

# Merajul Haque Ansari

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## EDUCATION

### Carnegie Mellon University

Doctor of Philosophy in Materials Science and Engineering

GPA: 3.9/4.0

Pittsburgh, PA

May 2027

### Indian Institute of Technology Bombay

Master of Technology in Metallurgical Engineering & Materials Science

GPA: 9.7/10.0

Mumbai, India

Jul 2021

### BIT Sindri (Affiliated with Vinoba Bhave University)

Bachelor of Technology in Metallurgical Engineering

GPA: 7.9/10.0 (Last 4 semesters GPA: 8.4/10.0)

Dhanbad, India

May 2017

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## SKILLS

**Modeling & Computation:** FactSage, Thermo-Calc, Python, MATLAB, Advanced MS-Excel, Computational Thermodynamics, Process Modeling, Statistical Analysis, Predictive Modeling

**Metallurgy:** Ironmaking, Steelmaking, Inclusion Engineering, Steel Cleanliness, Thermodynamics, Reaction Kinetics, Physical Metallurgy of Steels, Thermomechanical Processing, Solidification, Phase Transformations

**Characterization & Testing:** Metallography, Optical Microscopy, SEM-EDS, XRD, Tensile Testing, Charpy Impact Testing, Hardness Testing, Grain Size Analysis, Image Analysis, Phase Identification, Failure Investigation

**Professional:** Root Cause Analysis, Process Optimization, Cross-Functional Collaboration

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## THESIS

### Carnegie Mellon University

*Assessing Blast Furnace Performance with Hydrogen-based Injectants*

Process Modeling & Decarbonization

Pittsburgh, PA

Aug 2023 - Present

- Developed predictive blast furnace models to evaluate 100+ biofuel injection scenarios, enabling rapid assessment of coke replacement potential and supporting key findings in a peer-reviewed ISIJ paper
- Validated a biomass injection strategy through an industrial pilot trial, achieving less than 4% prediction error against plant operating data and demonstrating model reliability for operational decision-making
- Analyzed performance data from 27 benchmark blast furnaces and 180+ months of operating data across 3 industrial furnaces, reassessing critical thermal parameters for high-hydrogen injection and metallic iron charging strategies in low-carbon ironmaking

High Temperature Experiments & Materials Characterization

- Conducted 10+ high-temperature softening tests across 5 iron-bearing burden materials, demonstrating that mineralogy, not hydrogen concentration, governs cohesive zone behavior in hydrogen-based ironmaking
- Analyzed phase composition, phase distribution, and reduction products using XRD and SEM-EDS to establish links between mineralogical transformations and softening behavior
- Performing interrupted softening tests at key temperature intervals to investigate the microstructural transformations governing cohesive zone behavior in low-carbon ironmaking
- Evaluating the impact of hydrogen injection on the reactivity of 3 industrial coke grades, generating kinetic data to predict coke consumption and performance in blast furnace operations

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## ADDITIONAL RESEARCH EXPERIENCE

### Indian Institute of Technology

*Effect of Ladle Glaze on Non-metallic Inclusions in Aluminum-killed Steels*

Mumbai, India

Jun 2020 - Jun 2021

- Investigated inclusion evolution in 22 industrial heats across 6 ladle-life stages using SEM-EDS, OES, and LECO characterization, identifying four inclusion classes and key refractory interactions
- Integrated plant-scale steelmaking data with FactSage kinetic modeling to validate ladle-glaze driven Mg transfer and  $\text{MgO} \cdot \text{Al}_2\text{O}_3$  spinel formation in low-carbon Al-killed steel
- Quantified ladle-glaze contributions to steel cleanliness by tracking magnesium enrichment in spinel from 2.8–8.2 wt.%, revealing refractory-driven changes in inclusion chemistry

## PROFESSIONAL EXPERIENCE

### Tata Steel

Manager - Quality Assurance

Jamshedpur, India

Aug 2021 - Apr 2023

- Led an inter-departmental team and reduced automotive steel sliver defects by 35% by applying a DMAIC-based process optimization initiative in hot rolling, improving product quality and process capability
- Led the casting quality team to improve continuous cast slab quality by 15% through argon gas flow optimization, reducing pinhole defects and increasing downstream yield by 2.2%
- Identified root causes of longitudinal slab cracking through integrated analysis of operational, quality, and automation data, supporting the development of an advanced mold monitoring system
- Collaborated with production, operations, and maintenance teams to improve steel quality and process consistency in the continuous casting and hot rolling processes

### Government Polytechnic Dhanbad

Lecturer - Metallurgical Engineering

Dhanbad, India

Feb 2018 - Jul 2019

- Delivered instruction for 5+ metallurgy courses and laboratory sessions to 100+ students annually, achieving high student engagement through practical demonstrations, experiments, and industry-focused curriculum integration
- Coordinated 4+ NBA and AICTE accreditation workshops involving 20+ faculty and staff members, supporting institutional quality-improvement initiatives and contributing to enhanced ranking performance among Indian polytechnic colleges

## CONFERENCES / PRESENTATIONS

**Ansari, M.H.**, Webler, B., Pistorius, P.C. "*Reassessing Critical Parameters of the Blast Furnace for Operational Feasibility in a Hydrogen-Injected Furnace*", AISTech 2026, Pittsburgh, PA (USA), 05 May 2026. Conference Paper & Presentation.

**Ansari, M.H.**, Pistorius, P.C., Webler, B. "*Evaluating the properties of biomass as a blast furnace injectant*", AISTech 2025, Nashville, TN (USA), 05 May 2026. Conference Paper & Presentation.

**Ansari, M.H.**, Webler, B., Pistorius, P.C. "*Operating window for co-injection of charcoal, coal, and natural gas in the blast furnace*", AISTech 2025, Nashville, TN (USA), 05 May 2026. Conference Poster.

**Ansari, M.H.**, Sengupta, S., Pande, M., Kumar, D., "*Role of ladle glaze on inclusion composition in low carbon aluminum killed steel*", 4<sup>th</sup> International Conference on Science and Technology of Ironmaking and Steelmaking, Mumbai, India, 13 Dec 2022. Conference Paper & Presentation.

## TEACHING ASSISTANT EXPERIENCE

### Carnegie Mellon University

Engineering the Materials of the Future

Pittsburgh, PA

Aug 2025 - Dec 2025

- Led weekly tutorials, administered quizzes, and graded assignments for graduate coursework

### Indian Institute of Technology Bombay

Transport Phenomena

Mumbai, India

Jul 2020 - Nov 2020

- Led weekly tutorials, administered quizzes, and graded assignments for graduate coursework

## LEADERSHIP

**Founding Member**, Materials Advantage Group, IIT Bombay

Jan 2021 - Jan 2022

**Vice Chairman**, IIM students' chapter, BIT Sindri

Dec 2015 - Dec 2016

## AWARDS and SCHOLARSHIPS

Josef. S Kapitan Award (Ironmaking)

May 2026

Graduate Research Fellowship

Aug 2023

GATE scholarship

July 2019

## LANGUAGES

English: Full Professional Proficiency

Hindi: Native Proficiency