IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

Project title Microstructural Developments in Twin Roll Cast Mg Alloys during Hot Rolling

Project number: IMURA0196

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Research Academy theme/s

1. Advanced computational engineering, simulation and manufacturing

The research problem

Lightweight magnesium alloys have attracted increasing interest in recent years for potential applications in the electronic, automotive and aerospace industries. One important group of magnesium products is those magnesium sheets produced by twin-roll casting and hot rolling. In comparison to the traditional time-consuming and costly manufacturing process that involves direct chill casting of a magnesium slab, slab trimming, and repeatedly hot-rolling and annealing the slab to reduce it to sheets, the twin roll casting technology is much more energy efficient. It eliminates repeated rolling and annealing, only needs moderate rolling to get the product down to the dimensions required. However, there are currently only a few alloy compositions available for this technology and the alloy sheets thus produced have not been systematically characterised and evaluated. Further improvements in the formability and mechanical properties of the twin-roll cast and hot rolled magnesium sheets require better understanding of microstructures and microstructural evolution during the thermomechanical process.

Project aims

The aims of this project are to examine the microstructures of magnesium sheets of selected alloys that are produced by twin-roll casting and hot rolling, and to establish the evolution of microstructure during the hot rolling process. This project involves characterisation and analysis of microstructures of samples subjected to different rolling schemes and annealing conditions. The facilities to be used include electron back scatter diffraction (EBSD) (including 3d-EBSD), x-ray diffraction, dynamic nano hardness measurements and transmission electron microscopy (TEM). The combined use of these advanced facilities allows the grain orientation (texture), grain size and grain shape to be accurately determined, and the deformation and recrystallisation behaviours to be firmly established.

Expected outcomes

Provide an improved understanding of microstructures of advanced lightweight magnesium alloys for energy-efficient manufacturing

Which of the above Theme does this project address?

1. Advanced computational engineering, simulation and manufacturing.

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.