Complex 3D lattice structures – Micro Laser Sintering enables maximum functionality by minimum material use

Lattice structures are used to save weight without sacrificing stability of parts. Furthermore these structures can also realize functions like shielding, guiding or separating fluids in medical devices, reactors, heat exchangers, fuel cells and other microfluidic applications.

Example 1: slotted nozzle with free formed external geometry, variable cross-section and squared lattice structure with 100 µm wall thickness; material 1.4404 (316L)

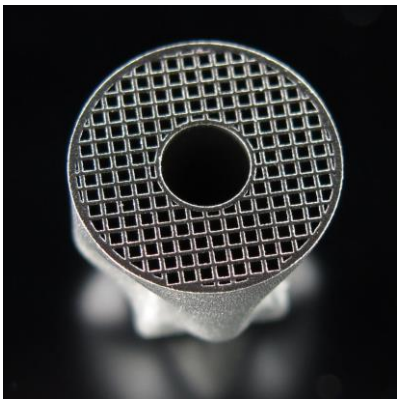

Figure 1: bottom view

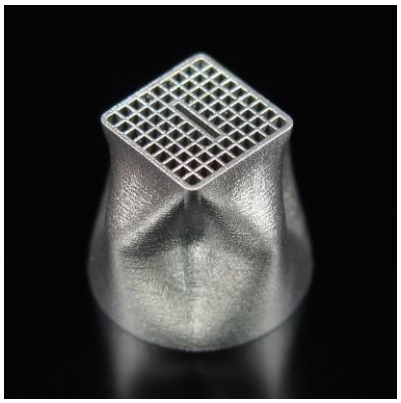

Figure 2: inclined top view

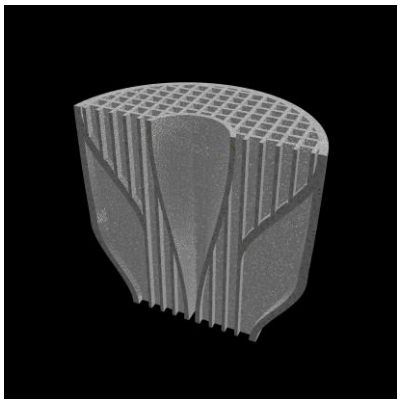

Figure 3: section view (CAD)

Example 2: hexagonal grid structure with 100 µm wall thickness; material 1.4404 (316L)

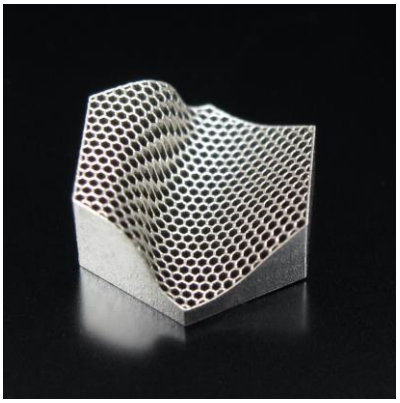

Figure 4: inclined top view

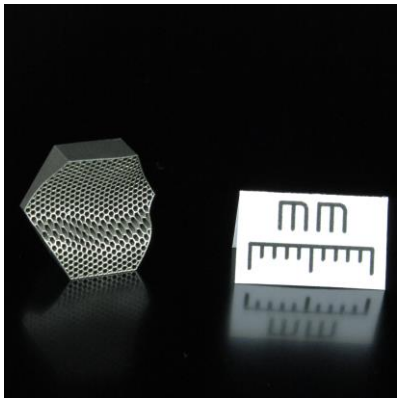

Figure 5: comparison 10mm scale

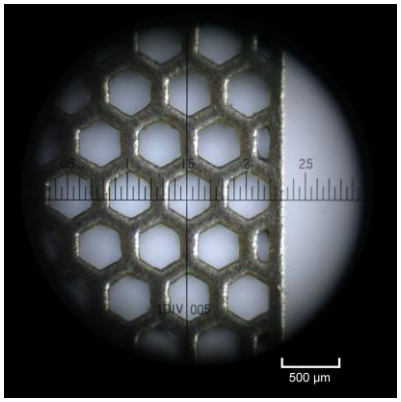

Figure 6: microscope view

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Example 3: bar grate structure with 150x150 µm bar cross section; material 1.4404 (316L)

Figure 7: top view

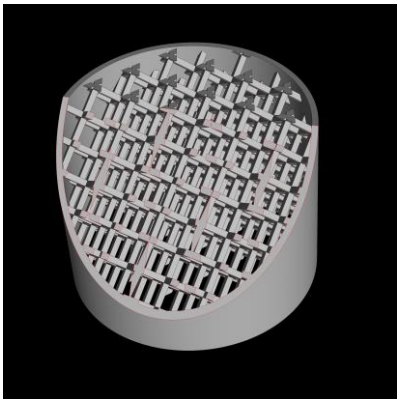

Figure 8: section view (CAD)

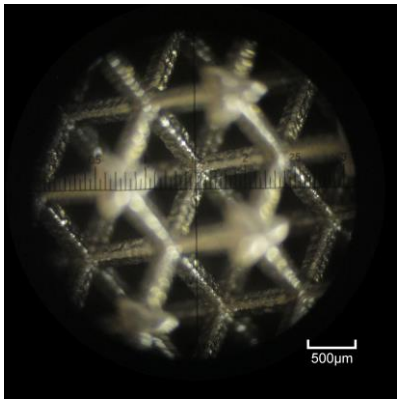

Figure 9: microscope view

Source: 3D MicroPrint GmbH

Geometric highly complex and functional lattice structures of metal can be precisely manufactured with the Micro Laser Sintering technology with minimal resource consumption. Compared to conventional manufacturing technologies, the raw material savings lead to a 60% reduced weight of the part. There are almost no limitations in the freedom of design. Even 3D-lattices with changes of the geometric features inside or undercuts can be manufactured. The wall thickness, the bottleneck of precise lattices, can be reduced down to 30 µm. The minimal achievable wall thickness heavily depends on the topology of the part as well as the raw material.

Micro Laser Sintering of lattice structures opens up new dimensions in the part design process, such as a property gradient of the geometry or density within a part. The new possibilities also enable innovations like optimized flow characteristics in microfluidics and functional integration. The absence of joints between the components will ultimately lead to an improved stability of the filigree lattice structures.

The featured parts were manufactured with a DMP50 GP Micro Laser Sintering machine developed by 3D MicroPrint GmbH.

The technology

A 3D-CAD model of the target geometry contains all details of the final part. This CAD model is split into several cross sections, called layers. During manufacturing, a thin layer of powder is applied to a build platform. The powder is selectively fused by a laser beam according to each cross section. After that the building platform is lowered, the procedure of powder coating, fusing and platform lowering is repeated layer by layer, until the part completed.

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About 3D MicroPrint GmbH

3D MicroPrint GmbH is known for high-precision micro parts manufactured by Micro Laser Sintering. Since the company was founded in 2013 by EOS GmbH and 3D-Micromac AG, the additive manufacturing process has been further developed for micro parts and has been adapted to run an industrial production. Today we are providing our customers the entire portfolio of design consulting for additive manufacturing, feasibility studies and parts production up to their own 3D MicroPrint Micro Laser Sintering system. Furthermore 3D MicroPrint offers material developments for exclusive technologies on demand. The key applications for micro parts are medical industry, wearables, semiconductors and micro industries, high frequency applications as well as aerospace.

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