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# The fabrication method of diffractive optical elements by plasma-chemical etching to form etalon dot-images

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*An option of design of the diffractive optical elements (DOE), which are working on light transmission inside the optical systems on the second order of diffraction, is considered. The possibility of using the phase DOEs, having a two-level structure of rectangular micro-profile of working surface, is shown. The possibilities of manufacturing of DOEs and hologram optical elements (HOE) using the "Caroline 15 PE" plasma etching machine, are confirmed. The aim of the work was to increase the quality indicators of multilevel DOE-HOEs, which are mainly determined by the depth of functional micro-relief. It is shown, that the maximal depth of the relief of DOE-HOE conforms to the maximal etching selectivity of glass related to the mask material. The optimal mode of plasma chemical etching (PCE) of DOE, made of alkaline glass, is determined. It is established, that on the 100 nm thickness of chromium mask the up to 1,4  $\mu\text{m}$  deepness of micro-relief can be achieved, that, in its turn, allows to increase the diffractive efficiency of DOE-HOE. In particular, it is shown, that the relative intensity of light in the second order of diffraction could be 30%, that allows to create new items of micro-optics.*

**Keywords:** *diffractive optical element, phase diffractive grating, rectangular profile of the micro-relief, grooves depth, inorganic optical glass, plasma-chemical etching, mask, selectivity of etching, etching mode, diffraction efficiency.*

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