

An Indian-Australian research partnership

**Project Title:** Hydrogen Induced Degradation in Austenitic Stainless Steels: A  
Microstructural Perspective

**Project Number** IMURA0614

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**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
7. Humanities and Social Sciences

## The research problem

*The durability of what are nominally corrosion resistant alloys is challenged in the presence of hydrogen bearing environments. Such environments are routine encountered in service, whether it is processing environments, pipelines, oil & gas, or energy application, including nuclear. Understanding the fundamentals of hydrogen induced damage, particular in regards to corrosion and environmentally assisted failure, remains a critical issue. It is now well established that corrosion is deterministic, and to that end, it is (for a given environment) dictated by the alloy microstructure. The alloy microstructure includes features that range from the atomic scale, to include defects, dislocations, grain boundary character, and crystallographic texture. In addition, different microstructures have different capacity for hydrogen uptake. The present project will seek to establish fundamental relationships between microstructure and hydrogen induced damage. The project will be centred on stainless steels, and will involve the combination of detail microstructural analysis coupled with electrochemical testing. In addition, an element of computational modelling will be encouraged, to assist with the understanding of H-effects.*

## Project aims

*To identify role of microstructure in enhancing/arresting hydrogen induced degradation. This will include crystallographic orientations, grain boundaries, tri-junctions and geometrically necessary dislocations*

## Expected outcomes

*Basic understanding in an area of applied interest.*

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

*This is a collaborative project where fundamental aspects of hydrogen induced degradation in austenitic stainless steels are to be explored.*

## Capabilities and Degrees Required

*The student should have a Bachelors degree in Materials Engineer (with focus on Metallurgy) from Reputed Institute  
The student should have basic programing skills.*

## Potential Collaborators

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

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

**Corrosion, Molecular Dynamics, Electrochemistry**