Allresist - Customized e-beam resists for different applications

Mandy Grube [a], Maik Gerngroß [a], Harry Biller [a], Matthias Schirmer [a]
ALLRESIST GmbH, Am Biotop 14, Strausberg, D-15344, Germany
mandy.grube@allresist.de

Allresist develops, produces and distributes resists for optical and electron beam lithography as well as the associated process chemicals for the manufacture of electronic components. Our unique selling point is the development of resists according to customer requirements. With over 43 years of resist experience, and great flexibility, we have been able to manufacture technology-adapted resists cost-effectively in a short time since October 1992. Thereby standard products are ready for shipment already after 2-3 days.

The Allresist portfolio of e-beam resists is diverse and offers various fields of application. For example, with our CSAR 62 (AR-P 6200 series) we offer a highest resolution (<10 nm), high contrast, and plasma etch resistant, positive e-beam resist.[1,2] Furthermore, CSAR 62 can be used to easily generate lift-off structures. To dissipate charges during electron irradiation with CSAR 62 or PMMA, for example, we offer Electra 92 (AR-PC 5090 series), our conductive protective coating.

In cooperation with the MLU Halle, three-dimensional T-gate structures based on CSAR 62, PMMA and our AR-P 617 (PMMA-MAA 33% copolymer) could be successfully processed by lift-off (see *Figure 1 & 2*). The sensitivity of the three layers to their respective developers allows for a very large, controllable undercut in the middle layer. Therefore, the PMMA layer was developed with a solvent mixture of ethanol and isopropanol. Water-based PMMA developers will continue to keep us busy in the future. Due to the reclassification of MIBK from December 2022 as a probable carcinogen, Allresist is striving to bring a new, green, water-based PMMA developer to the market as a MIBK alternative.

Still well suited for two-layer processes (lift-off) with AR-P 617 or PMMA is our thermolabile resist, Phoenix 81, processable by thermal scanning probe lithography. In collaboration with Swiss Litho, the PPA-based[3] resist showed very high sensitivity and allowed the preparation of 16 nm single lines. Increasing the dosage promotes crosslinking processes and leads to a negative pattern. In addition to e-beam lithography, gray tone lithography is also possible.

---

[1] R. Andok, A. Bencurova, K. Vutova, E. Koleva, P. Nemec, P. Hrkut, I. Kostic, and G. Mladenov, Journal of Physics: Conference Series **700**, 012030 (2016).
[2] Arsenty Kaganskiy, Tobias Heuser, Ronny Schmidt, Sven Rodt, and Stephan Reitzenstein, Journal of Vacuum Science & Technology B, Nanotechnology and Microelectronics: Materials, Processing, Measurement, and Phenomena **34** (6), 061603 (2016).
[3] S. T. Howell, A. Grushina, F. Holzner, and J. Brugger, Microsyst Nanoeng **6**, 21 (2020).

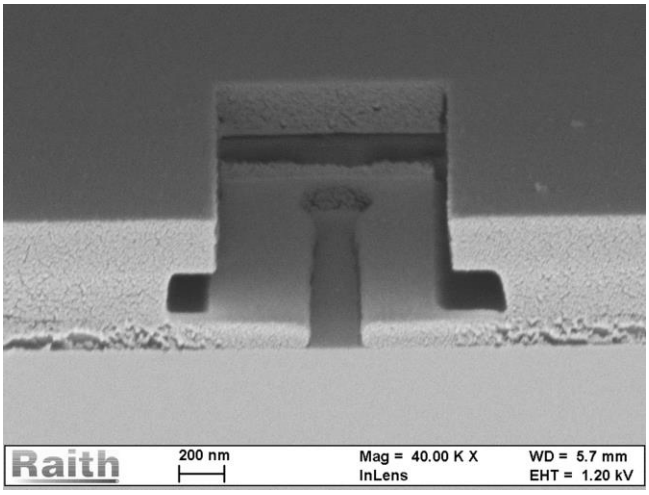

Figure 1: Three-dimensional resist profile for a T-gate nanostructure.

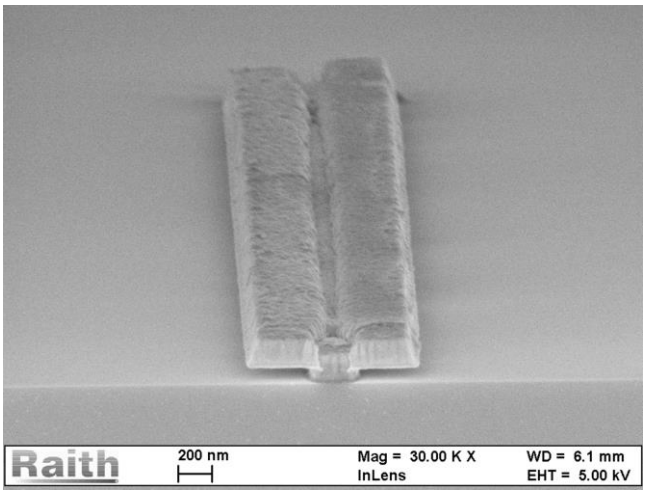

Figure 2: T-gate nanostructure after lift-off.