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Nanometer-Size Writing using 200 keV Electron Beam Lithography

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For the next generation technology called nanotechnology, there have been two approaches for the fabrication of nanodevices or nanosystems. The first one as bottom-up approach is to create tailored structures starting from building blocks of matter which is atoms-- The second method called as top-down approach is to scale down into the nanosize line or devices using various lithography techniques.

In this report, we will report the atomic size writing using high energy electron beam lithography. Fabrication of the letters with 30nm linewidth were performed using electron beam direct writing and lift -off techniques. In order to fabricate the atomic size patterns, high energy electron beam with 200 keV and conventional positive PMMA(polymethylmethacrylate) resist were employed. After direct writing of the patterns, the samples were rinsed in the 1:3 methylisobutylketone/propanol solution with and without ultrasonic agitation. The sample was immediately inserted into the vacuum chamber. Au film with 30 nm thickness was deposited using sputtering method with operating pressure of 10^{-5} torr. followed by lift-off techniques in propanol bath rinsing in hot trichloethylene. The patterns of 30 nm wide nanosize dots and lettering on silicon surface were successfully revealed using scanning electron microscopy (SEM).