steel by Binder Jetting (BJ): Investigation of Microstructural and Mechanical Properties.” *Journal of Manufacturing Processes* 132 (2024) 686–711 DOI: 10.1016/j.jmapro.2024.11.008 ([link](#))
- A. Choudhari, S. Karki, et al. “Enhancing Quality Control: Image-Based Quantification of Carbides and Defect Remediation in Binder Jetting Additive Manufacturing.” *Materials* 17 (10) (2024) 2174 DOI: 10.3390/ma17102174 ([link](#))
- S. Digole, S. Karki, et al. “Spark Plasma Sintering of Pure Titanium: Microstructure and Mechanical Characteristics.” *Materials* 17 (14) (2024) 3469 DOI: 10.3390/ma17143469 ([link](#))
- F. Ishrak, S. Karki, et al. “Microstructural Evolution and Magnetic Properties of Spark Plasma Sintered SmCo<sub>5</sub> and SmCo<sub>5</sub>–Fe Composites.” *Journal of Alloys and Compounds* (2025) 1045:184709 DOI: 10.1016/j.jallcom.2025.184709 ([link](#))

- A. Choudhari, S. Karki, et al. "Evaluation and Comparison of High-Temperature Coatings for Decarburization Prevention in Low-Alloy Steels." *JOM* (2025) 1–21 DOI: 10.1007/s11837-025-07876-0 (link)

## CONFERENCE PRESENTATIONS AND SEMINARS

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- **Karki, S.**, Selective Laser Melting of Graphene nanoplatelets-Inconel 718 Nanocomposites: Processing-Structure-Property Relationship. TMS 2026, March 3-7, San Diego, USA. (Abstract accepted)
- **Karki, S.**, Synergistic enhancement of mechanical and tribological properties of multiwalled carbon nanotubes reinforced Inconel 718 composites. MS&T 2025, Sep 28-Oct 1, Columbus, OH, USA. (Poster Presentation)
- **Karki, S.**, et al., Boosting Mechanical and Tribological Properties in Multi-walled carbon Nanotube Reinforced Inconel 718 fabricated by High-Energy Ball Milling and Spark Plasma Sintering. TMS 2025, March 23-27, Las Vegas, NV, USA. (Oral Presentation)
- **Karki, S.**, et al., Optimization of Ball Milling and Spark Plasma Sintering Process Parameters for Graphene Nanoplatelets Reinforced IN718 Composites. MS&T 2024, October 6-9, Pittsburgh, PA, USA. (Oral Presentation)
- **Karki, S.**, et al., Optimization of ball milling and Spark Plasma Sintering process parameters for graphene nanoplatelets reinforced IN718 composites. Engineering Research Day: Cleveland State University, Oct 4, 2024 (Poster Presentations).
- **Karki, S.**, et al., Synergistic Enhancement of Mechanical and Tribological Properties in Inconel 718-GNP Composites Fabricated by High-Energy Ball Milling and Spark Plasma Sintering. TMS 2024, March 3-7, FL, USA. (Oral Presentation) (Oral Presentation)

## JOURNAL REVIEWER EXPERIENCE

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- Reviewer of *Journal of The Minerals, Metals & Materials Society (JOM)*
- Reviewer of *Materials Science and Engineering: A*
- Reviewer of *Journal of Materials Research and Technology*

## COLLABORATIONS

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### • Industry, United States

Collaborated with forging industry partners to evaluate high-temperature oxidation and decarburization resistance of *AISI 4340* and *AerMet 100* steels for industrial forging applications.

### • Academia, United States (North Carolina State University)

Collaborated on spark plasma sintering (SPS) processing and microstructural characterization of *SmCo<sub>5</sub>-Fe* composites for high-temperature magnetic applications.

### • Academia, United States (North Carolina State University)

Conducted focused ion beam-transmission electron microscopy (FIB-TEM) analysis of *Inconel 718-graphene nanoplatelet* composites to investigate interfacial features and nanoscale reinforcement dispersion.

### • Academia, United States (Wayne State University)

Collaborated on electron backscatter diffraction (EBSD) analysis of *Inconel 718-carbon nanotube* composites to study grain structure, texture evolution, and deformation mechanisms.

## LEADERSHIP & SERVICE

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- President, ASME – Cleveland State University
- Secretary, Material Advantage – Cleveland State University
- Treasurer, Financial Management Association – Cleveland State University

## AWARDS & CERTIFICATIONS

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USRA Research Grant Awardee | TMS 2024 Travel Grant | MS&T 2025 Travel Grant | Monte Ahuja Endowment Scholarship | Lean Six Sigma Green Belt | SolidWorks CSWA (Mechanical Design)

## PROFESSIONAL MEMBERSHIPS

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Material Advantage (ACerS, AIST, ASM International, TMS), ASME