ON MULTI–LEVEL HIGHER–ORDER–DIFFRACION GRATINGS

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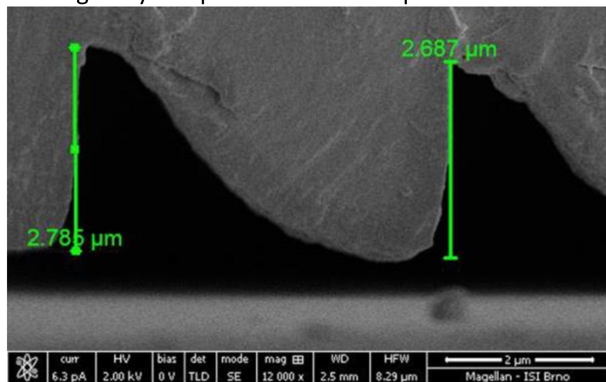
This contribution is on the development of the electron beam lithography for the preparation of deep planar relief structures in electron resist (PMMA). It is essential, for deep relief planar technology, to achieve the wafer (or glass) surface coating by the thick resist layers (up to 10 micrometers) that are sufficiently homogeneous in the area needed to prepare planar optical microstructures. In addition to commonly used 100–mm silicon wafer, the coating technology was extended to wafers of 150–mm diameter. Another successfully solved problem is the adaptation of the exposure procedures to avoid cracking of the resist layer due to high internal stress during the electron beam exposure and, in particular, during the relief creation in the surface resist layer upon its local selective dissolution. Procedures for data preparation of exposed structures were also modified to take into account the phenomenon of electron scattering. Both planar structures for the transparent mode and the reflective mode of operation are covered because the large ratio (approximately 6:1) of the respective required structure deepness implies different technology restrictions. Results and optical parameters of the grating structures achieved by e–beam origination using the Gaussian beam and the rectangularly–shaped beam are compared.



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