AMIT KUMAR, Ph.D.

Additive Manufacturing | Metal Powders | Advanced Materials

Email: amit.researcher24@gmail.com Phone: +1 438 725 5865

Location: Sherbrooke, Québec, Canada ***ORCID*** | ***LinkedIn*** | ***ResearchGate***

SUMMARY

- Materials engineer and industrial R&D specialist with a Ph.D. and experience translating metal additive manufacturing, powder processing, and materials expertise into practical solutions for industrial partners.
- Strong background in LPBF, metal powders, process development, characterization, product validation, technical reporting, and multidisciplinary project coordination.
- Solution-oriented professional experienced in evaluating technical requirements, manufacturability, process performance, and scale-up for advanced manufacturing applications.

CORE COMPETENCIES

- Metal powders, powder-bed processing, and additive manufacturing
- Technical communication, presentations, reporting, and stakeholder collaboration
- Metallurgy of Ni-based alloys, steels, Ti, Al, Cu, and refractory metals
- Process development, validation, scale-up, and manufacturing implementation
- Deep-tech product development, DFMEA, DfMA, and project coordination
- Materials characterization, root-cause analysis, and problem solving
- LPBF, post-processing, machining, heat treatment, and surface engineering

PROFESSIONAL EXPERIENCE

Additive and Digital Manufacturing Specialist **Feb 2025 – Jul 2026**

Productique Québec (CCTT), Sherbrooke, Québec, Canada

- Collaborated with industrial partners and multidisciplinary teams to assess manufacturing needs and develop practical additive manufacturing and materials solutions.
- Evaluated material selection, design constraints, powder-bed manufacturability, and post-processing requirements to define practical industrial implementation strategies.
- Supported the transfer and scale-up of AM concepts by connecting technical requirements, process capability, and validation results.
- Developed and validated LPBF strategies for IN625, achieving ≥99.9% relative density and improving surface roughness from ~Ra 20 µm to ~Ra 7 µm.
- Supported heat treatment, machining, surface finishing, and workflow improvements to advance components toward manufacturing readiness.
- Applied characterization and metrology to investigate defects, resolve process issues, and support data-driven technical recommendations.
- Translated R&D outcomes into technical reports, process guidelines, and repeatable workflows for industrial implementation.
- Represented the organization at industry conferences, technical forums, and networking events, promoting its additive manufacturing capabilities and engaging with industrial stakeholders and prospective partners.

Principal Instructor **May 2024 – Sep 2024**

The Advanced Training Program on Additive Manufacturing Technologies at IIT Guwahati

- Designed and delivered technical training on LPBF, powder-bed processing, build preparation, DfAM, post-processing, and materials characterization.
- Communicated process-material relationships, parameter optimization, defect mechanisms, and practical manufacturing approaches for high-value metallic components.
- Introduced data-driven and machine-learning approaches for laser parameter optimization and predictive process development.

Doctoral Research Fellow (Thesis Link) **Jan 2018 – June 2024**

Supervisor: Dr. Mathieu Brochu, Mining and Materials Engineering, McGill University, Montréal, Canada

- Conducted doctoral research in LPBF, focusing on process optimization, defect formation, material behavior, and process-structure-property relationships.
- Designed controlled LPBF studies linking processing parameters with microstructure, surface morphology, residual stress, dimensional accuracy, and mechanical performance.
- Developed LPBF strategies across Ni-based superalloys, steels, titanium and aluminum alloys, tungsten, molybdenum, and niobium-related material systems.
- Performed optical microscopy, SEM, EBSD, TEM, EDS, XRD, surface metrology, and mechanical testing for process validation and root-cause analysis.
- Investigated drivers of LPBF variability, including surface condition, roughness, microstructural evolution, thermal history, residual stress, and post-processing response.
- Applied FEM and statistical modeling for thermomechanical analysis, residual-stress prediction, and data-driven LPBF process optimization.
- Translated experimental and modeling results into validated manufacturing approaches, functional demonstrators, patents, and peer-reviewed publications.

Engineering Consultant **May 2018 – Mar 2021**

B3D Performance Inc., Montréal, Canada

- Designed and built a precision system to measure powder-layer density in 10-250 µm layers for powder-bed additive manufacturing (Patent Link).
- Led deep-tech product development through design reviews, DFMEA, DfMA, testing, technical reporting, and cross-functional project coordination.
- Supported prototype validation, SPE1000 compliance, electrical/software subsystem development, and successful project delivery.

Research Assistant **Dec 2016 - Dec 2017**

Supervisor: Dr. Manas Paliwal, IIT Gandhinagar, Gandhinagar, India

- Performed CALPHAD calculations and materials characterization studies, including tensile testing, microscopy, and SEM, for industrial and academic research projects.

- Designed and built an in-house Bridgman induction furnace for directional solidification up to 1500°C and supported the establishment of a high-temperature materials processing laboratory.

Research Assistant **July 2016 – Dec 2016**

Supervisor: Dr. Amit Arora, IIT Gandhinagar, Gandhinagar, India

- Conducted friction stir welding and processed dissimilar aluminum–copper joints.
- Designed a 6-axis manipulator concept for support-free fabrication of metal–polymer composite structures.
- Performed kinematic and dynamic analysis for robotic manufacturing applications.

Research Intern **May 2015 - June 2016**

Supervisor: Dr. K P Karunakaran and Dr. Sajan Kapil, Rapid Manufacturing Lab, IIT Bombay, Mumbai, India

- Conceptualized and built a 5-axis parallel-type steward manipulator for support-free extrude deposition in fabrication.
- Assisted in programming CNC programs for the omnidirectional deposition of TIG and MIG-based direct energy deposition to fabricate an open impeller using the Hermle CNC machine.
- Conducted FEM calculations (ANSYS Workbench) to assess the thermophysical properties of the deposited model.

TECHNICAL SKILLS

- **Materials Characterization and Surface Analysis** : SEM, EBSD, TEM, FIB, ECCI, AFM, XRD, EDS, XPS, X-ray CT, optical microscopy, surface profilometry, roughness, powder-layer density, microstructural evaluation
- **Mechanical Testing and Reliability**: Tensile testing, compression testing, fatigue, nanoindentation, DIC, fracture analysis, failure analysis, ultrasonic testing, modal analysis
- **Manufacturing and Processing**: Metal powders, powder-bed processing, LPBF, metal additive manufacturing, laser processing, machining, welding, heat treatment, HIP, directional solidification, surface engineering, post-processing
- **Modeling and Data Analysis** : FEM, ABAQUS, ANSYS Workbench, CALPHAD, DFT, statistical analysis, process modeling, residual-stress analysis
- **Programming and Software**: Python, MATLAB, R, C++, LabVIEW, PyTorch, TensorFlow, Microsoft Office (Excel, PowerPoint, Word)
- **Design and AM Tools**: Netfabb, Materialise, nTopology, Autodesk Fusion, SOLIDWORKS, PolyWorks, ORS Dragonfly

EDUCATION

Jan 2018 – Jun 2024

Ph.D. in Materials Engineering, McGill University, Montréal, Canada

- Thesis: "Laser Powder Bed Fusion of Support-Free Overhang Structure."
- Supervisor: Dr. Mathieu Brochu

Master's in Materials Science and Engineering (Thesis), IIT Gandhinagar, India Jun 2014 - Jun 2016

- Thesis: Design and Manufacturing of a 6-axis Stewart Manipulator
- Supervisors: Dr. Jyoti Mukhopadhyay and Dr. K. P. Karunakaran

Bachelor's in Mechanical Engineering, Visvesvaraya Technological University (VTU), India Jun 2008 – Jun 2012

- Project: Design and Fabrication of Low-Cost Feed Cutting Machine

SELECTED PUBLICATIONS

- Kumar A., Brochu M., Atabay S. "Understanding residual stresses in the field of additive manufacturing." ASM Handbook, Volume 25A: Residual Stress Fundamentals, ASM International, 2025.
- Kumar A. Laser Powder Bed Fusion of Support-Free Overhang Structure. Ph.D. Thesis, McGill University, 2024.
- Kumar A., Shandiz M.A., Kumar M., Jena A., Brochu M. "Support-free fabrication of IN625 low-angle overhang structures using laser powder bed fusion." Materials & Design, 2025.
- Kumar A., Shandiz M.A. "Solution heat treatment of support-free IN625 overhang sections fabricated via laser powder bed fusion." Progress in Additive Manufacturing, 2025.
- Kumar A., Shandiz M.A., Sikan F., Brochu M. "Microstructural and mechanical properties of an internal support-free IN625 closed impeller manufactured via laser powder bed fusion." Materials Science and Engineering: A, 2023.
- Ramakrishnan T., Kumar A., et al. "Crack-free tungsten fabricated via laser powder bed fusion additive manufacturing." Advanced Functional Materials, 2023.
- Espiritu E.R.L., Kumar A., Nommeots-Nomm A., Muñiz Lerma J.A., Brochu M. "Investigation of the rotating drum technique to characterise powder flow in controlled and low-pressure environments." Powder Technology, 366, 925–937, 2020

**Full publication list available upon request.*

PATENTS

- Brown C., Brochu M., Shandiz M.A., Kumar, A., (2023). Powder bed fusion methods and related apparatus, US Patent App. US20230405681A1.
- Ding Y. Y., Muniz Lerma J. A., Brochu M., Kumar A., Ramakrishnan T. (2022). Device and method for measuring powder bed density in 3D printing/additive manufacturing operations, US Patent App. US20220023951A1.

CERTIFICATIONS

- Design for Additive Manufacturing, Wohlers Associates, 2018
- Finite Element Analysis: Engineering Application and Programming, IIT Gandhinagar, 2016
- WHMIS Certification, McGill University, 2024
- Hazardous Waste Management Certification, McGill University, 2022
- Laser Safety Certification, McGill University, 2022

AWARDS AND ACHIEVEMENTS

- McGill Engineering Doctoral Award, 2018–2021
- Graduate Research Enhancement and Travel Award, McGill University, 2019
- MHRD Postgraduate Scholarship, India, 2014–2016
- Qualified GATE – Mechanical Engineering, 99.9 percentile among approximately 170,000 applicants, 2014
- Best Outgoing Mechanical Engineer, Bachelor's Program, 2012

LANGUAGES

- English: Fluent professional proficiency
- French: Basic proficiency A1/A2
- Hindi: Native proficiency