AR NEWS

34th issue, April 2017, Allresist GmbH

Content:

Welcome to the 34th issue of the AR NEWS. We would like to inform you again about the further development of our company and the ongoing research projects.

1. Allresist plans another building extension in the 25th year of its existence

The economic development of Allresist, based on the new innovative products and the acquisition of additional, also large customers, necessitates another expansion of our company building in 2018. The synthesis and production capacities as well as the storage possibilities will be significantly expanded. For this purpose, Allresist will thus purchase additional land from the city of Strausberg in the next months. A first conceptual design has already been handed over to the construction planner. The building space will increase to more than 1500 m² in 2018 and the employment of additional staff is intended.

According to the considerably increasing demand, the well-established products CSAR 62 and Electra 92 can then be produced even more effectively.

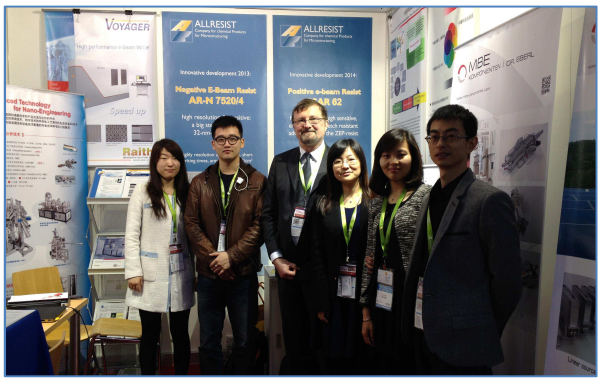
In our 25th year of existence, the R&D department is developing three brand-new products which might be of interest to our customers:

- The thermally developable positive resist "Phoenix 81"
- "Atlas 46", an alternative to SU-8
- Positive CAR e-beam resist "EOS 72"

These new product developments are presented in detail in this AR NEWS.

2. New sales partners

Our foreign sales partners have always contributed strongly to the economic success during the last years. We meanwhile realise more than 12 % of our sales volume with our long-standing Chinese partner "German Tech".

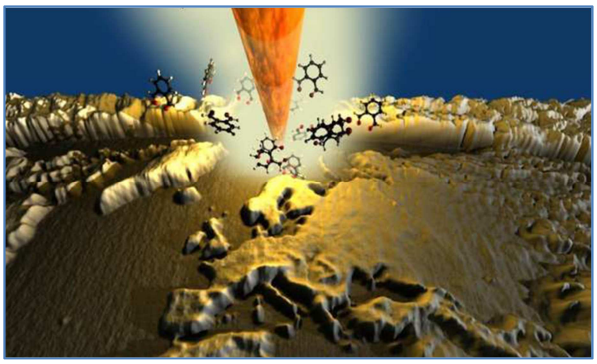


Picture 1 GermanTech and Allresist on the Semicon in China

The business with sales offices in Korea "SEMCRON" and in India "EdgeTech" also continue to progress well. New additions are the Russian partner "Ostec", the Taiwanese partner "Techpoint Taiwan", and the Israeli partner "PicoTech". Our export ratio has meanwhile reached about 46 %.

3. Thermally developable positive resist "Phoenix 81"

We have already repeatedly presented results from the Eurostar project "PPA-Litho" in the past AR NEWS. Poly(phthalaldehydes) (PPAs) are thermally structurable resists which were developed within the scope of the project mainly for applications with the NanoFrazor of SwissLitho AG. In the NanoFrazor device, a hot needle taps extremely rapidly into the resist and evaporates the resist by this means. This technique allows to write both 10 nm lines and also three-dimensional structures.



Picture 2 "Europe", written with PPA-resist Phoenix 81

The new resists are however also suitable for electron beam lithography since the energy of the electrons likewise evaporates the polymers. Substrates which are ejected from the e-beam device after irradiation are already fully developed. Finalising works to complete this project are currently ongoing at the Raith GmbH.

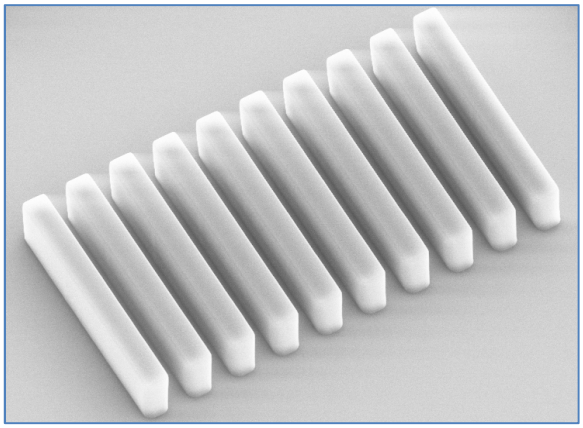
We described two-layer systems with PPA resists for very high-resolution lift-off applications already in the 31st issue of the AR NEWS. For this purpose, the PPA resist is structured as top resist with the NanoFrazor, followed by aqueous-alkaline development of the optimized bottom resist AR-BR 5400 to generate the desired lift-off structures.

To give all interested users the possibility to test the PPA resist **Phoenix 81**, these resists will be offered from mid-May onwards under the designation **SX AR-P 8100.04/1**. Available are also the resists which are required for two-layer processes (AR-BR 5400 and PMMA resists). Due to the small volume requirement for NanoFrazor appications, Phoenix 81 is offered in 10 ml samples.

4. Negative photoresist "Atlas 46"– our effective alternative to SU-8

The outstanding properties of SU-8 are well known to all users of microsystem technologies. In response to repeated requests of many customers, we now succeeded in designing a solvent-developable negative resist Atlas **46 S** ("S" for "solid") which is based on the reproducible raw material of a cresol novolac epoxy resign. First experiments demonstrated that Atlas layers can easily be coated, exposed and developed. In addition, Atlas layers exhibited a high reproducibility of the properties which was not always the case for SU-8. As expected, the resist structures resisted all solvent attacks. **Atlas 46 S** is thus suitable for all applications in which the layer is intended to remain permanently and resistively on the substrate. Currently in development are layers with thicknesses of a few to several hundred micrometers.

We furthermore developed a second derivative, resist **Atlas 46 R** ("R" for "Removing") which can be structured in a similar way with a slightly higher dose. Atlas 46 R-layers can however be removed with commercial removers if resist additives are used which reduce the degree of crosslinking. Due to the easy removability, the range of potential applications in photolithography is thus extended. The resist is in addition highly suitable for galvanic applications since it can just as simply be removed from metal structures.



Picture 3 Resist structures with negative resist "Atlas 46 S"

As of mid-May 2017, the first **Atlas 46** samples to produce 10 µm layers for own tests can be obtained under the designations:

Atlas 46 S: SX AR-N 4600-10/3

Atlas 46 R: SX AR-N 4650-10/4

As with all other resists, customer-friendly batch sizes of ¼ l and test samples of 30 ml and 100 ml are available.

5. Positive CAR e-beam resist "EOS 72"– our response to FEP 171

In the past few months, we successfully developed a chemically enhanced positive resist. The first tests with deep UV lithography (248 - 300 nm wavelength) showed a high sensitivity and a high contrast. The polymer compositions are now optimised in proven cooperation with our long-term partner IDM e.V., Teltow. Preparations for the production of the optimised base polymer at Allresist have already begun, which is one of the reasons for the need to expand of our company building.

Just recently in the pre-Easter week, we obtained the first electron beam lithography results from the MLU-Halle. Exposure dose variations were performed, beginning with 2.0 µC/cm². In each subsequent step, the dose was increased by 5 %. The dose to clear was 3 µC/cm² in this experiment. The contrast was 33, with is very high, and increasing the dose by 5 % produces a leap from the slightly developed to the fully developed state.

Process parameters:

Silicon substrate, adhesion promoter AR 300-80

Spin coating: 4000 rpm, layer thickness: 200 nm

Softbake: 85 °C, 5 min hot plate

Acceleration voltage: 30 kV

Post exposure bake: 3 min at 165 °C

Development: 60 s AR 300-26; 60 s H_2O

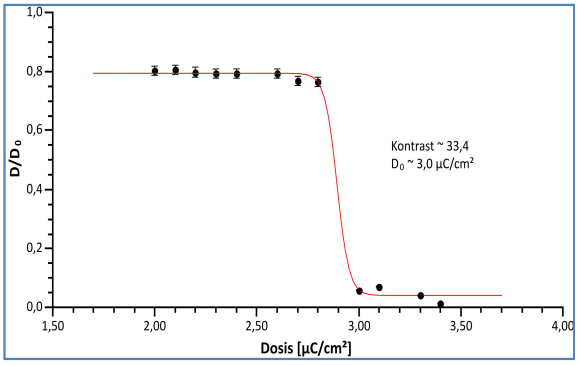


Figure 4 Gradation curve of SX AR-P 7200.10/2

A comprehensive characterisation of all resist parameters will follow in the next few weeks; this brief report is just intended to wake the interest of all customers who use eg. FEP 171. Our goal is a product with similar properties like FEP 171, but more durable, less expensive, and a faster delivery. First samples of EOS 72 for own tests will approximately be available in the middle of 2017 under the designation SX AR-P 7200.10/2.

6. 25 years of Allresist

Our 25th anniversary will be celebrated on 16. October 2017. In this quarter of a century, we exclusively developed, manufactured and distributed own products and proved to be a stable and reliable partner for our customers. We look back with joy on economic success and many honors and prizes. In the last 12 years, we have been pursuing the path for a sustainable business model of excellence with the three well-balanced components economy, ecology and social responsibility. The highlight in this respect was the awarding of the national Ludwig Erhard Prize which rewarded our efforts to live true excellence.

We will invite friends, partners, customers and other important personalities to celebrate this round anniversary on **Monday, 16. October**. In addition to speeches and a certainly excellent culinary supply, a technical colloquium is planned in which we will present the developments of our resist "think tank". Provided is also a forum for our partners to speak about their own interesting technological applications with our resists.

We are looking forward to a successful event and will then tackle the next quarter of the century.

We highly appreciate your suggestions and encourage you to communicate your wishes.

You can visit us on our stands at the **MNE 2017 in Braga, Portugal (18. – 21. September** 2017) and at **the Semicon Europe 2017 in Munich (14. – 17. November 2017)**.

The next issue of AR NEWS will be presented again in October 2017. Until then, we wish you and us every success.

Strausberg, 26.04.2017
Matthias & Brigitte Schirmer
Team of Allresist