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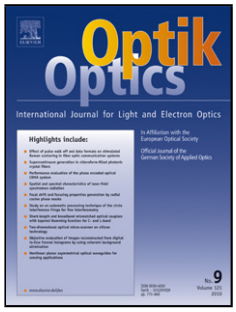

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Fabrication of high fill-factor aspheric microlens array by digital maskless lithography

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Abstract

A simple and effective method for fabricating high fill-factor aspheric microlens array using digital maskless lithography is reported. The method use the contour planes of the designed profile as binary image, which replace physical mask by DMD display. On the lithography system, the dose accumulated over multiple exposures and the exposure dose reconstructed in wafer, then the designed profile developed. Aspheric microlens arrays with hexagonal base and square base were produced by the method, and they were gapless at each microlens periphery, so the microlens array with fill-factor of 100%.

Keywords

Fill-factor; Aspheric microlens array; Digital maskless lithography

1. Introduction

Microlens array is widely used in diffusers, beam shapers, optical communication, optical interconnection, digital displays and sensing application, etc. [1-5]. Fill-factor and surface profile are two critical parameters that influence the performance of the microlens array. The fill-factor is defined as the percentage of lens area to the total area. High fill-factor microlens array will capture most incident lights to increase the signal-noise-ratio and optical performance. Microlens with aspheric shape, whose surfaces profile is neither spherical nor part of a cylinder, can eliminate spherical aberration or other optical aberrations. Hence, an optical system by aspheric microlens array not only smaller size, lighter weight, but also significant improvement of its optical performance, such as better imaging

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