The Study of the Resist Profile in PMMA Bilayer on SiO_2/Si Substrate

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Abstract. This article presents experiments and simulation of the electron lithography process with the aim of finding optimal parameters for lift-off technique which is a crucial step in the process of creating metal patterns on a substrate utilizing an electron beam. A bilayer comprising two PMMA resists with different molecular weights 950,000 on the top and 495,000 on the bottom (different sensitivities accordingly) was studied. The shape of the obtained developed resist images in the case of a single line (500 nm) was studied and the influence of the exposure dose on the sidewall geometry of the developed profiles in 550 nm bilayer PMMA resist system was investigated experimentally and theoretically in order to achieve close to vertical profile sidewalls. Contour plots of the developed bilayer PMMA resist half linewidths depending on the exposure dose along the resist depth were obtained through simulation and allow the profile geometry to be predicted for doses in the range from 360 $\mu C/cm^2$ to 2120 $\mu C/cm^2$.

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