

Publication

Determination of strain fields in porous shape memory alloys using micro computed tomography

JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)

ID 1193147

Author(s) Bormann, Therese; Friess, Sebastian; de Wild, Michael; Schumacher, Ralf; Schulz, Georg; Muller, Bert

Author(s) at UniBasel [Müller, Bert](#) ;

Year 2010

Title Determination of strain fields in porous shape memory alloys using micro computed tomography

Journal Proceedings of SPIE

Volume 7804

Pages / Article-Number 78041M (9 pp.)

Shape memory alloys (SMAs) belong to 'intelligent' materials since the metal alloy can change its macroscopic shape as the result of the temperature-induced, reversible martensite-austenite phase transition. SMAs are often applied for medical applications such as stents, hinge-less instruments, artificial muscles, and dental braces. Rapid prototyping techniques, including selective laser melting (SLM), allow fabricating complex porous SMA microstructures. In the present study, the macroscopic shape changes of the SMA test structures fabricated by SLM have been investigated by means of micro computed tomography (muCT). For this purpose, the SMA structures are placed into the heating stage of the muCT system SkyScan 1172Trade (SkyScan, Kontich, Belgium) to acquire three-dimensional datasets above and below the transition temperature, i.e. at room temperature and at about 80degC, respectively. The two datasets were registered on the basis of an affine registration algorithm with nine independent parameters - three for the translation, three for the rotation and three for the scaling in orthogonal directions. Essentially, the scaling parameters characterize the macroscopic deformation of the SMA structure of interest. Furthermore, applying the non-rigid registration algorithm, the three-dimensional strain field of the SMA structure on the micrometer scale comes to light. The strain fields obtained will serve for the optimization of the SLM-process and, more important, of the design of the complex shaped SMA structures for tissue engineering and medical implants.

Publisher SPIE

ISSN/ISBN 0277-786X

edoc-URL <http://edoc.unibas.ch/dok/A6003395>

Full Text on edoc No;

Digital Object Identifier DOI 10.1117/12.861386

ISI-Number INSPEC:11606159

Document type (ISI) Conference PaperJournal Paper