Effect of structure on the fatique properties of aluminum casting alloys

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Casting alloys are materials used for producing shape castings, specifically aluminum alloy products with intricate geometries. These alloys are increasingly prevalent and find numerous applications in modern industry [1]. Aluminum alloys are critical engineering materials extensively utilized in various fields such as automotive parts, aircraft components, wire ropes, and overhead electrical cables due to their high strength-to-density ratio. However, in these applications, aluminum alloys are also susceptible to fatigue damage [2].

Aluminum alloys used in the automotive industry must exhibit a suitable balance of strength and ductility. Sheets or profiles are typically formed into final shapes, such as body panels or bumper beams, through cold deformation. Therefore, bendability is crucial for both fabrication and application, where ductility ensures optimal energy absorption. While uniaxial tensile testing is commonly employed to determine the mechanical properties of metals, it may not accurately reflect the deformation modes experienced by a component. In such cases, the three-point bending test is a more appropriate method for assessing mechanical properties. Several factors influence bendability, including hardening behavior, constituent particles, shear band formation, microstructure, and texture/anisotropy [3].

The aim of this work is to study and analyze the properties of aluminum alloys for casting. The experimental measurement is aimed at material evaluation and fractographic analysis of fracture surfaces after three-point bending loading.

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