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Applications of LIGA technology to precision manufacturing of high-aspect-ratio micro-components and -systems: a review

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Abstract

The by far leading technology for manufacturing MEMS devices is Si-micromachining with its various derivatives. However, many applications of microsystems have requirements on materials basis, geometry, aspect ratio, dimensions, shape, accuracy of microstructures, and number of parts that cannot be fulfilled easily by mainstream silicon-based micromachining technologies. LIGA, an alternative microfabrication process combining deep X-ray lithography, plating-through-mask and molding, enables the highly precise manufacture of high-aspect-ratio microstructures with large structural height ranging from hundreds to thousands of micrometers thick. These tall microstructures can be produced in a variety of materials with well-defined geometry and dimensions, very straight and smooth sidewalls, and tight tolerances. LIGA technology is also well suited for mass fabrication of parts, particularly in polymer.

Many microsystems benefit from unique characteristics and advantages of the LIGA process in terms of product performance. The LIGA technology is briefly reviewed. The strengths of the manufacturing method and its main fields of application are emphasized with examples taken from various groups worldwide, especially in micromechanics and microoptics.

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Keywords

LIGA; 3D-micromachining; High-aspect-ratio; Micromechanics; Microoptics; Microfluidics

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