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Some investigations in holographic microscopic interferometry with respect to the estimation of stress and strain in micro-opto-electro-mechanical systems (MOEMS)

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Abstract

Holographic microscopy with conjugate reconstruction for the interferometric determination of three-dimensional displacement was used for the investigation of the mechanical behaviour of micromechanic and microelectronic components. An experimental set-up for the exposure of the holographic interferograms is described for the application of the spatial heterodyne technique, for the application of phase shifting, and for electro-optic holography. Three holograms for different illumination directions recorded on one holographic plate were reconstructed conjugately, and spatial-heterodyne technique as well as phase-shift technique were used to evaluate the interferograms. Only by conjugated reconstruction, it is possible to obtain a perfectly optimised interferometer for the static evaluation method. The evaluation of interferograms, which are strongly disturbed by speckle noise, can be performed successfully. A comparison of the results of the application of these techniques is given. The influence of the speckle effect on the resolution was investigated. © 2001 Elsevier Science Ltd. All rights reserved.

Keywords: Holographic microscopy; Phase shifting; Heterodyne technique; Speckle noise

1. Introduction

Recent industrial demands in the fields of microsystems and device miniaturisation led to development of two major technologies, micro-electro-mechanical and

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