GOPAL PANDEY, PhD

Research Fellow, Swinburne University of Technology, Australia
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Professional Summary

Research Engineer specialising in hydrogen-enabled steelmaking with a model-driven approach to decarbonising heavy industry. Hands-on in high-temperature experimental work (induction furnaces, flame experiments, billet reheating, and oxidation) combined with advanced CFD on high-performance computing (HPC) platforms. Experienced with thermodynamic and phase-equilibrium tools (FactSage) and Python-based analysis. Proven track record of producing high-impact research, publishing in peer-reviewed journals, and presenting at major international steelmaking conferences. Eager to apply integrated experimental and computational skills to green steelmaking processes, contributing to sustainable, CO_2-neutral steel production through collaborative research.

Skills Summary

- High-temperature process engineering (carbothermic reduction, selective oxidation, flame testing); materials characterisation via ***XRD, SEM-EDS, Optical Microscopy***; instrumentation (TC/IR), safety protocols, risk assessments, root cause analysis, technical drawings/P&IDs, and OHS for industrial projects.
- Process modelling and optimisation using ***ANSYS Fluent/CFX, SolidWorks, MATLAB, Python (data visualisation, SPC, DOE), MPI/HPC, FactSage*** to address fluid dynamics, emission reduction, and project efficiency.
- ***Team collaboration, leadership, stakeholder engagement, exceptional communication, customer service, logistics management***; problem-solving in multi-disciplinary projects, with conference presentations and industry partnerships in energy transition and supply chain solutions.

Educational Background

PhD in Mechanical Engineering (Hydrogen Energy)
Graduate Certificate of Research and Innovation Management Completed, June 2026
Swinburne University of Technology Melbourne, Australia

- Developed CFD models on HPC (ANSYS Fluent, open-source) for EAF/reheat furnaces; optimised process parameters to reduce NO_X and CO_2 emissions, enhancing efficiency and sustainability for steel production.
- Conducted combustion and oxidation studies in scrap piles using hydrogen/natural-gas flames, improving material quality and process consistency for manufacturing applications.
- PPerformed FactSage thermodynamic and phase-equilibria analyses for ferrosilicon-based oxides/alloys, identifying process windows to ensure product quality and operational efficiency.
- Designed and executed high-temperature experiments, focusing on safety cases, compliance, and professional development.
- Validated outcomes via XRD, SEM-EDS, and Optical Microscopy, translating findings into recommendations and net-zero goals.

Key Areas: Hydrogen Energy, Computational Fluid Dynamics, Materials Science, Digital Analytics, Sustainability, Energy Transition, Renewable Gases

Master of Engineering (Mechanical) Graduated, Sept 2020
University of Wollongong Wollongong, Australia

- Thesis: Microstructural and Hardenability Study of Low-Carbon Low-Manganese Steels, focusing on material properties.
- Projects: Alum reactor involving piping and fluid process design; Design of a robotic protrusion arm.

Bachelor of Engineering (Mechanical) Graduated, Dec 2017
Tribhuvan University Kathmandu, Nepal

- Final Year Project: Hydraulic Ram Pump with Water Recirculation - Best Project Award, demonstrating innovative design in mechanical piping and fluid dynamics.
- Led robotics club initiatives, fostering teamwork in mechanical systems and diversity and inclusion.

Professional Experience

Postdoctoral Research Fellow (Academic Level B) Feb 2026 - Present
Swinburne University of Technology Melbourne, Australia

- Conduct a literature review on introducing chemical energy in the smelting furnace and detailed thermodynamic modelling
- Carry out small-scale controlled hydrogen environment tests
- Conduct smelter assessment through a modified induction furnace
- Prepare and characterise processed samples from the smelting furnace using advanced characterisation techniques (XRD, SEM-EDS, XRF, OM, Raman Spectroscopy)
- Provide training and supervision to undergraduate and postgraduate students

Key Areas: Pyrometallurgy, Materials Characterisation, High-Temperature Processing

Postgraduate Research Student Jul 2022 - Dec 2025
CSIRO, Manufacturing Business Unit Melbourne, Australia

- Designed and executed hydrogen/natural-gas flame experiments, involving burner design, flow calculations, and fabrication, relevant to gas pipeline, storage operations, and renewable gas integration.
- Prepared and characterised materials (XRD, SEM-EDS) for projects, delivering insights for asset performance, safety cases, and compliance.
- Implemented safety protocols, risk assessments, and SOPs, aligning with compliant operations in gas infrastructure and net-zero emissions targets.

Award: Victorian Hydrogen Hub (VH2) Impact PhD Scholarship
Key Areas: Process Engineering, Materials Characterisation, Safety, Renewable Gases, Energy Transition

Senior Maintenance Officer (Canberra Region) Sept 2021 - Jun 2022

Southern Cross Care, Facilities Maintenance & Engineering Department Canberra, Australia

- Led facility renovations and mechanical works, ensuring safety compliance and efficiency through data-driven planning and asset management.
- Coordinated contractors and teams, using CMMS for workflows, performance optimisation, and project management.
- Developed risk assessments and documentation, promoting safety in fast-paced environments with a focus on wellbeing and inclusion.

Packaging and Technical Support (Part-time) Sep 2018 - Dec 2020
Freshfine Foods Sydney, Australia

- Dealt with technical issues in food packaging machines, including troubleshooting, servicing, and assembly to ensure smooth operation of production and packaging.
- Conducted root cause analysis to resolve problems and implement risk management strategies.
- Provided technical support to maintain efficiency in industrial food processing environments.

Skills: Technical Support, Root Cause Analysis, Risk Management

Teaching Assistant Jan 2018 - Jun 2018
Tribhuvan University Kathmandu, Nepal

- Delivered lectures on Fluid Mechanics, Heat Transfer, and Finite Element Methods, mentoring students in analytical skills for engineering applications.
- Supervised projects, promoting communication, teamwork, and professional development.

Mechanical Graduate Researcher Nov 2017 - Jun 2018
DatalyticsNepal Pvt. Ltd. Kathmandu, Nepal

- Conducted CAD and FEA for micro-hydropower systems, optimising designs for efficiency, quality, and sustainable energy solutions.
- Documented workflows and safety protocols for collaboration and compliance.

Publications and Conferences

(Selected) - Full list on Google Scholar

- Pandey, G., Brooks, G., Naser, J. et al. *NOx Prediction of Supersonic Coherent Jets for Electric Arc Steelmaking Furnace.* Metall Mater Trans B (2024). doi:10.1007/s11663-024-03129-8
- Pandey, G., Brooks, G., Naser, J. et al. *Modelling of NOx Mitigation Strategies for Hydrogen Shrouded Supersonic Coherent Jets for Steelmaking Furnaces.* Metall Mater Trans B (2025). doi:10.1007/s11663-025-03577-w
- Pandey, G., Brooks, G., Naser, J., & Liang, D. (2025, July). *Numerical Investigation of Hydrogen Blending on the Impinging Flame Structure in Non-Premixed (CH_4/H_2/Air) Combustion for Scrap Metal Heating.* J. Phys.: Conf. Ser. 3050 012012. doi:10.1088/1742-6596/3050/1/012012

Conference Presentations:

- AISTech 2024 - Columbus, USA
- AIST ANZ Steel Symposiums (2024, 2025, 2026) - Melbourne, Australia
- EASES 2025 - Slovenia
- Core organising committee & primary editor, AIST ANZ Steel Symposium 2025 and 2026

Professional Memberships & Registration

- Engineers Australia - Professional Engineer Membership Credential ID: 7112240
- Nepal Engineering Council - Professional Engineer Credential ID: 3527 "Mechanical" "A"
- Association for Iron and Steel Technology (AIST) - Member
- Australian Steel Institute (ASI) - Member

Volunteering

- President (2023-2025) - Swinburne MEPDE HDR Student Association; organised 20+ HDR seminars, fostering collaboration, knowledge-sharing, and diversity and inclusion.
- Programme Coordinator (2017-2018) - AMESIN; facilitated industry-student networking events to bridge academic and industrial innovation.

Award: Swinburne Emerging Leaders 2025

Selected Media and Recognition

- Swinburne News (Nov 2022) - Innovative hydrogen research to advance sustainable steel
- AISTech 2024 - Conference presentation highlight
- Swinburne News (Sep 2024) - Green steel revolution: net-zero steel manufacturing
- VH2 on LinkedIn - Sustainability / Hydrogen feature
- VH2 (EASES Conference) - Green-steel representation at EASES
- AIST ANZ / Steelmaking Symposium - Symposium editor role
- Swinburne HDR spotlight - HDR research feature
- Green steelmaking engagement - Industry–academic engagement

References

available upon request.