Comparison of Microstructure and Mechanical Performance of A356 Aluminum EPC Casting Solidified at High Pressure and Nor

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ABSTRACT

This study analyzes and compares the effect of one atmospheric pressure and high-pressure solidification modes on the mechanical properties and microstructures of A356 aluminum alloy EPC castings to underatand the difference between two casting pressure modes. Comprehensive analysis and comparison about the influence of the EPC process parameters on the characteristics of A356 aluminum alloy castings were evaluated to provide better manufactueing condictions for the industry-university co-operation partners, and the yield of casting as well as production capacity of co-operation partners can be improved via this study. The result of study reveals that the high-pressure solidification mode on EPC process can indeed enhance the mechanical properties and reduce the porosity of A356 aluminum alloy castings. After mechanical property testing, it was found that the ASTM standard tensile test bar castings of 720 ° C pouring temperature show different tensile strength, yield strength, elongation, hardness for two pressure solidification modes. For five different section thicknesses of the step-type plate castings with pattern coated with 0.3 mm coating thickness, their strength and hardness are better than those with 0.6 mm coating thickness. Finally, the tensile strength, yield strength, elongation, hardness and microstures of ASTM standard tensile test bar castings at 6 minutes duration time of of high-pressure mode are better than those of 3 minutes or 10 minutes duration time. It was found that the metallographic microstructures and ditribution of A356 aluminum alloy castings at high-pressure solidification mode are better than those at one atmospheric solidification one. The reason for this result is that the castings at high-pressure solidification mode possess smaller grain size and more uniform distribution of eutectic mixture then those at one atmospheric pressure mode. In addition, many segregations of eutectic accumulation occurred in the microstructure of castings at one atmospheric pressure mode, and this phonmenon will be seriously detrimental to the mechanical properties of A356 aluminum alloy EPC castings.

Keywords : EPC process、A356 aluminum alloy、mechanical performance、high-pressure solidification modes、microstructure

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