

# Grain refinement of Al–Si–Mg cast alloys by Al<sub>3</sub>Ti<sub>3</sub>B master alloy

Xixi Dong, Shouxun Ji\*

Brunel Centre for Advanced Solidification Technology (BAST), Brunel University London,  
Uxbridge, Middlesex, UB8 3PH, United Kingdom

\*Corresponding author: Tel: +44 1895 266663; Fax: +44 1895 269758

E-mail address: shouxun.ji@brunel.ac.uk

## Abstract

The requirements of lightweighting structures in automotive industry and other transport applications drive the improvement of mechanical properties of cast Al–Si–Mg alloys. Grain refinement is a way to improve both the strength and ductility of cast Al–Si–Mg alloys. Al<sub>5</sub>Ti<sub>1</sub>B master alloy with TiB<sub>2</sub> and extra Ti has been widely accepted in industry for the grain refinement of aluminium alloys, especially wrought aluminium alloys, but it is hard to meet the expectations in the case of cast Al–Si–Mg alloys due to the poisoning effect by Si. Al<sub>3</sub>Ti<sub>3</sub>B master alloy with TiB<sub>2</sub> and extra B was prepared for the grain refinement of cast Al–Si–Mg alloys. The microstructure and tensile properties of cast Al–Si–Mg alloys under the refinement of Al<sub>3</sub>Ti<sub>3</sub>B master alloy were investigated for the improvement of mechanical properties. Under optimised condition, the Al–Si–Mg cast alloys could provide a yield strength over 300 MPa, a UTS over 350 MPa and an elongation over 8 %. The mechanisms of grain refinement and improvement of mechanical properties were discussed.

**Key words:** Aluminium alloy; Grain refinement; Microstructure; Mechanical properties