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Motivation

A standard developer for PMMA coatings is a mixture of MIBK and IPA. Since MIBK will be reclassified as probable carcinogen from the end of 2022, Allresist is striving to offer a green, water-based PMMA developer that is harmless to health and also significantly more ecological.

Research & Development

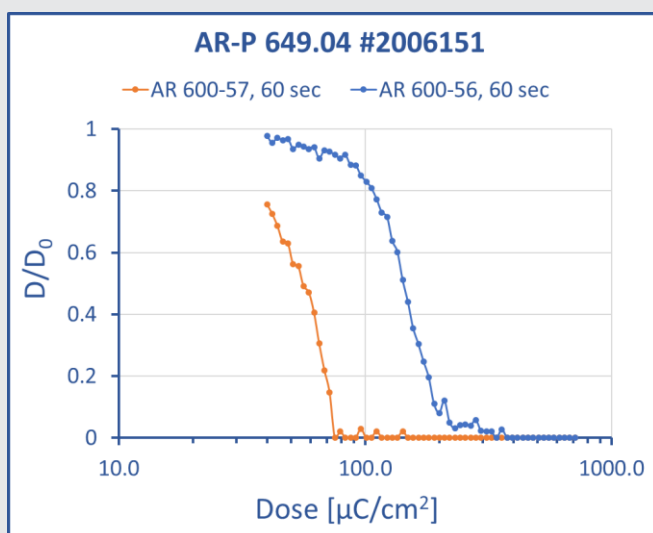


Figure 1: Development curves of AR-P 649.04 #2006151 with AR 600-57 (water/IPA mixture) in orange and AR 600-56 (MIBK/IPA mixture) in blue.

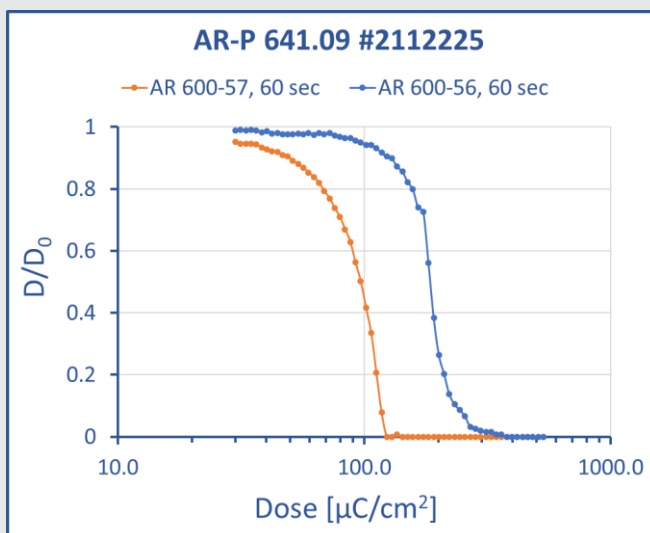


Figure 2: Development curves of AR-P 641.09 #2112225 with AR 600-57 (water/IPA mixture) in orange and AR 600-56 (MIBK/IPA mixture) in blue.

Results

Table 1: Processing parameters and development results of PMMA resists AR-P 649.04 #2006151 and AR-P 641.09 #2112225.

| | Coating | SB | Exposure | Development | D ₀ [µC/cm ²] | Contrast |
|-------------------------|-------------------|-----------------|--------------|--------------------------------|--------------------------------------|----------|
| AR-P 649.04 #2006151 | 150nm@ 4000rpm | 60min@ 180°C | E-Beam, 30kV | AR 600-57, 60 sec | 80 | 3.3 |
| | | | | Stop: H ₂ O, 60 sec | | |
| AR-P 641.09 #2112225 | 530nm@ 4000rpm | 60min@ 200°C | E-Beam, 30kV | AR 600-56, 60 sec | 213 | 2.9 |
| | | | | Stop: IPA, 60 sec | | |
| AR-P 641.09 #2112225 | 530nm@ 4000rpm | 60min@ 200°C | E-Beam, 30kV | AR 600-57, 60 sec | 125 | 4.2 |
| | | | | Stop: H ₂ O, 60 sec | | |
| AR-P 641.09 #2112225 | 530nm@ 4000rpm | 60min@ 200°C | E-Beam, 30kV | AR 600-56, 60 sec | 251 | 3.8 |
| | | | | Stop: IPA, 60 sec | | |

AR 600-57 is a mixture of isopropanol and water - this may sound surprising at first, IPA is known as a developer for PMMA, however, usually a high exposure dose is required. Mixing with water that by itself does not develop PMMA at all, results in a new developer with high process speed close to that or even faster than MIBK/IPA mixtures.

In further investigations, it was found, as shown in Table 1, that AR 600-57 increases the sensitivity of PMMA resists while maintaining contrast. The investigations could also already be reproduced. The developer is currently attracting a great deal of interest from our cooperation partners, so that further (positive) results are in prospect.