EOS 72 – High-sensitivity, chemically amplified e-beam resist with excellent alkali stability

ALLRESIST

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Motivation

The target for our FEP 171 alternative, **EOS 72**, is to generate 100 nm structures at a sensitivity of 10µC/cm². EOS 72 is to be processable by both e-beam and photolithography. The main focus is a particularly high alkali stability.

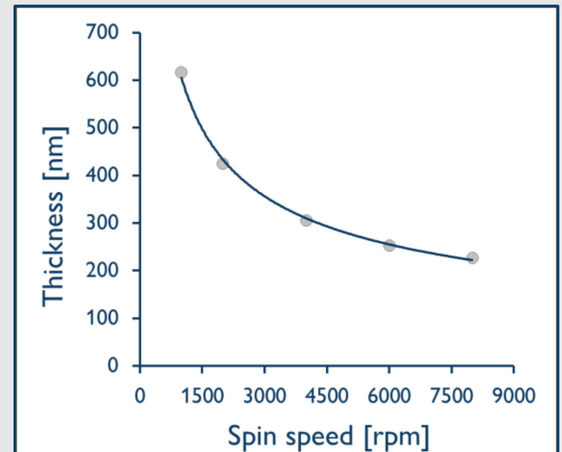
Research & Development

EOS 72 is based on a copolymer, various acid generators and a base as quencher, dissolved in methoxy propyl acetate (PGMEA). The working dose for the **e-beam application** is currently approx. **5-35µC/cm²**, depending among others on the used developer concentration and post exposure bake (PEB) conditions. For example, a longer and also higher PEB decreased the value of the clearing dose.

We have already been able to prove the high alkali stability with the first prototypes. For example, EOS 72 can be developed using a **0.70 n TMAH or 0.26 n TMAH** solution.

Figure 1: Spin curve of SX AR-P 7200.14/1.n (EOS 72) with a solid content of 14%. The softbake was performed for 3min@95°C on the HP. At 4000rpm, EOS 72 achieves a film thickness of about 300 nm.

Processing



Results

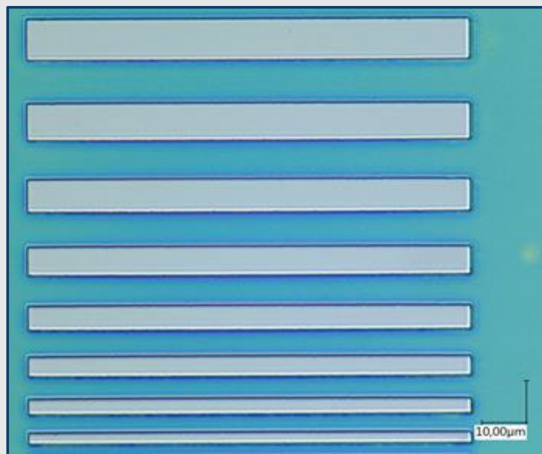
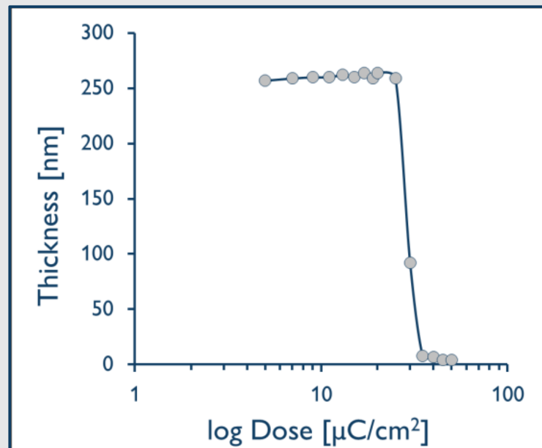


Figure 2: Developed structures of SX AR-P 7200.14/1.n, 100kV, 5µC/cm², PEB: 15min@130°C, development: AR 300-73, 1min. The processing of the chip was carried out at KIT in Karlsruhe, Germany.

Figure 3: Contrast curve of SX AR-P 7200.14/1.n, 10µm feature size, 50kV, 35µC/cm², PEB: 15min@130°C, development: AR 300-44, 2min. The processing was carried out at Fraunhofer ENAS in Chemnitz, Germany.

Process conditions	
Coating	4000rpm
SB	3min@95°C
Exposure	E-Beam
PEB	15min@130°C
Development	AR 300-44, 2min AR 300-73, 1min
Rinse	H_2O, 30sec

Table 1: Processing parameters for SX AR-P 7200.14/1.n (EOS 72).



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Outlook

Ongoing studies are investigating the clearing doses and contrast curves for the nm range. Furthermore, the resolution limits and feature sizes will be identified. The influence of PEB and development process will also be further investigated and optimized. Besides, the high alkali stability makes EOS 72 attractive for the production of etching structures in silicon.