Design and fabrication of compliant micromechanisms and structures with negative Poisson's ratio

This paper describes a new way to design and fabricate compliant micromechanisms and material structures with negative Poisson's ratio (NPR). The design of compliant mechanisms and material structures is accomplished in an automated way using a numerical topology optimization method. The procedure allows the user to specify the elastic properties of materials or the mechanical advantages (MA's) or geometrical advantages (GA's) of compliant mechanisms and returns the optimal structures. The topologies obtained by the numerical procedure require practically no interaction by the engineer before they can be transferred to the fabrication unit. Fabrication is carried out by patterning a sputtered silicon on a plasma-enhanced chemical vapor deposition (PECVD) glass with a laser micromachining setup. Subsequently, the structures are etched into the underlying PECVD glass, and the glass is underetched, all in one two-step reactive ion etching (RIE) process. The components are tested using a probe placed on an x-y stage. This fast prototyping allows newly developed topologies to be fabricated and tested within the same day.

General information
Publication status: Published
Organisations: Department of Micro- and Nanotechnology, Department of Solid Mechanics
Contributors: Larsen, U. D., Sigmund, O., Bouwstra, S.
Pages: 99-106
Publication date: 1997
Peer-reviewed: Yes

Publication information
Journal: IEEE Journal of Microelectromechanical Systems
Volume: 6
ISSN (Print): 1057-7157
Original language: English
Electronic versions:
Larsen.pdf
DOIs: 10.1109/84.585787

Bibliographical note
Copyright: 1997 IEEE. Personal use of this material is permitted. However, permission to reprint/republish this material for advertising or promotional purposes or for creating new collective works for resale or redistribution to servers or lists, or to reuse any copyrighted component of this work in other works must be obtained from the IEEE
Source: orbit
Source-ID: 167914
Research output: Contribution to journal › Journal article – Annual report year: 1997 › Research › peer-review