

An Indian-Australian research partnership

**Project Title:** **Effect of microstructure on rail/wheel interaction and defects**

**Project Number** **IMURA0648**

**Monash Main Supervisor**

(Name, Email Id, Phone)

Prof. Wenyi Yan ([wenyi.yan@monash.edu](mailto:wenyi.yan@monash.edu), +61-399020113)

*Full name, Email*

**Monash Co-supervisor(s)**

(Name, Email Id, Phone)

Dr Cong Qiu ([cong.qiu@monash.edu](mailto:cong.qiu@monash.edu), +61-99024355)

Mr Peter Mutton ([peter.mutton@monash.edu](mailto:peter.mutton@monash.edu), +61-399051970)

**Monash Head of Dept.**

(Name,Email)

Prof. Chris Davies

[Chris.davies@monash.edu](mailto:Chris.davies@monash.edu)

*Full name, email*

**Monash Department:**

Mechanical and Aerospace Engineering

**Monash ADRT**

(Name,Email)

Prof. Emanuele Viterbo

[Ana.deletic@monash.edu](mailto:Ana.deletic@monash.edu)

*Full name, email*

**IITB Main Supervisor**

(Name, Email Id, Phone)

Aparna Singh

[aparna\\_s@iitb.ac.in](mailto:aparna_s@iitb.ac.in)

91-25767605

*Full name, Email*

**IITB Co-supervisor(s)**

(Name, Email Id, Phone)

NA

**IITB Head of Dept**

(Name, Email, Phone)

Prof. N. Venkataramani

[head.met@iitb.ac.in](mailto:head.met@iitb.ac.in)

91-2576-7657

*Full name, email*

**IITB Department:**

Metallurgical Engineering and Materials Science

## Research Academy Themes:

**Highlight which of the Academy's Theme(s) this project will address?**

*(Feel free to nominate more than one. For more information, see [www.iitbmonash.org](http://www.iitbmonash.org))*

1. **Advanced computational engineering, simulation and manufacture**
2. **Infrastructure Engineering**
3. Clean Energy
4. Water
5. Nanotechnology
6. Biotechnology and Stem Cell Research

**The research problem**

Rail materials undergo a lot of stress and wear damage under use. After prolonged service various defects including squats and material loss result. There are limited studies done on the origins of such defects. A combination of high stresses and stress-induced microstructural evolution may lead to such defects. We wish to investigate the effect of initial steel composition, heat treatment, contact stresses induced and stress-induced microstructural evolution on the damage tolerance of rails.

### **Project aims**

1. Study the processing-microstructure-property correlation of rail steels.
2. Investigate the contact stresses undergone by rails under various kinds of wheel-rail interaction scenarios.
3. Experimental wear studies to determine wear damage under various conditions.
4. Detailed investigation of the reason for various defects.
5. Devise processing strategies to mitigate the damage.

### **Expected outcomes**

1. Understanding of reasons for rail defects.
2. Development of damage-tolerant rail materials.

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

By understanding the root cause of formation of defects in rails, changes can be made in processing and manufacturing strategies for more robust infrastructure development.

### **Capabilities and Degrees Required**

1. BTech/MTech: Metallurgy/Materials Science/Mechanical Engineering.
2. Hard working
3. Should have excellent analytical and experimental skills.
4. Willingness to do systematic experiments and modelling.
5. Willingness to make field trips to understand railways better.

### **Potential Collaborators**

NA

Please provide a few key words relating to this project to make it easier for the students to apply.

**Rail, wear, tribology, contact, steels, heat treatment.**