Application Note

HEIDELBERG INSTRUMENTS

Lift-off with maskless lithography

à˘ ÁÙ4¦^}ÁŠ4•&@ IFW Dresden

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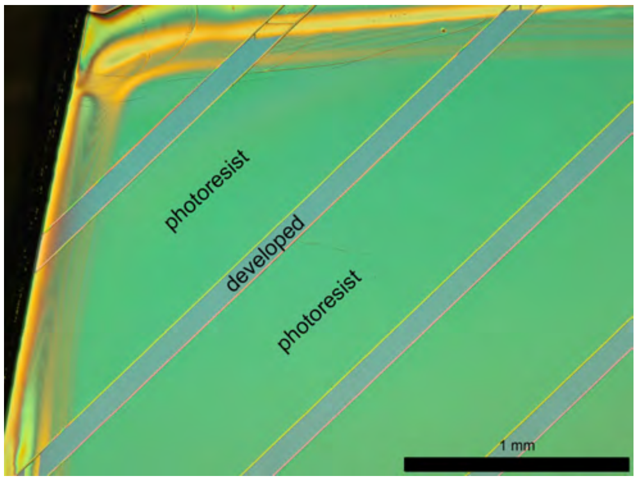

Fig. 1: positive photoresist AZ 5214E, after developing

The most common substrate materials ã Á [˘¦Á|æà•Áæ¦^Á]˘¦^ÁÙãÁæ}åÁÙãÁ¸ãc@FÁ{Á c@¦{æ|^Á*¦[¸}ÁÙãUGÈÁ¸@ã&@Áæ¦^¸^||Á \}[¸}Á¬[{Á&|æ••ã&æ|Á•^{ã&[}å˘&q[¦ ãå˘•dã•ÈÁY^Áæ¦^Áæ•[Á˘•ã*¸~¦c@¦Á •˘à•dæc^•Á|ã^Á*|æ••ÈÁÕæŒ•Ê•æ]]@ã^ÈÁ Ø^GUHÁæ}åÁØ^GÔ[HUIÈ

Our samples and layout size range from 5 x 5 mm² to complete 4” wafers.

For small layouts the exposure of the whole layout takes only 1 min. We are drawing our layouts with A9CAD (dxf-format) and LayoutEditor (gdsii- format).

Mostly we are using the AZ 5214E photoresist with TI-prime as bonding agent. The AZ 5214E can be used as a positive and image reversal (IR) photoresist. The exposure time for the positive option is 36 milliseconds and the development time in the MIF726 developer time is 50 seconds. The IR option includes a few more steps. The exposure time reduces to 6.5 milliseconds followed by a baking of 2 minutes at 120 °C. The final step before developing is a flood exposure of the whole sample. Using IR process, the AZ 5214E creates a huge undercut of ~ 740 nm (see Fig. 2).

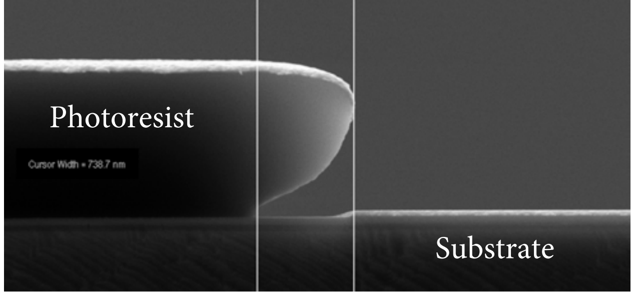

Fig. 1: SEM-picture of IR photoresist with an undercut of approx.. 740 nm. The photoresist is covered by 50 nm gold.

The positive option is used for etching steps and the negative pattern for metal deposition by evaporation (e.g. e-beam).

The smallest structure we can create in the photoresist is 1 μm (squares and width of lines) which were still visible with an optical microscope after developing. But for metal deposition the smallest feasible size is about 2 μm. For smaller structures no metal remains on the substrate after lift-off.

Our processes require a second and third exposure after metal deposition and lift-off. The alignment accuracy for the following exposure can be adjusted to distances smaller than 1 μm.

* The μPG501 Maskless Lithography System is replaced by the MLA100 Maskless Aligner.

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