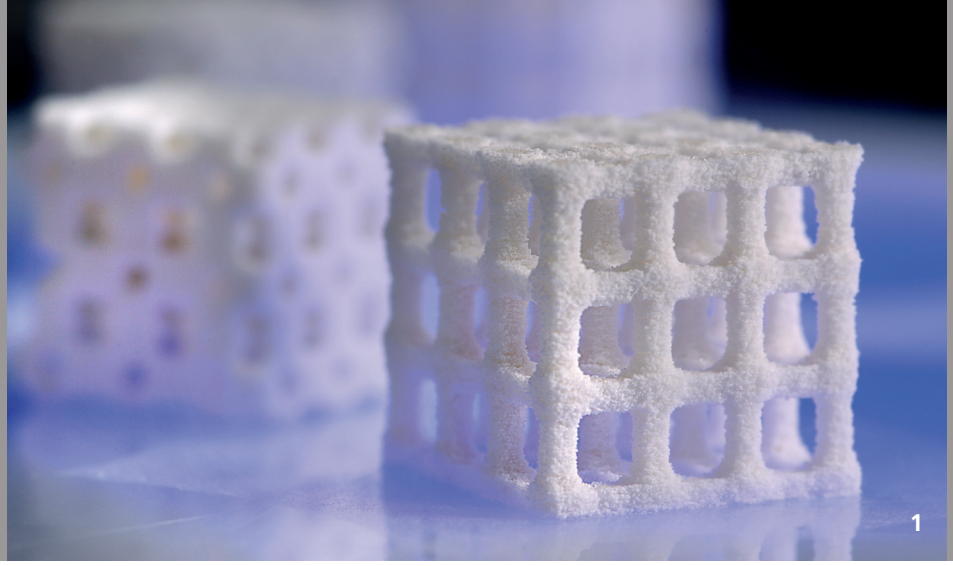

SELECTIVE LASER MELTING OF POLYMER BASED BIORESORBABLE IMPLANTS

Task

Polylactide-based composite materials with β-tricalcium phosphate (β-TCP) or calcium carbonate as a filler make it possible to produce bioresorbable bone replacement implants that have controllable absorption kinetics and adjustable mechanical properties. So far, however, no one has developed a shaping production process which enables patient-specific implants to be produced with interconnecting pore structure so as to optimize bone ingrowth. In the future, Selective Laser Melting (SLM) could enable the production of such tailor-made implants. Fraunhofer ILT has developed the processing of a composite material made of polylactide and β-TCP with SLM on a laboratory scale. So that this process can be implemented in the industry, the following steps are necessary: a scale-up of material synthesis, use of commercially available equipment technology and an improvement of the material by using calcium carbonate with buffer capacity to neutralize the acidic degradation products of the polylactide.

1 Lattice structure manufactured with SLM (strut thickness about 1 mm) of a polylactide/calcium carbonate composite.

Method

The SLM process is currently being developed for a new composite material made of polylactide and calcium carbonate, which can be synthesized using a scalable and solvent-free dry grinding process in accordance with requirements of medical technology. The SLM process development is being carried out with an EOS Formiga P 110 system, whereby the process parameters (e.g. laser power and scanning speed) are adjusted to the new composite material.

Result

Complex geometries can be prepared from a polylactide/calcium carbonate composite material using commercially available equipment technology. In the next step, the geometries produced will be characterized both biologically and mechanically.

Applications

Selective Laser Melting can be used for the production of patient-specific bioresorbable bone replacement implants, of which the main area of application is in the maxillo-facial region.

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