HEAT TREATMENT INVESTIGATION OF THE AlSi10Mg ALLOY PRODUCED BY SELECTIVE LASER MELTING (SLM): MICROSTRUCTURE AND HARDNESS

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ABSTRACT

Additive manufacturing has been established as a promising new technology, incorporated in many applications, in the focus of many researches. A major aspect of the Selective Laser Melting process involves the need for suitable heat treatments since a high degree of stress arises in the built components originating from the fast movement of the laser and the high local cooling rates. In order to overcome this issue, a well-known stress relief process (2 hours at 300ºC) is applied as the common treatment in all built products. However, this treatment comes at the expense of mechanical properties attained during the building process. Thus, this work was performed to enhance the understanding of post-processing T5 heat treatments behaviour of AlSi10Mg samples produced by the currently commercially available AM-SLM processes, as well as to investigate the possibility of modifying the existing treatment to yield improved mechanical properties without significantly changing the microstructure. A series of heat treatments were conducted in the range of 100ºC-300ºC and a T5 treatment of 2 hours at 200ºC in particular showed a noticeable increase in hardness values due to precipitation / coarsening of the Si phase. Further mechanical testing will be conducted in order to validate the suggested T5 treatment as a viable possible alternative.

KEYWORDS: additive manufacturing, AlSi10Mg alloy, microstructure, hardness, heat treatment.

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