

Effect of High Intensity Ultrasonic Treatment on the Micro Structure, Corrosion and Mechanical Behavior of ac4c Aluminium Alloy

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Abstract : Ultrasonic treatment is a promising process nowadays in the engineering field due to its high efficiency and it is a low-cost process. It enhances mechanical properties, corrosion resistance, and homogeneity of the microstructure. In this study, the effect of ultrasonic treatment and several casting conditions on microstructure, hardness and corrosion behavior of AC4C aluminum alloy was examined. Various ultrasonic treatments of the AC4C alloys were carried out to prepare billets for thixocasting process. Treatment temperatures varied from about 630oC and cooled down to under ultrasonic field. Treatment time was about 90s. A 600-watts ultrasonic system with 19.5 kHz and intensity of 170 W/cm² was used. Billets were reheated to semisolid state and held for 5 minutes at 582 oC and temperatures (soaking) using high-frequency induction system, then thixocasted using a die casting machine. Microstructures of the thixocast parts were studied using optical and SEM microscopes. On the other hand, two samples were conventionally cast and poured at 634 oC and 750 oC. The microstructure showed a globular none dendritic grains for AC4C with the application of UST at 630-582 oC, Less dendritic grains when the sample was conventionally cast without the application of UST and poured at 624 oC and a fully dendritic microstructure When the sample was cast and poured at 750 oC without UST .The ultrasonic treatment during solidification proved that it has a positive influence on the microstructure as it produced the finest and globular grains thus it is expected to increase the mechanical properties of the alloy. Higher values of corrosion resistance and hardness were recorded for the ultrasound-treated sample in comparison to cast one.

Keywords : ultrasonic treatment, aluminum alloys, corrosion behaviour, mechanical behaviour, microstructure

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