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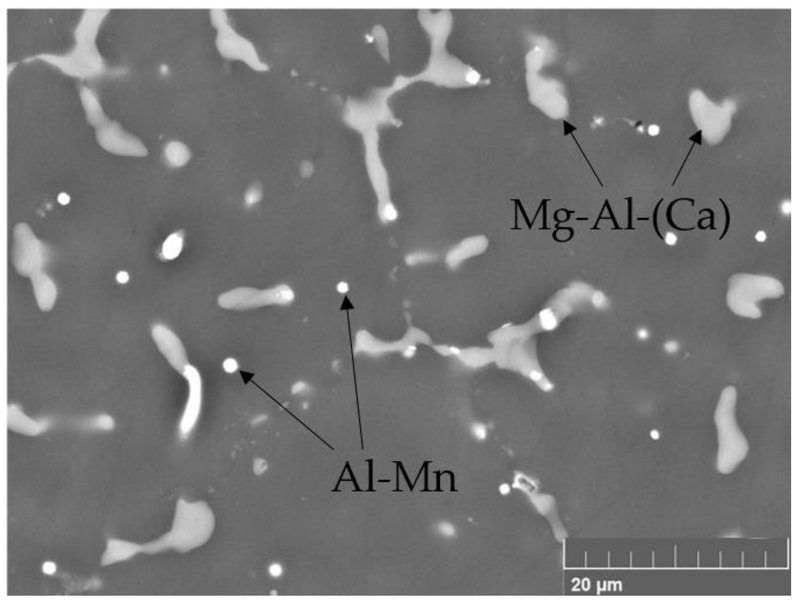
ReMaP

Research of Magnesium Alloys for Additive Manufacturing of Structural and Biocompatible Parts

PROJECT AIM

The INTERREG AT-CZ project **ReMaP** aims at **developing novel magnesium (Mg) alloys** for future applications in **lightweight construction** as well as **medical applications** (implants) using two representative additive manufacturing (AM) technologies – **wire-arc additive manufacturing (WAM) and laser powder bed fusion (LPBF)**.

The main objectives are to gain knowledge about the processing of customized Mg alloys for additive manufacturing and their properties. In this way, a contribution is made to the sustainability goals of lightweight mobility and health technology.

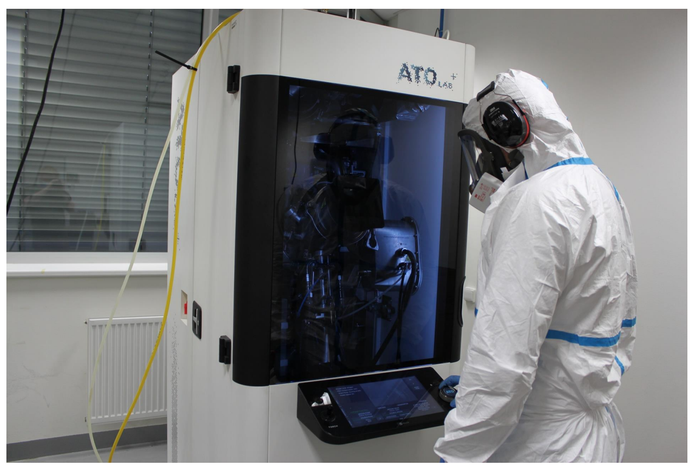


ALLOY DEVELOPMENT

In the project, alloys are developed which are suitable for AM and meet the specific requirements of the particular application. For structural materials, special attention is being paid to mechanical strength, while the medical materials are being designed for good biodegradability.

WIRE AND POWDER MANUFACTURING

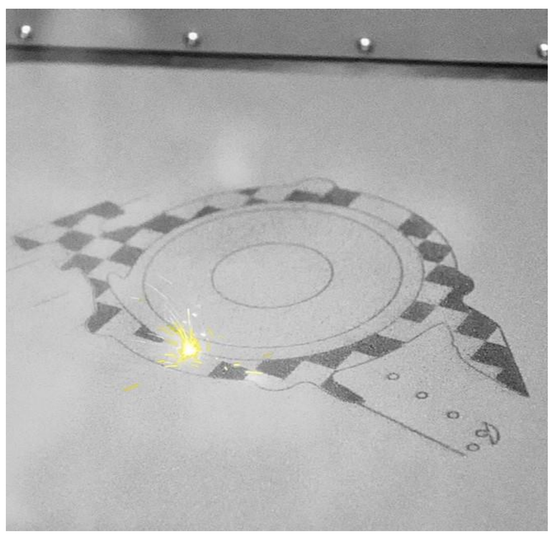
To investigate the materials developed in the project, the starting materials for the respective processes are produced in small quantities at the partners. At Light Metals Technologies Ranshofen (LKR), filler wire with a diameter of 1.6 mm is produced from cast billets by direct extrusion, which can then be processed in the WAM process. For the LPBF process, this wire is atomized into powder (< 70 µm) at the Brno University of Technology (BUT).



ATO lab atomizer

The ATO Lab+ atomizer installed at the Brno University of Technology produces metal powder material out of wires using a novel ultrasonic atomization technology.

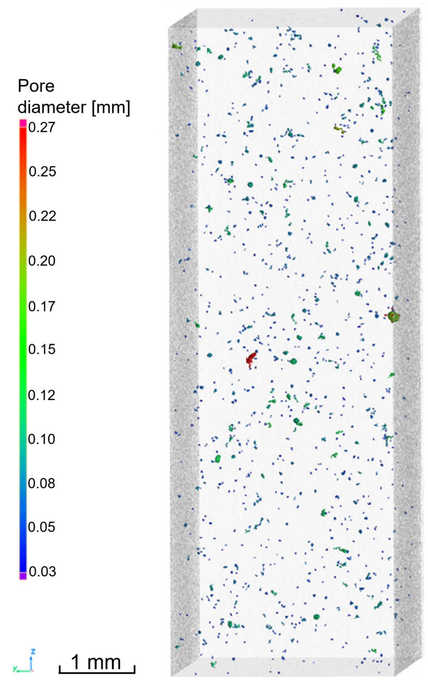
This material is sieved and can be processed directly in the university's laser powder bed facility.



PROCESSING VIA WAM AND LPBF

The wires produced in-house are processed in LKR's state-of-the-art additive manufacturing laboratory via WAM, using a robot driven welding equipment. Thin-walled structures suitable for sample extraction are produced.

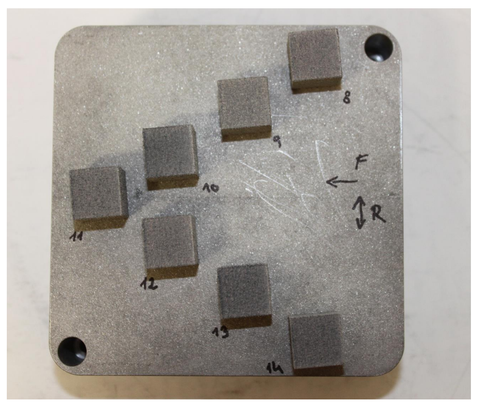
For the powder route, samples are prepared from powders produced specifically for the project as well as commercially available powders at BUT using the LPBF process.



SAMPLE MANUFACTURING AND RESULTS

In addition to studies of the process behavior itself, numerous analyses are carried out on the additively generated structures.

Mechanical tests and microstructural analysis (SEM, EDX, EBSD) are done as well as corrosion tests (electrochemical potential). Additionally, computed tomography (CT) scans for defect analysis are performed by FH Wels for correlating properties and structural features.



Manufactured parts

For AM, geometries were selected which are representative on the one hand, but on the other hand also allow easy removal of specimens.

Thin-walled structures were produced using WAM, while dense cubes were built by LPBF.

FUNDING

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