# MIRTUNJAY KUMAR

C223, Hall 10, IIT Kanpur, Kanpur

Contact No. :- +91-7388 44 8881 Email ID: - mjay@iitk.ac.in, mjay@hotmail.com

Website: - https://mjaykr.github.io

## EDUCATION

**M.Tech. + Ph.D.** in Materials Science and Engineering, IIT Kanpur, India **2022**

**CPI: - 8.6 / 10**

**Ph.D. Thesis Title:** *Experimental and Crystal Plasticity Simulation Study of the Deformation Behaviour of Liquid Phase Sintered Tungsten Heavy Alloys*

**M.Tech. Thesis Title:** *Development of Processing-Microstructure-Mechanical Behaviour Paradigms for Tungsten Heavy Alloys*

**B.Tech.** in Metallurgical and Materials Engineering, NIT Warangal, Telangana **2013**

Division: - First Class with Distinction

CGPA: - 8.18 / 10

**B.Tech. Project: -** Pressure-less Sintering behaviour of Cu-TiB2 Composite Produced by Powder Metallurgical Technique

Supervisor: - Dr. Asit Kumar Khanra

**12th** Class in Science Stream from Jamshedpur Public School, Jamshedpur **2008**

Affiliation: - C.B.S.E. **Score:** - 73.8%

**10th** Class from PTJM Saraswati Vidya Mandir, Bokaro, Jharkhand **2006**

Affiliation: - C.B.S.E. **Score:** - 82.7%

## Journal Publications

1. **Kumar M,** Gurao NP, Upadhyaya A. Evolution of microstructure and crystallographic texture during cold rolling of liquid phase sintered tungsten heavy alloy. International Journal of Refractory Metals and Hard Materials. 2022 Apr 5:105849.

2. **Kumar M**, Gurao NP, Upadhyaya A. Effect of Tungsten Content and Compression on Microstructure and Texture Evolution in Liquid Phase Sintered Heavy Alloy. Metallurgical and Materials Transactions A. 2022 Apr;53(4):1253-66.

3. **Kumar M**, Singh A, Mishra S. Enriching mean-field self-consistent texture simulations using the full-field FFT model. Materials Science and Technology. 2021 Nov 22;37(17):1343-52.

4. **Kumar M**, Singh A, Beura VK, Mishra S. Incorporating latent hardening in visco-plastic self-consistent framework for performing texture simulations. Materials Science and Technology. 2021 May 24;37(8):752-64.

5. Mishra S., **Kumar M**, Singh A Evolution of rotated Brass texture by cross rolling: implications on formability , Materials Science and Technology, 36:12, 1272-1281

6. **Kumar M,** Gurao NP, Upadhyaya A. "Implications of slip transition on the work hardening and texture evolution of nickel-tungsten-iron ternary alloy" (Received minor correction in Materials Characterization)

7. **Kumar, Mirtunjay**, and Sumeet Mishra. " Revisiting Taylor flow stress equation based on insights from full field texture simulations". (Under review in Frontier of Materials Science)

## Manuscript under preparation

1. **Kumar, Mirtunjay,** and Sumeet Mishra. "Dependence of the micro-mechanical Taylor factor of cube grain on the local neighbourhood".

2. **Kumar, Mirtunjay**, Nilesh P. Gurao, Anish Upadhyaya. "Texture and microstructure evolution during rolling deformation of novel Ni-24W-22Fe alloy".

## Oral Presentation

1. **Mirtunjay Kumar**, Nilesh P. Gurao, Anish Upadhyaya, "Microstructure and mechanical properties of W-Ni-Fe tungsten heavy alloy." In 46th Annual Technical Meeting of PMAI (PM2020) at Mumbai, India.

2. **Mirtunjay Kumar**, N. P. Gurao, A. Upadhyaya, "An automated methodology for assessing the microstructural attributes of liquid phase sintered microstructure." In Research Scholar Day 2020 at IIT Kanpur.

3. **Mirtunjay Kumar**, N. P. Gurao, A. Upadhyaya, "Development of Processing-Microstructure-Mechanical behaviour Paradigms for Tungsten Heavy Alloys." In 5th International Conference on Powder Metallurgy in Asia (APMA 2019) at Pune, India.

4. **Mirtunjay Kumar**, N. P. Gurao, A. Upadhyaya, "Understanding the role of shear bands on recrystallization texture of 54Ni-24W-22Fe alloy." In Research Scholar Day 2019 at IIT Kanpur.

5. **Mirtunjay Kumar**, N. P. Gurao, A. Upadhyaya, "Deformation behaviour of dual phase tungsten heavy alloy." In NMD-ATM 2019 at Koavalam, Kerala.

6. **Mirtunjay Kumar**, N. P. Gurao*, A. Upadhyaya, "Effect of matrix volume fraction on deformation texture evolution in two phase tungsten heavy alloy." In 18th International Conference on Textures of Materials (ICOTOM-18) at St George, Utah, USA.

7. **Mirtunjay Kumar**, N. P. Gurao, A. Upadhyaya, "Rolling of liquid phase sintered 90W-7Ni-3Fe tungsten heavy alloy." In NMD-ATM 2016 at IIT Kanpur.

8. **Mirtunjay Kumar**, Anish Upadhyaya "Rolling of liquid phase sintered 90W-7Ni-3Fe tungsten heavy alloy." NMD-ATM 2014 – COEP, Pune, India.

9. Guest Speaker in Material Advantage outreach Programme on topic "Correct and Incorrect Phase Diagrams Features" at UIET - CSJM University Kanpur in September 2019.

## Poster Presentation

1. **Mirtunjay Kumar**, Nilesh P. Gurao, Anish Upadhyaya, "In-situ electron back scatter diffraction study of deformation behaviour of concentrated Ni-24W-22Fe alloy." In 26th International Symposium on Metastable, Amorphous and Nanostructured Materials at IIT Madras. DOI: dx.doi.org/10.5281/zenodo.4630117

2. **Mirtunjay Kumar**, Nilesh P. Gurao, Anish Upadhyaya, "Microstructure and texture analysis of deformation of Ni-W-Fe matrix alloy." In Microstructural Engineering 2018-19 at IIT Kanpur.

3. **Mirtunjay Kumar**, Nilesh P. Gurao, Anish Upadhyaya, "Towards a comprehensive understanding of the role of shear bands on recrystallization texture in Ni-24W-22Fe alloy." In 7th International Conference on Recrystallization and Grain Growth at University of Ghent, Belgium. DOI: dx.doi.org/10.5281/zenodo.4630023.

## Experimental Skills

1. X-ray Diffraction – Standard measurement, Pole figure measurement, Residual stress measurement
2. Scanning electron microscopy – Scanning electron imaging, Backscattered electron imaging, Energy-dispersive X-ray spectroscopy (EDS), Electron Backscatter Diffraction (EBSD), Fractography
3. Transmission Electron Microscopy – Bright Field Imaging, Dark Field Imaging, EDS
4. Optical Microscopy – Bright field, Dark field and Differential Imaging Contrast (DIC)
5. Universal Testing Machine (UTM) – Compression testing, Tensile test, Strain Rate Jump test and Strain Relaxation test

## Analytical Skill

1. Full-Field Crystal Plasticity (DAMASK) and viscoplastic Fast Fourier Transform (VPFFT)
2. Mean-Field Crystal Plasticity simulation (VPSC)
3. Synthetic microstructure generation using Dream.3D, Neper and Voronoi Tessellation
4. EBSD analysis using MTEX and TSL-OIM, and ATEX
5. X-ray data analysis using X'Pert HighScore Plus
    a. Line Profile Analysis
    b. Phase Identification
    c. Rietveld refinement
6. Image processing of microstructure using MATLAB and ImageJ

## Computational Skill

1. MATLAB – Basics and problem-solving approaches
2. Text processing language (AWK)
3. Advanced Microsoft Excel including macro creation
4. OriginLab for interactive scientific graphing and data analysis
5. Python – Matplotlib and seaborn

## Academic Responsibilities

### Tutor

1. Introduction to Manufacturing Processes (TA201)
    a. 2018 – 2019 (Even semester) at IITK (Online Classes)
    b. 2015 – 2016 (Odd semester) at IITK
    c. 2015 – 2016 (Odd semester) at IITK

### Teaching Assistance

1. Nature and Properties of Materials (ESO205)
    a. 2018 – 2019 (Odd Semester)
    b. 2013 – 2014 (Odd Semester)
2. Introduction to Manufacturing Processes (TA201)
    a. 2014 – 2015 (Odd Semester) in the Lab
    b. 2013 – 2014 (Even Semester) in the Course work
3. Manufacturing Process Lab (MSE315) in 2014 – 2015 (Even Semester)
4. Process metallurgy Lab (MSE314) in 2015 – 2016 (Even Semester)

## Expertise of equipment

1. Transmission Electron Microscopy (FEI Tecnai T20) for **two years** (2016 – 2018) at MSE department
2. Scanning Electron Microscope (CARL ZEISS EVO 50) for **Six month** at MSE department
3. Scanning Electron Microscope (JEOL JSM-6010LA) for **two years** (Jan 2015 – Dec 2016) at Advanced Centre for Materials Science (ACMS), IIT Kanpur
4. Field Emission SEM (JEOL JSM-7100F) including Orientation Imaging Microscopy (OIM) and *in-situ* tensile testing for **five years** (Jan 2015 – Dec 2020) at Advanced Centre for Materials Science (ACMS), IIT Kanpur
5. Four Circle Diffractometer (Rigaku Ultima IV) for **two years** at ACMS IIT Kanpur

## Professional Associations

1. Member of the Powder Metallurgy Association of India from Jan 2018 – Present.
2. Member of Materials Advantage Society, IIT Kanpur Chapter from 2019 – Present
3. Member of The Indian Institute of Metals (IIM) from 2018 – 2020.
4. Member of ASM – International

## Workshop Participation

1. Participated in Ten days SERB School on Mechanical Testing held at the Department of Materials Engineering, Indian Institute of Science, Bangalore, from 22 – 31 May 2017.
2. Participated in Five days SERB school on Crystallographic Texture held at Department of Metallurgical Engineering and Materials Science, IIT Bombay from 3 – 7 Oct 2017.
3. QIP short term course on "Fundamentals of Materials Manufacturing Processes and their Applications" conducted from 06 – 10 May 2019
4. Six-day workshop on "Advanced Material Processing and Characterization (AMPC)" organized at IIT Kanpur in 2014.

## Position of Responsibility

1. Member of Maintenance committee of Hall IV in 2014 – 2015.
2. Organizer of N.K. Batra Metals and Materials Quiz – 2014 at MSE dept, IIT Kanpur
3. Organized "ANU BODHAN' 12 – a workshop on Powder Metallurgical processing of Materials" conducted by NITW and PMAI and served as Core Member for Demonstration team.
4. Elected as "Mess & Establishment Secretary" and worked for Students' Council during 2012-2013.
5. Elected as "Student Representative of MME department", NITW for 2012-2013.

## Reference

**Dr. Nilesh P. Gurao**
Dept. of Materials Science and Engineering
IIT Kanpur
Kanpur
India

**Prof. Anish Upadhyaya**
Dept. of Materials Science and Engineering
IIT Kanpur
Kanpur
India

## Declaration

I hereby declare that the information furnished above is true to the best of my knowledge and belief.

Signature

(Mirtunjay Kumar)