

An Indian-Australian research partnership

Project Title:	Effect of texture on formability of hexagonal metals (Zn and Mg)	
Project Number	IMURA0807	
Monash Main Supervisor (Name, Email Id, Phone)	Prof Jian-Feng Nie jianfeng.nie@monash.edu	<i>Full name, Email</i>
Monash Co-supervisor(s) (Name, Email Id, Phone)		
Monash Head of Dept/Centre (Name,Email)	Prof Nick Birbilis, nick.birbilis@monash.edu	<i>Full name, email</i>
Monash Department:	Department of Materials Science and Engineering	
Monash ADGR (Name,Email)	Prof Emanuele Viterbo, Emanuele.viterbo@monash.edu	<i>Full name, email</i>
IITB Main Supervisor (Name, Email Id, Phone)	Prof Sushil Mishra, sushil.mishra@iitb.ac.in	<i>Full name, Email</i>
IITB Co-supervisor(s) (Name, Email Id, Phone)	Prof Indradev Samajdar, indra@iitb.ac.in	<i>Full name, Email</i>
IITB Head of Dept (Name, Email, Phone)	Prof. B. Puranik, head.me@iitb.ac.in	<i>Full name, email</i>
IITB Department:	Department of Mechanical Engineering	

Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST one. For more information, see www.iitbmonash.org)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see www.iitbmonash.org)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	Advanced computational engineering, simulation and manufacture
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Infrastructure Engineering
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Water
5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Nanotechnology
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Biotechnology and Stem Cell Research
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Humanities and social sciences
8	HSS, Design, Management	8	Design

The research problem

Define the problem

Zinc and magnesium both have a hexagonal structure, with the c/a ratio of zinc being slightly larger than that of magnesium. Both metals develop a strong texture after thermomechanical processing, but their formability at room temperature is remarkably different. This project aims to reveal the effect of texture on formability of these two types of metals. It involves preparation of zinc and magnesium and their alloys that have different grain sizes and textures using hot rolling or extrusion. The microstructures of these samples will be characterized using electron backscatter diffraction and transmission electron microscopy, and formability will be assessed by Erichsen tests. Formability analysis will also be performed using Finite Element Methods (FEM). Complete strain path diagram will be developed using both experiment and Numerical methods. The Materials Science and Engineering department and Monash Centre for Electron Microscopy have all facilities that are needed for the preparation and characterization components of this project. Department of Mechanical Engineering and Department of Metallurgical Engineering & Materials science IIT Bombay are completely equipped with formability analysis equipment/software for both experimental and FEM.

Project aims

Define the aims of the project

1. Preparation of zinc and magnesium samples that have different grain sizes and textures
2. Microstructure characterization of zinc and magnesium samples plastically deformed at room temperature at various strain rates
3. Room temperature testing of mechanical property (tensile and ductility) and formability of sheet along different directions of the sheet
4. Formability analysis using FEM

Expected outcomes

Highlight the expected outcomes of the project

1. Understanding formability and forming limit diagram development of hexagonal metals with similar and different textures

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

The objective of this project is to understand the effects of texture on formability of hexagonal metals with different c/a ratio. Thus, the project falls under the category (1): Advanced computational engineering, simulation and manufacture in the Research Cluster of Material Science/Engineering (including Nano, Metallurgy)

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

1. Microscopy, testing and analytical skills
2. Willingness to learn and work hard

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Prof. Indra Samajdar
Dr. Sushil Mishra

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

Hexagonal metals, texture, formability, FEM