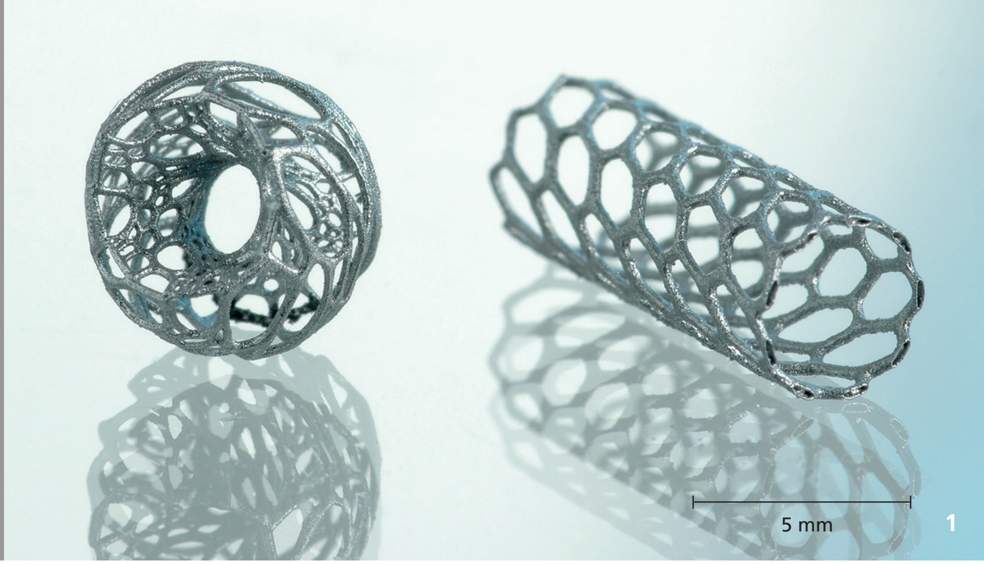

Subject to alterations in specifications and other technical information. 06/2016.

CONSTRUCTION OF MICRO-STRUCTURES FROM AN NiTi MATERIAL WITH µSLM

Task

Thanks to the development of micro SLM (µSLM) out of Selective Laser Melting (SLM), the surface quality and detail resolution of small (≤ 10 mm) functional components have been enhanced significantly. To demonstrate the potential of the µSLM process with respect to the production of implants and microstructures, Fraunhofer ILT should qualify a binary alloy of nickel and titanium (NiTi) for the µSLM method. Due to its shape memory effect and proven biocompatibility, NiTi is suitable for various applications in the field of medical technology. The µSLM process has clear advantages over conventional milling processes as the expensive material has to be processed extensively and potential functional parts are quite complex.

Method

Process parameters and exposure strategies should be identified for NiTi with which complex structures and functional parts can be produced in the sub-centimeter size with a high detail resolution and enhanced surface quality.

Result

By adapting the conventional SLM systems engineering and using a laser modulation device, Fraunhofer ILT has been able to produce complex structures and functionally integrated micro devices made of an NiTi material. For this purpose, a set of parameters – scanning speed, laser power track pitch, pulse rate and pulse width – were identified, making it possible to produce thin-walled structures with a minimum width of 32 µm and a surface roughness of Ra = 1.3 µm.

Applications

In medical technology, NiTi is already being used as a material for endovascular stents and for osteosynthesis implants. The µSLM method has the potential to produce delicate implants individually and efficiently.

In addition to their applications in medical technology, many micro-components can only be produced with the µSLM process due to their complexity.

Contacts

Lukas Masseling M.Sc.
Telephone +49 241 8906-8349
lukas.masseling@ilt.fraunhofer.de

Dr. Wilhelm Meiners
Telephone +49 241 8906-301
wilhelm.meiners@ilt.fraunhofer.de

1 Microstructures of NiTi (wall thickness: 32 µm, surface roughness: Ra = 1.3 µm).

Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
DQS certified by DIN EN ISO 9001, Reg.-No.: DE-69572-01