One-step Nanofabrication of Diffractive Structure via Focused Ion Beam Scanning on Glass

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Abstract

A diffractive structure was obtained by directly scanning on a glass substrate in an area of 25×20 µm² by use of focused ion beam (FIB) with energy of 30 keV and beam current of 1 nA. It is a one-step, and pattern transfer free process. Ripples with regular shape and geometric size were observed on glass after FIB scanning. The ripples can be used as diffractive grating. Wavelength and amplitude of the ripple was characterized by use of atomic force microscope (AFM), ranging from 1.2 to 2.3 micron, and 30 to 256 nm, respectively. The ripples have potential application in optics as blaze grating for the working wavelength in the range from visible light to ultra violet (UV). However, physical properties of the glass maybe caused to a certain extent due to more or less Ga⁺ ion implantation during the scanning with energy of 30 keV. Considering this, the phase variation, refractive index, and transmission were investigated in this paper. To further study the implanted Ga⁺, the implantation depth was calculated by TRIM software, which is commonly used for ion beam analysis. The compound percentage of the implanted Ga⁺ was measured using electron dispersion X-ray spectrometer (EDX).