MIRTUNJAY KUMAR

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EDUCATION

Ph.D. in Materials Science and Engineering, IIT Kanpur, Kanpur, India 2021

CPI: - 8.6 / 10

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

Supervisors: Prof. Anish Upadhyaya, Dr. Nilesh Prakash Gurao

M.Tech. in Materials Science and Engineering, IIT Kanpur, Kanpur, India 2021

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

Supervisors: Prof. Anish Upadhyaya, Dr. Nilesh Prakash Gurao

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%

Academic Achievement

- Achieved All India Rank **85** in Graduate Aptitude Test in Engineering (GATE), 2013
- Won first prize in Vedic Ganit organized by Vidya Vikas Samiti, Jharkhand
- Won second prize in science fair organized by Vidya Bharti, North-East region

Journal Publications

1. **Kumar, Mirtunjay,** Amit Singh, Vikrant Kumar Beura, and Sumeet Mishra. "Incorporating latent hardening in visco-plastic self-consistent framework for performing texture simulations." Materials Science and Technology 37, no. 8 (2021): 752-764. https://doi.org/10.1080/02670836.2021.1946949

2. Mishra, Sumeet, **Mirtunjay Kumar,** and Amit Singh. "Evolution of rotated Brass texture by cross rolling: implications on formability." Materials Science and Technology 36, no. 12 (2020): 1272-1281. https://doi.org/10.1080/02670836.2020.1773036

3. **Kumar, Mirtunjay,** Amit Singh, and Sumeet Mishra. " Enriching mean-field self-consistent texture simulations using full-field FFT model" Materials Science and Technology (Under Review)

4. **Kumar, Mirtunjay,** Nilesh P. Gurao, Anish Upadhyaya. "Effect of Tungsten Content and Compression on Microstructure and Texture Evolution in Liquid Phase Sintered Heavy Alloy." Metallurgical and materials transactions (Under Review)

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. Universal Testing Machine (UTM) – Compression testing, Tensile test, Strain Rate Jump test and Strain Relaxation test
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. X-ray Diffraction – Intensity vs 2θ plot, Pole figure measurement, Residual stress measurement
5. Optical Microscopy – Bright field, Dark field and Differential Imaging Contrast (DIC)
6. Hardness test – Vickers hardness
7. Metallography
8. Surface area analyser based on BET theory

Analytical Skill

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

Computational Skill

1. Text processing language (AWK and SED)

2. Advanced Microsoft Excel including macro creation
3. OriginLab for interactive scientific graphing and data analysis
4. Python – Matplotlib and seaborn
5. Matlab – Double, Table and HDF5 file handling

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 *insitu* 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.

Personal information

Father's Name	Late Rajendra Prasad
Mother's Name	Manorama Devi
Date of Birth	19 – Feb – 1991
Present Address	WL – 208, Powder Metallurgy Lab, MSE Department, IIT Kanpur Uttar Pradesh, India.
Permanent Address	S/O Late Rajendra Prasad, Dak Baba Gali, Main Road, Warisaliganj, Nawada, Bihar Pincode – 805030.
Gender	Male
Marital Status	Single
Nationality	Indian
Language	Hindi, English

List of referees

Dr. Anish Upadhyaya
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IIT Kanpur, India
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Dr. Nilesh P Gurao
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IIT Kanpur, India
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Email: - nn@nitw.ac.in

Declaration

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

Date 28 October 2021

Signature

(Mirtunjay Kumar)