

## Grain Refinement of Al-7Si-0.4Mg Alloy by Combination of Al-Ti-B and Mg-Al<sub>2</sub>Ca Mater Alloys and Their Effects on Tensile Property

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**Abstract :** Al-7Si-0.4Mg alloy (designated A356) is widely used in the automotive and aerospace industries as structural components due to an excellent combination of castability and mechanical properties. Grain refinement has a significant effect on the mechanical properties of castings, mainly since the distribution of secondary phase is changed. As a grain refiner, the Al-Ti-B master alloys containing TiAl<sub>3</sub> and TiB<sub>2</sub> particles have been widely used in Al foundries. The Mg loss and Mg based inclusion formation by the strong affinity of Mg to oxygen in the melting process of Mg contained alloys have been an issue. This can be significantly improved only by Mg+Al<sub>2</sub>Ca master alloy as an alloying element instead of pure Mg. Moreover, the eutectic Si modification and grain refinement is simultaneously obtained because Al<sub>2</sub>Ca behaves as Ca, a typical Si modifier. The present study is focused on the combined effects of Mg+Al<sub>2</sub>Ca and Al-Ti-B master alloys on the grain refinement of Al-7Si-0.4Mg alloy and their proper ratio for the optimum effect. The aim of this study, therefore, is to investigate the change of the microstructure in Al-7Si-0.4Mg alloy with different ratios of Ti and Al<sub>2</sub>Ca (detected Ca content) and their effects on the tensile property. The distribution and morphology of the secondary phases by the grain refinement will be discussed.

**Keywords :** Al-7Si-0.4Mg alloy, Al<sub>2</sub>Ca, Al-Ti-B alloy, grain refinement

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