

Grain refinement in semi-solid metal processing: current status and recent development

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ABSTRACT

Metal casting has become increasingly significant in the manufacture of industrial components. Aluminium alloys have become a typical metal casting material due to their lightweight, excellent corrosion resistance, improved mechanical properties, and excellent electrical conductivity. Grain refinement is a preferred method for improving the strength and flexibility of metallic materials by modifying the size of the grain structure using various processes. As a result, aluminium grain refinement is regarded an essential method in the aluminium processing industry. Grain refinement involves severe plastic deformation, quick solidification, and the addition of an inoculant. This paper discusses semi-solid metal processing (SSMP) research that enhances material properties using the grain refinement technique. The effect of different grain refinement techniques to the microstructure formation is also highlighted. The importance of the fine equiaxed globular microstructure in SSMP areas is explained. This study is expected to help the researcher establish the most effective grain refining technique in SSMP.

KEYWORDS

Semi-solid metal processing; Globular microstructure; Grain refinement; Severe plastic deformation; Rapid solidification; Grain refiner

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