Aerospace Europe Conference 2023
Joint 10th EUCASS – 9th CEAS Conference

Abstract #XXX *(to be filled by the organizers)*
Preferred Topics: STRMAT
Corresponding author: PAPENBERG Nikolaus
e-mail of corresponding author: nikolaus.papenberg@ait.ac.at
Type: Oral
Status of corresponding author: Regular

Title

Investigations on forging of low-density Mg-Li alloys

Authors

Nikolaus PAPENBERG[1], Stefan Gneiger[2], Alexander Großalber[3], Clemens Simson[4]*

** Corresponding author*
LKR Light Metals Technologies Ranshofen, Austrian Institute of Technology, A-5282 Ranshofen, Austria
[1] nikolaus.papenberg@ait.ac.at
[2] stefan.gneiger@ait.ac.at
[3] alexander.grossalber@ait.ac.at
[4] clemens.simson@ait.ac.at

Abstract

Lightweight construction plays a vital role in aerospace applications and has a direct impact on fuel consumption and payload. While a variety of new materials and composites have been used in structural parts in the past and continue to be used, light metals such as Al, Ti and Mg still play a key role today.

Among the light metals, magnesium holds a special place as it is known to be the lightest structural metal in the world. Depending on the processing method used, its alloys can achieve specific mechanical properties comparable to those of high strength 7xxx Al alloys. However, its limited ductility at medium and low temperatures, caused by its crystal structure, can lead to reservations regarding its processing and use. This can be mitigated by Lithium, as an alloying element, greatly increasing ductility by changing the brittle HPC crystal structure to the more ductile BCC structure at additions above 10 wt. % Li.

In addition, as the density of Li is only about 0.5 g/cm³, the mass of parts made from Mg can be further reduced, leading to exceptional specific strength and stiffness. A disadvantage of using Li is its high reactivity in most media, e.g. air, making production complicated and parts prone to oxidation. This can be alleviated using Ca, which is known to improve the oxidation resistance of Mg alloys.

Here, we present results of our investigations on forged Mg-Li-Al-Ca alloys. The material was produced through lab-scale casting and formed in a two-step forging operation. The manufacturing route and the processing behavior are discussed, in addition the microstructure as well as the mechanical properties will be shown. In conclusion, we demonstrate the capabilities of Mg alloys with high Li contents, which are promising due to their remarkably low density and high specific mechanical properties, we look forward to exploring their full potential in future studies.