

## Here comes Aluminum 7050

Aluminum 7050 has been utilized in many industries, especially in the aerospace sector. Similar to 2xxx and 6xxx series aluminums, 7xxx series aluminums are heat treated to develop their precipitate strengthened microstructure, thereby adding considerable strength. The alloy is known for high strength, fatigue resistance and resistance to stress corrosion cracking (SCC).

Elementum 3D has recently completed a preliminary research project to design a composition and post-processing plan for additively manufactured Al7050. The reactive RAM additions are locally activated by the laser energy during the build process to produce product phases that act as nucleants for the aluminum alloy during solidification. These nucleants produce an equiaxed grain structure to reduce columnar grain growth and eliminate hot tearing. As expected, the RAM additions solved the hot tearing and columnar grain problem. Figure 1 shows tensile bars on a build plate that were built utilizing E3D's RAM additions while Figures 2-3 show the fracture surfaces and optical micrographs of both altered by RAM and unaltered compositions of Al7050.

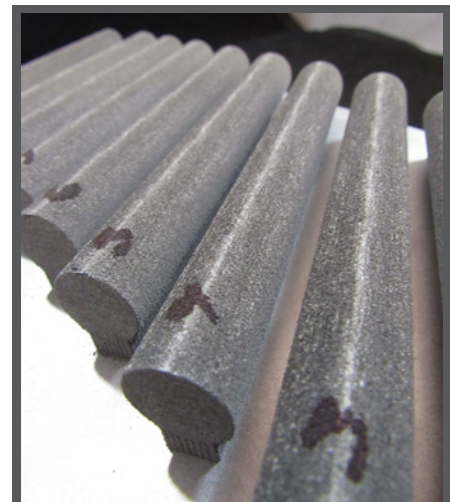


Figure 1: Tensile bars successfully built from a RAM altered composition of Al7050.

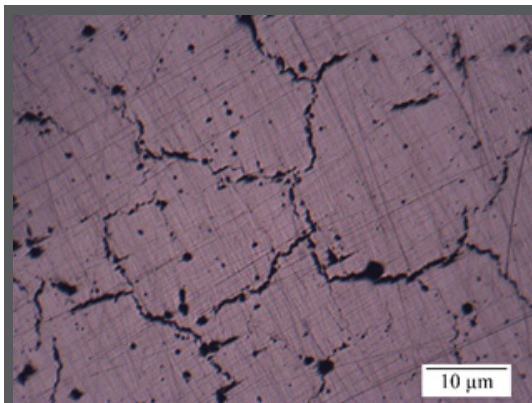


Figure 2: Image of hot tearing on an optical micrograph, which is expected for unaltered aluminum 7050 (Composition 1)

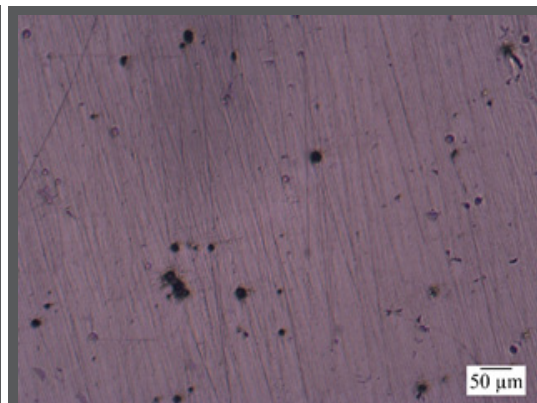


Figure 3: Microstructure of aluminum 7050 with RAM additions expressing the absence of hot tearing and minimized porosity.

It is expected that the feedstock composition specified range along with RAM additions and additive processing conditions can be optimized to further improve the microstructure and performance of the 7000 series alloy. Heat treatments are also expected to be able to be further developed and characterized for improved performance. With future work, the properties of this newly printable material can be optimized for commercial release in early Q2 2019. Further testing can work towards A-basis data for aerospace reliability.