



Semi-solid rheocasting of Al-5Cu-1Ag high strength aluminum alloy

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Abstract: Aluminum is one of the important metals; therefore, different alloys are used in many industrial applications but these helpful alloys have many problems during their production process. Al-5Cu-1Ag is one of those important Al-Cu alloys that has high tensile strength and hardness with favorable elongation. The common defect in Al-5Cu-1Ag alloy is hot tear; so it is necessary to solve it. Hot tear is a direct result of molten droplets remaining between dendrites during solidification; therefore, it is important to break the dendrites and change the structure to an equiaxed structure. Thixocasting and rheocasting are semi-solid casting methods that could be useful for hot tear decreasing in the alloys with wide solidification range. In this research after alloying process, casted in direct casting (DC) and semi solid casting (SC). Samples were aged for 18 hours in 150 °C and microstructure studies by optical and scanning electron microscope were performed. EDX was used for analysis and image analyzing done by CLEMEX software. Brinell hardness and tensile strength measurement were used to investigate mechanical properties. Semi-solid behavior and optimum solid fraction during the process were studied by Thermo Calc. software. Results show that the dendritic structure in DC mode samples could change to a spherical structure with 48 µm diameter and 0.78 sphericity grains in SC method. Thus, hardness increased up to %50; tensile strength and elongation also increased. According to thermodynamic simulation results the optimum temperature range for Al-5Cu-1Ag alloy rheocasting process is 545-612 °C.

Keywords : “Al-5Cu-1Ag alloy”; “hot tear”; “rheocasting”; “mechanical properties”