IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

CSIRO

Industry sponsored project by CSIRO

Project title: Metallurgical Bonding During Consolidation of Ti Particulate

Project number: IMURA0181

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Research Academy theme/s

List only the research academy theme/s that is relevant to the project

5. Nanotechnology

The research problem

The project will identify the key process conditions and material parameters that influence metallurgical bonding between Ti particulates during a consolidation process.
The project will identify the principle mechanisms leading to the formation of the metallurgical bonding and determine the influence of such factors as: surface chemistry, self diffusion and local grain boundary migration.

Expected outcomes

Various Ti particulate of different morphology, composition and hardness will be subject to a consolidation process and subsequently examined to determine the extent of the metallurgical bonding that occurs between the particles using both optical and electron microscopy.
Ti particles will be consolidated using a high shear/compression process to investigate the role of temperature, plastic strain and shear strain rate on the formation of metallurgical bonds between particles.
Transmission electron microscopy will be used to identify the mechanisms of the bonding process with particular emphasis on the role of surface chemistry, self diffusion and grain boundary migration.

A greater understanding of the fundamental mechanisms that lead to metallurgical bonding between Ti particles during a consolidation process. Publications highlighting the underlying science revealed

Specific Milestones and Deliverables

- Literature study
- Selection of suitable Ti particulate for the study

- Commissioning of a suitable experimental consolidation process
- Consolidation experiments on several Ti powders
- Sectioning, polishing and preparation of microscope specimens
- Microscopic examination of bonding between particulates
- Conclusion of bonding mechanisms and influence of interfacial aspects