Mirtunjay Kumar, Ph.D.

mjay@iitk.ac.in, mjay@hotmail.com
https://mjaykr.github.io/
https://www.linkedin.com/in/mjaykr/
+91-7388 44 8881 +44-7833 82 4515

Employment History

Nov 2022 – · · · · **Postdoctoral Research Associate,** The University of Manchester, UK

Modelling the formability of light alloys during warm forming processes. This project is focussed on the modelling the formability of light alloys during warm forming processes, so that these may be exploited to fulfil the vision of the LightForm programme. It will also involve extending current crystal plasticity models to enrich the current description of the deformed state and couple them with phase transformation and dynamic precipitation models.

Education

2013 – 2022 **M.Tech + Ph.D. (Dual degree), Indian Institute of Technology Kanpur**
Ph.D. Thesis title: *Experimental and Crystal Plasticity Simulation Study on the Deformation Behavior of Liquid Phase Sintered Tungsten Heavy Alloys.*
M.Tech. Thesis title: *Development of Processing-Microstructure-Mechanical Behaviour Paradigms for Tungsten Heavy Alloys.*
CGPA: 8.7 out of 10.

2009 – 2013 **B.Tech., Metallurgical and Materials Engineering, National Institute of Technology Warangal**
B.Tech Project: *Pressureless sintering behaviour of $Cu - TiB_2$ composite produced by powder metallurgical technique.*
CGPA: 8.18 out of 10.

2008 **Class XII:CBSE**
School: *Jamshedpur Public School A.I.W.C, Jamshedpur.*
Score: 73.8%

2006 **Class X:CBSE**
School: *P.T.J.M. Saraswati Vidya Mandir, Bokaro.*
Score: 82.7%

Research Publications

1. Khairnar, V. S., Kulkarni, A. N., Lonikar, V. V., Gite, A. B., **Kumar**, **M.**, Patil, D. P., & Kadam, D. P. (2023). Electrodeposition of bi2te3 thin films for thermoelectric applications: Effect of electrolyte ph. *Journal of Materials Science: Materials in Electronics*, *34*(10), 875. doi:10.1007/s10854-023-10295-z

2. Singh, B. P., **Kumar**, **M.**, Jain, R., Singh, A., & Mishra, S. (2023). Finite element assisted self-consistent simulations to capture texture heterogeneity during hot compression. *International Journal of Materials Research*, *114*(3), 219–230. doi:10.1515/ijmr-2022-0138

3. **Kumar**, **M.**, Gurao, N., & Upadhyaya, A. (2022a). Effect of tungsten content and compression on microstructure and texture evolution in liquid phase sintered heavy alloy. *Metallurgical and Materials Transactions A*. doi:10.1007/s11661-021-06586-x

4. **Kumar**, **M.**, Gurao, N., & Upadhyaya, A. (2022b). Evolution of microstructure and crystallographic texture during cold rolling of liquid phase sintered tungsten heavy alloy. *International Journal of Refractory Metals and Hard Materials*, *105*, 105849. doi:10.1016/j.ijrmhm.2022.105849

5. **Kumar**, **M.**, Gurao, N., & Upadhyaya, A. (2022c). Implications of slip transition on the work hardening and texture evolution of nickel-tungsten-iron ternary alloy. *Materials Characterization*, 112010. doi:10.1016/j.matchar.2022.112010

6. **Kumar**, **M.**, & Mishra, S. (2022). Revisiting taylor factor using fast fourier transform based model and its implications on work hardening. *Available at SSRN 4125910*. doi:10.2139/ssrn.4125910

7. **Kumar**, **M.**, Singh, A., Beura, V. K., & Mishra, S. (2021). Incorporating latent hardening in visco-plastic self-consistent framework for performing texture simulations. *Materials Science and Technology*, 1–13. doi:10.1080/02670836.2021.1946949

8. **Kumar**, **M.**, Singh, A., & Mishra, S. (2021). Enriching mean-field self-consistent texture simulations using the full-field fft model. *Materials Science and Technology*, *37*(17), 1343–1352. doi:10.1080/02670836.2021.2007455

9. Mishra, S., **Kumar**, **M.**, & Singh, A. (2020). Evolution of rotated brass texture by cross rolling: Implications on formability. *Materials Science and Technology*, *36*(12), 1272–1281. doi:10.1080/02670836.2020.1773036

Skills

Experimental Skills

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

Expertise of equipment

- TA on Transmission Electron Microscopy (FEI Tecnai T20) for two years (2016 – 2018) at MSE department
- 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
- TA on Nova NanoSEM 450 (FEG-SEM) for one year equipped with Hikari EBSD camera and Octan Plus for EDS
- TA on CARL ZEISS EVO 50 W-SEM for 6 month
- TA on JEOL JSM-6010LA W-SEM for two years

Programming Skill

- MATLAB – Basics and problem-solving approaches
- Python - Basic programming and Data structure
- Programming with MATLAB
- Basics of C++

Skills (continued)

Analytical Skill

- Full-Field Crystal Plasticity (DAMASK) and viscoplastic Fast Fourier Transform (VPFFT)
- Mean-Field Crystal Plasticity simulation (VPSC)
- Synthetic microstructure generation using Dream.3D, Neper and Voronoi Tessellation
- EBSD analysis using TSL-OIM and MTEX
- X-ray data analysis using X'Pert HighScore Plus
- Image processing of microstructure using MATLAB and ImageJ

Academic Responsibility

- Teaching Assistance (TA) for two semester in Nature and property of materials
- Teaching Assistance (TA) for two semester in Introduction to Manufacturing Processes
- Teaching Assistance (TA) for one semester in Manufacturing Process Lab
- Teaching Assistance (TA) for one semester in Process metallurgy Lab
- **Tutor** for three semester in Introduction to Manufacturing Processes Lab
- Independent user for four semester in **Transmission Electron Microscopy facility** equipped with tungsten filament
- Independent user for six semesters in **Scanning Electron Microscopy facility** equipped with FEG and tungsten filament.

Presentations

Poster Presentation

- 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

- 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.

- 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.

Oral Presentation

- 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.

Presentations (continued)

- 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.

- 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.

- 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.

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

- 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.

- 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.

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

Invited Speaker

- Invited speaker in SPARC Workshop 2023 on " Advanced Tools for Hierarchical Microstructure Characterization" jointly organized by IIT Roorkee and IIT Kanpur in March, 2023.

- Invited lecture at NIT Warangal Organised by MME association jointly with IIM-Students Chapter, NITW on 15 December 2022.

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

References

Prof. Anish Upadhyaya
Professor
IIT Kanpur,
Kanpur-208016.
anishu@iitk.ac.in

Prof. Nilesh Prakash Gurao
Associate Professor
IIT Kanpur,
Kanpur.
npgurao@iitk.ac.in

Dr. Sumeet Mishra
Assistant Professor
IIT Roorkee,
Roorkee.
sumeet.mishra@mt.iitr.ac.in

Declaration

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

April 19, 2023

Signature

(Mirtunjay Kumar)