MCP-HEK TOOLING

MCP-HEK Newsletter

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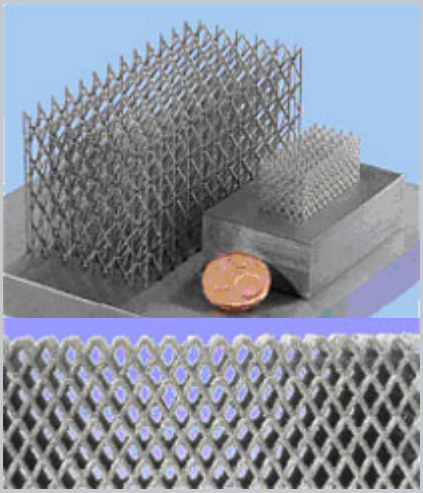
Selective Laser Melting (SLM) Technology opens New Perspectives in Medical Implantology

Mesh Structures for Body Implants through Rapid Manufacturing (RM)

Three-dimensional porous metallic structures are of great importance for implant surgery since such structures promote the in-growth of natural human bone cells (osseointegration). During the last few months MCP-HEK has produced prototypes with interconnected porous structures (see pictures) with the MCP Realizer II SLM in a benchmark study for the University of Liverpool.



The ultra-light components, produced in titanium, cobalt-chrome and stainless steel, are the most complex geometries ever to be generated in dense, non-infiltrated metals.

With the Selective Laser Melting technology the weight volume of a component made e.g. from stainless steel can be reduced from 7.83g/cm³ to 0.6g/cm³. With more than 90% weight reduction, but still retaining high rigidity and strength properties, SLM offers many new medical applications and perspectives in biomechanics for bone replacement. The lattice structures produced have a wire thickness of less than 0.25 mm. The wires are ductile and flexible with properties the same as cold rolled steel, cobalt-chrome and titanium.

The individual patient data - derived from computer tomography or nuclear magnetic resonace tomography - is modelled on the computer to design the ideal shape for the implant (P.H. Warnke et al., Lancet 2004; Vol. 364; p. 766). The corresponding shape in fine mesh titanium, or any other biocompatible metal, is generated with the SLM technology. Prior to the implantation, the robust, self supporting implant is coated or filled with a bone replacement and build-up material. In co-operation with medical research institutes in the surgical application of such implant structures excellent results have already been achieved.

SLM parts can be generated porous as well as homogeneously dense and a combination of both methods is also possible. All the common workshop machining methods can be applied to SLM parts. Surfaces can be polished to a mirror finish. Tests show that many metal powder materials, such as low melt alloys, bronze, zinc, stainless steel, tool steel, titanium, cobalt-chrome alloys can be used. For this reason, the MCP Realizer II SLM is the most flexible and open system regarding metal materials and medical applications. Alongside many industrial applications, dental caps, bridges and crowns are being produced in Germany on the MCP Realizer II SLM as well as medical drilling templates and technically, extremely demanding implants.

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