**Application Note**

HEIDELBERG INSTRUMENTS

# Maskless photolithography with the MLA150

by Théophane Besson, HIMT (in collaboration with CMi, EPFL)

The MLA 150 is a new generation laser writer aiming to provide a different and faster approach to standard photolithography. The embedded technology allows quick configuration, sub micrometric alignment and fast exposure of CAD designs within a few minutes, without the need to produce a photomask. This is a presentation of resists that have been tested with the MLA150 along several SEM illustrations.

| Resist | Film thick. [um] | Dose [mJ/cm$^2$] | Defoc [-10..10] | CD [um] |
|---|---|---|---|---|
| AZ 1512 | 1.6 | 130 | -2 | 2 |
| AZ 1512 | 1.1 | 90 | -2 | 1.5 |
| AZ 9260 | 4 | 190 | 2 | 1.4 |
| AZ 9260 | 10 | 350 | 3 | 1.6 |
| AZ ECI 3007 | 0.6 | 120 | -2 | 1 |
| AZ ECI 3007 | 1 | 160 | -2 | 1.2 |
| AZ ECI 3027 | 2 | 320 | -2 | 1.4 |
| AZ ECI 3027 | 4 | 650 | -2 | 1.4 |
| AZ ECI 3027 | 5 | 800 | -2 | 1.5 |
| AZ P4000 | 5 | 500 | 0 | 2 |
| AZ P4000 | 10 | 900 | 2 | 3 |
| AZ P4000 | 20 | 1800 | 6 | 4 |
| ma-P 1205 | 0.5 | 110 | 0 | 1 |
| ma-P 1205 | 1 | 110 | 0 | 1 |
| ma-P 1225 | 2.5 | 140 | 0 | 1.5 |
| ma-P 1225 | 4.5 | 200 | 0 | 1.5 |
| S1805 | 0.5 | 100 | 0 | 1 |
| S1805 | 1 | 150 | -1 | 1.2 |
| AZ4562 | 6.2 | 200 | 2 | 1.5 |
| mr-DWL | 40 | 250 – 350 | 0 – 10 | 2 |
| mr-DWL | 80 | 300 – 400 | 0 – 10 | 3 |

# Application Note

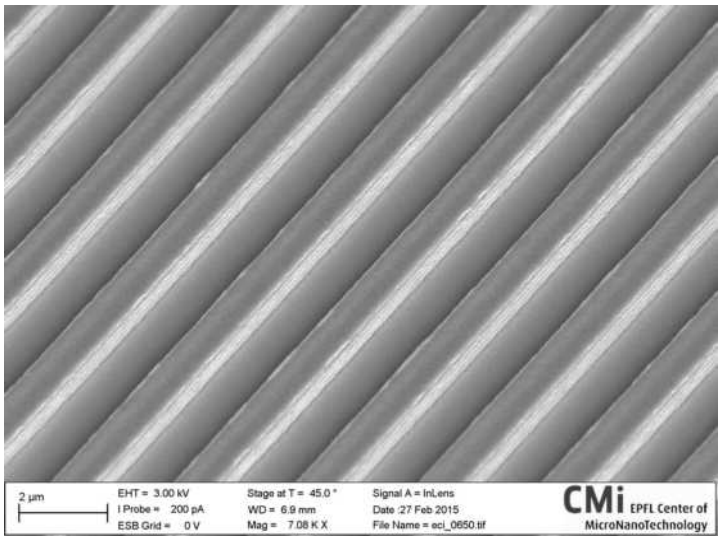


Fig. 1: AZ ECI 3007, 0.6 µm thick, 1.2 µm lines and spaces

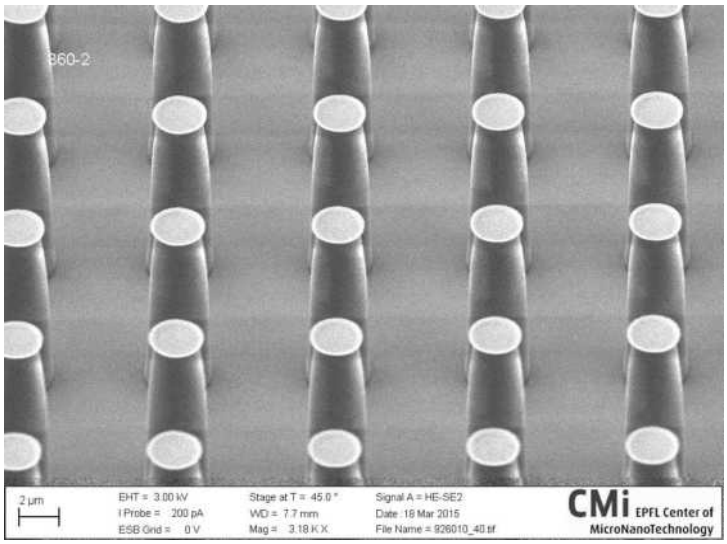


Fig. 2: AZ 9260, 10 µm thick, pillars with a diameter of 4 µm

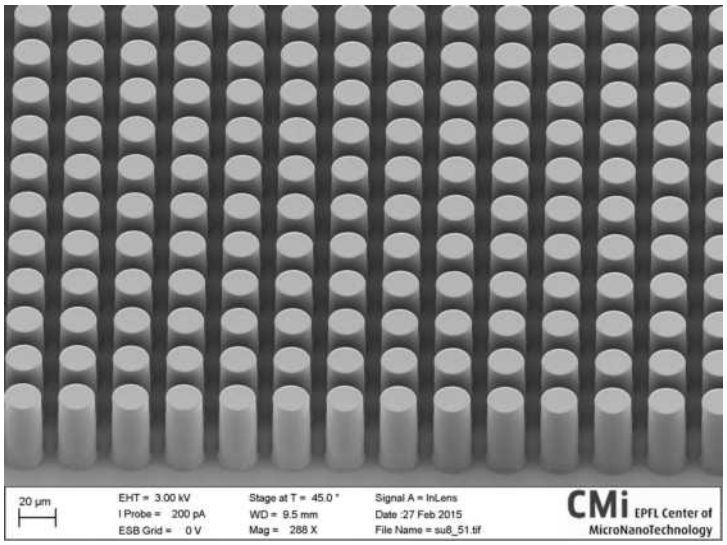


Fig. 3: mr-DWL 40, 40 µm thick, pillars with a diameter of 20 µm

# Application Note

## Examples of structures exposed in mr-DWL negative resist:

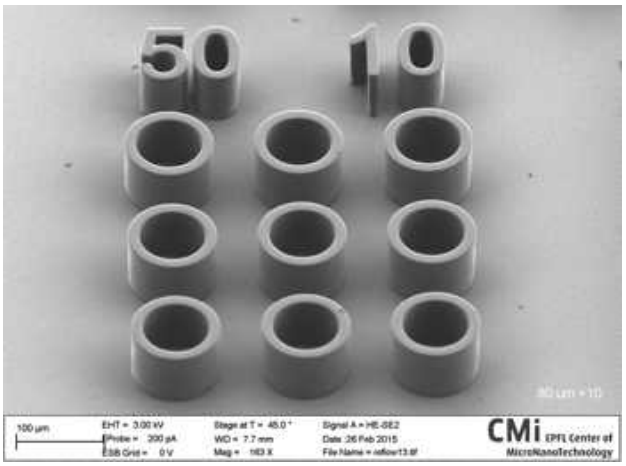


Fig. 4: mr-DWL 40, 80 µm thick, 100 µm wide cylinders with 10 µm wide walls

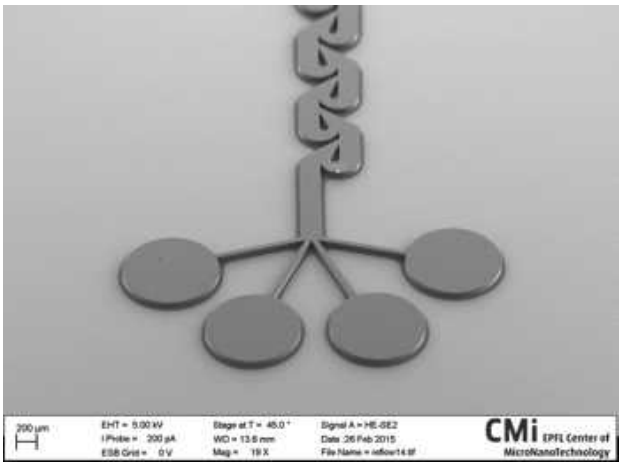

Fig. 5: mr-DWL 40, 80 µm thick, microfluidic device

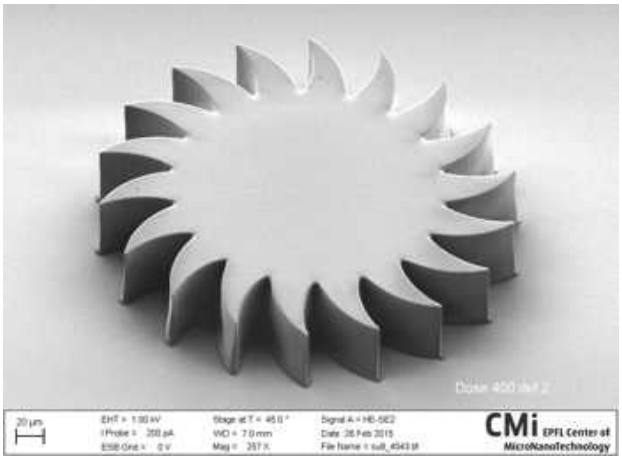

Fig. 6: mr-DWL 40, 40 µm thick, gear wheel

## Examples of structures exposed in mr-DWL thick resist:

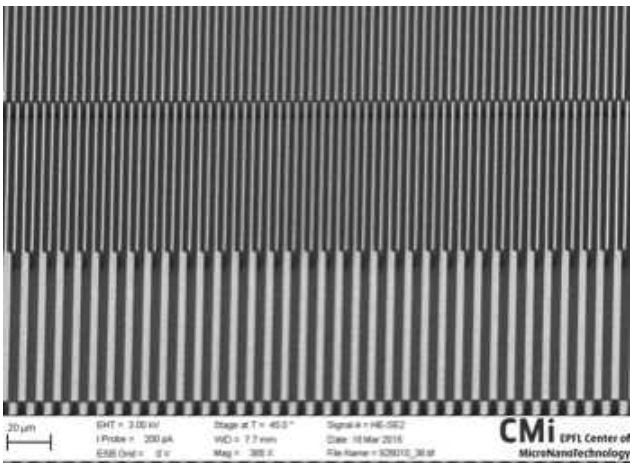

Fig. 7: AZ 9260, 10 µm, 4 µm and 2 µm lines and spaces

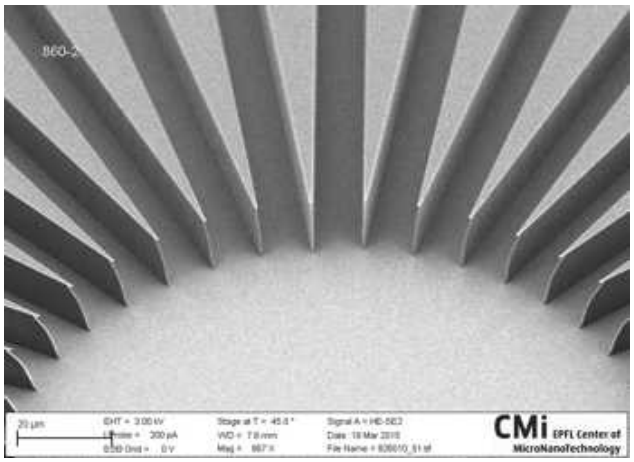

Fig. 8: AZ 9260, 10 µm thick, 10 µm spaces forming an asterisk

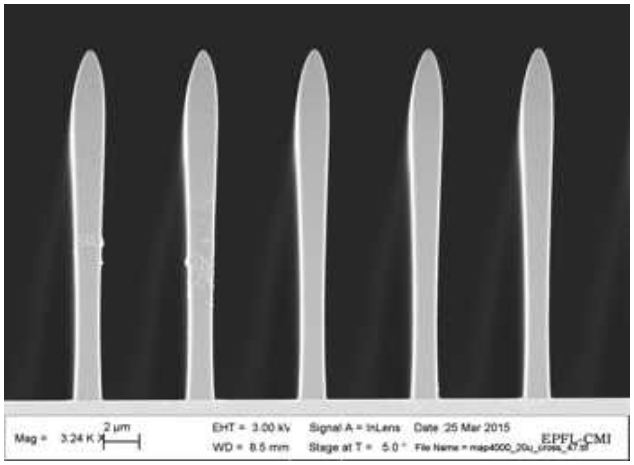


Fig. 9: AZ P4000, 20 µm thick, cross-section of 1.5 µm lines, 4.5 µm spaces

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**Examples of structures exposed in thinner positive resists:**

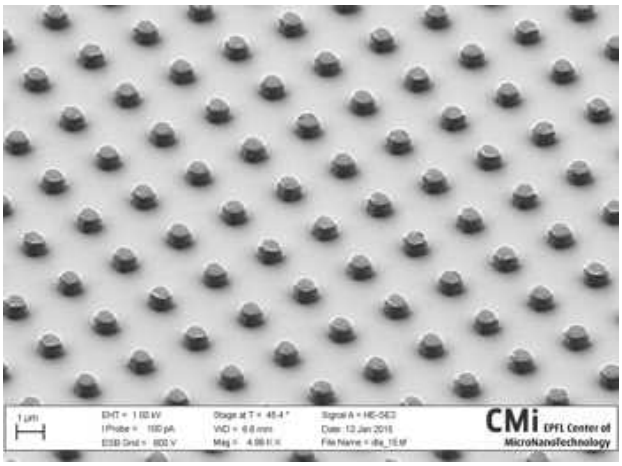

Fig. 10: AZ ECI 3007, 0.6 µm thick, 0.9 µm pillars with 1.5 µm spaces

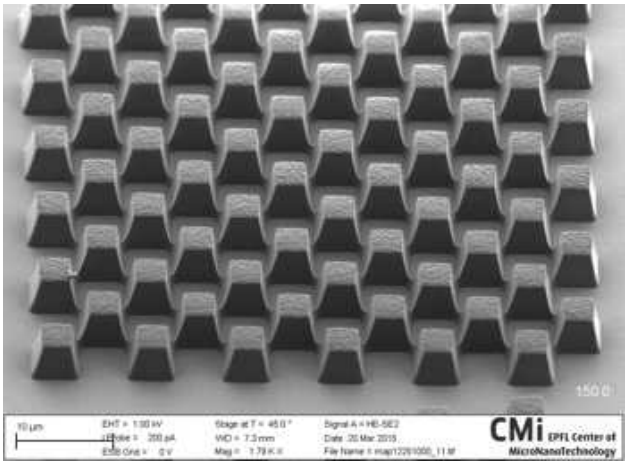

Fig. 13: ma-P 1225, 4.5 µm thick, 5 µm checkerboard

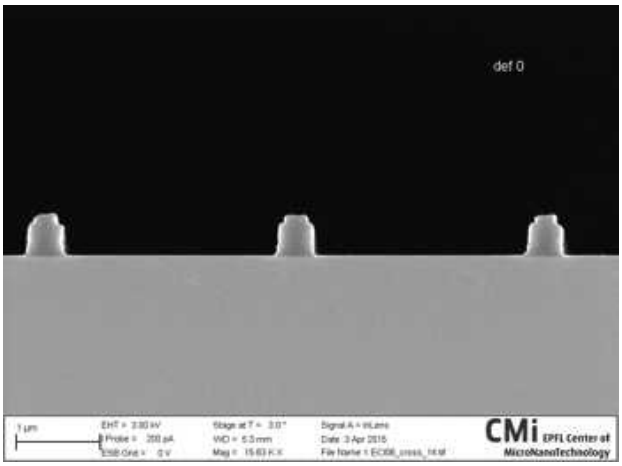

Fig. 11: AZ ECI 1207, 0.6 µm thick, cross-section of 0.5 µm lines with a period of 3 µm

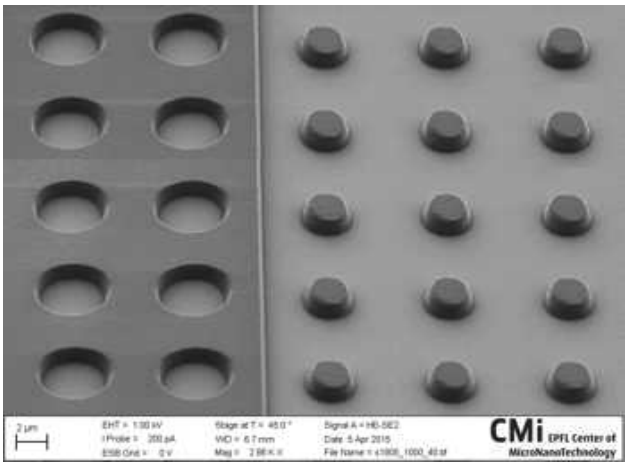

Fig. 14: S1805, 1 µm thick, holes and circles with a radius of 2 µm

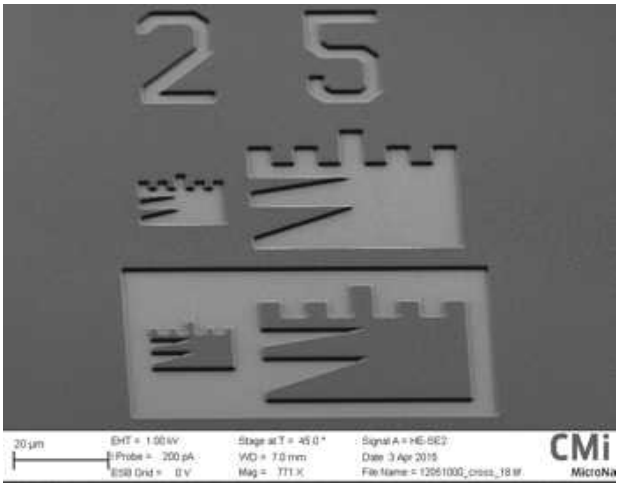

Fig. 12: ma-P 1205, 1 µm thick, resolution test structure


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