

[NP-13]

Chemically Amplified Photoresists for Electron Beam Lithography

Youngmin Choi, Sang-Wook Park, Yongil Kim, Jin Jegal, and Haiwon Lee*
Department of Chemistry, Hanyang University

Electron beam lithography (EBL) is one of the major technologies that are able to delineate sub-micron patterns for the fabrication of semiconductor devices.(1) It is expected that EBL will contribute to play an important role in future device development. Due to their high sensitivity, resist systems involving some types of chemical amplification mechanism are being employed to make the semiconductor.(2)

In this presentation, a new chemically amplified positive photoresist, a polymer of 1,3-bis(trimethylsilyl) isopropyl methacrylate(3) (BPMA) / pantolactone-2-yl methacrylate (PLMA) / methyl methacrylate (MMA), has been developed for EBL. The polymer structure, properties, and deprotection mechanism were evaluated by FT-IR, ¹H-NMR, GPC, and TGA. The moiety of BPMA has an acid labile silicon containing side group. This new terpolymer was thermally stable up to 130 °C and compatible with 2.38 wt% TMAH developer. This terpolymer resist also showed a good dry etching resistance against O₂ RIE as well as 0.50 μm resolution capability by lithography evaluation.

[References]

1. D. R. Medeiros, A. Aviram, C. R. Guarnieri, W.-S. Huang, R. Kwong, C. K. Magg, A. P. Mahorowala, W. M. Moreau, K. E. Petrillo, M. Angelopoulos, IBM J. RES. & DEV. 45, 639 (2001).
2. a) H. Ito, J. Photopolym. Sci. Technol. 11, 379 (1998).; b) S. A. MacDonald, C. G. Willson, J. M. J. Fréchet, Acc. Chem. Res. 27, 151 (1994).; c) E. Reichmanis, F. M. Houlihan, O. Nalamasu, T. X. Neenan, Chem. Mater. 3, 394 (1991).
3. a) S. J. Park, I. H. Kim, Y. J. Kang, H. Lee, S. H. Lee, S. J. Choi, J. Vac. Sci. Tech. 20, 2108, (2002).; b) M. S. Son, E. R. Kim, H. Lee, J. Korean Phys. Soc. 41, 949, (2002).