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Selective laser melting of a new tailored aluminium alloy (SilmaAl® AlSi7Mg0.6) for aerospace industry

Camilo Zopp¹, Frank Schubert¹, Frank Palm², Hubertus Lohner², Freerk Syassen² and Lothar Kroll¹¹Chemnitz University of Technology, Germany²Airbus Central Research & Technology (CRT), Airbus, Ottobrunn, Europe, Germany

In recent years the demand for additive manufactured components has experienced a considerable boost due to increased technical, economic and geometrical requirements. Above all for the aerospace industry, the additive production technology is predestined for the production of tailor-made and geometrically complex components. In particular, laser powderbed fusion (LPB-F) is characterized as an innovative and directional production process with enormous potential. Aluminum alloys are excellent lightweight materials due to their comparatively high stiffness and strength combined with low weight. However, the current use in the additive production process is limited by the comparatively difficult processing and which can lead to undesired low material densities. The focus of the work was the development of suitable LPB-F process parameters for higher strength and low oxygen aluminum alloy AlSi7Mg0.6 (SilmagAl®). In this context, material densities of approx. 99.98 % could be achieved. In the second step, mechanical investigations were carried out under static load. A comprehensive trade-off and comparison was made between different heat treatments. In the static range, yield stresses of up to 300 MPa and tensile strengths of up to 430 MPa have been achieved. The fracture elongation at break could be adjusted accordingly with values up to 20%. Hence processing of this improved aluminum alloy and the generated mechanical properties, new application potentials in the aerospace sector will open up, e.g. for future hydraulic components.

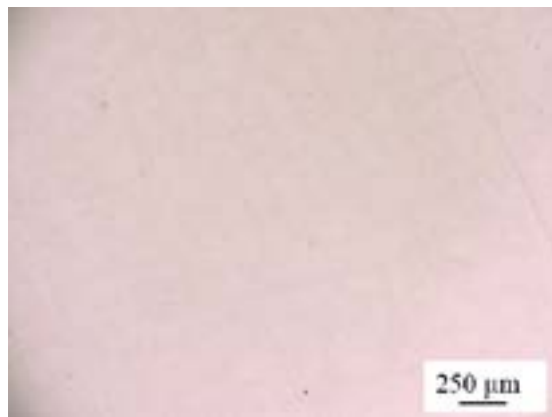


Figure 1: Material density of AlSi7Mg0.6.

Biography

Camilo Zopp graduated in Mechanical Engineering studies at Dresden University of Technology, Germany in 2013. Since 2014, he is a Research Assistant in the Department of Mechanical Engineering at Chemnitz University of Technology, Germany. He is currently working in the Germany's first and only Federal Cluster of Excellence "MERGE" in the field of lightweight structures. His research focuses on additive manufacturing, selective laser melting (SLM) especially in processing of new materials and development of material parameters. Another research topic is the production of thermoplastic-based hybrid laminates. He is interested in the processing of new metal alloys and development of design guidelines.

camilo.zopp@mb.tu-chemnitz.de