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Optimized ordered nanoprinting using focused ion beam

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Focused ion beam (FIB) is receiving great attention in nanopatterning due to its advantages such as direct milling and deposition. Like conventional lithography methods, dose is still the determining factor of pattern conformity in FIB. However, dose is also determined by many parameters such as ion beam current, pixel size and number of pixels of the bitmap file. In this work, we studied the effect of above parameters on dose per unit area, and thus on the pattern conformity. It was found that a dose approximately of 7.5—8.6 pC/ìm^2 or a bitmap file corresponding to 4000— 5000 pixels/ìm^2 at a beam current of 30 pA is reasonable in order to obtain well-separated nanohole arrays. Although direct pattern designing on FIB working field yields better conformity, it is not practical for large scale patterning. Finally, a relatively larger scale nanoholes arrays with diameter and spacing of 100 nm was achieved by using a dose of 8.6 pC/ìm^2. This work offers a few guidelines for nanopatterning on silicon substrate for photonic applications.

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