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Wire Arc Additive Manufacturing of Aluminium–Magnesium Alloy AlMg4.5Mn With TiC Nanoparticles

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Abstract : The grain morphology and size of the additively manufactured (AM) aluminium alloys play a vital role in the performance and mechanical properties. AM-fabricated aluminium parts exhibit a relatively coarse microstructure with a columnar morphology. Ceramic nanoparticles, such as Titanium carbide (TiC), have shown great potential to reduce grain size and consequently influence the mechanical properties. In this study, the microstructural and mechanical properties of aluminium parts with TiC nanoparticles will be investigated. AM aluminium components will be fabricated using wire arc additive manufacturing (WAAM). The effect of the addition of TiC nanoparticles with different wt% on the melt pool geometry will be examined, and the obtained results will be compared to those obtained from pure ER5183. The impact of TiC nanoparticles addition in the AM parts will be analyzed comprehensively, and the results will be discussed in detail.

Keywords : additive manufacturing, wire arc additive manufacturing, nanoparticles, grain refinement
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