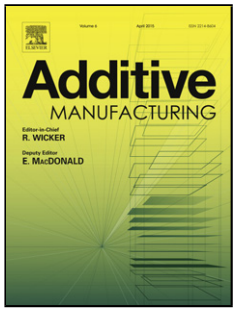

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Microstructure characterization of SLM-processed Al-Mg-Sc-Zr alloy in the heat treated and HIPed condition

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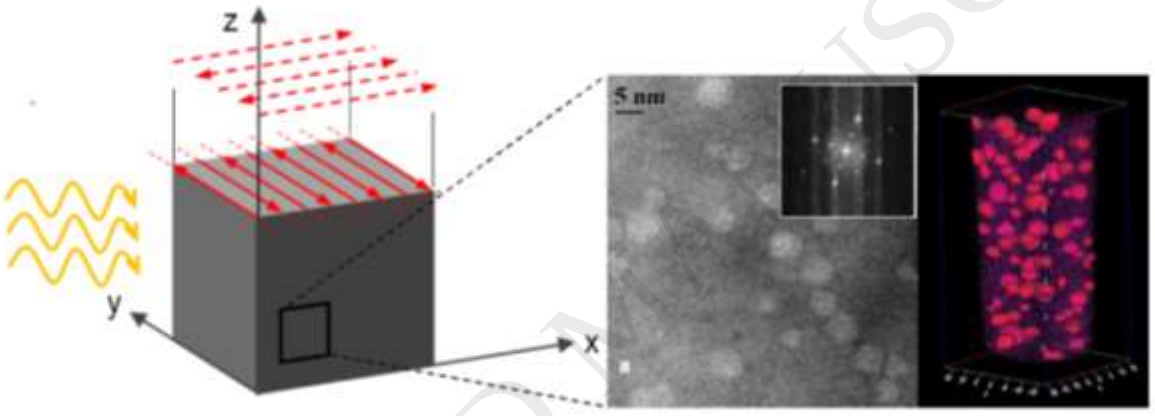
Graphical abstract



Highlights

- Heat treatment of Scandium and Zirconium modified AlMg alloys processed by Selective Laser Melting leads to precipitation of coherent Al3Sc particles.
- The number density of coherent Al3Sc particles in heat treated condition reaches 5.2□1023 m-3.
- Coherently precipitated Al3Sc particles are < 5nm in diameter
- Grain boundary particles stabilize the microstructure against grain growth during heat treatment.

Abstract

Sc- Zr-modified Al-Mg alloy, processed by selective laser melting, offers excellent properties in the as processed condition, due to the formation of a desirable microstructure. As in conventional processing, such alloys are age hardenable, thereby precipitating a high fraction of finely dispersed coherent $Al_3(Sc_x\ Zr_{1-x})$ intermetallics, which serve for the improvement of the mechanical strength. Electron backscatter diffraction measurements and transmission electron microscopy were used to determine the effects of heat treatment and HIP on the microstructures of SLM processed specimens. In addition, the chemistry and number density of Al_3Sc particles was analysed by atom probe tomography. The