



Development of a high resolution contact lithography process for fabrication of interdigitated electrode arrays

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We present recent results on UV contact lithography in the sub-0.5 μm range. Using a high resolution mask and an adequate resist material we were able to fabricate submicron structures down to 300nm. The realization of such structures is due to a precise optimization of each single lithography step, like pre-exposure processes, exposure and post-exposure processes. Furthermore, with contact lithography the use of thin resist films (down to 300nm thickness) is required to resolve sub-0.5 μm dimensions. A resist evaluation was investigated to achieve a proper pattern transfer from mask to resist. The selected resist was thinned with solvent and a filtration process ensures a pinhole-free sub- μm film. A subsequent additive or subtractive pattern transfer (lift-off and reactive ion etching) was accomplished to visualize the structures and to show their abilities.

Structuring in the sub-0.5 μm range enables the realization of sensitive interdigitated electrodes. An example are capacitive biochemical sensors for detecting DNA bindings which include large interdigitated electrode arrays exhibiting electrode widths and spacings of 500 nm or smaller [1,2]. Currently, the electrode arrays are directly written with high resolution electron-beam lithography (EBL). Especially for interdigitated electrode arrays, this serial process is time consuming, expensive and not efficient enough for chip fabrication. By using a conventional contact maskaligner combined with a high resolution mask and an adequate resist material the conditions for a parallel printing method are given.

References:

- [1] P. Van Gerwen, et al, "Nanoscaled interdigitated electrode arrays for biochemical sensors", *Sens. Actuators, B*, vol. 49, pp. 73-80, **1998**.
- [2] G. Hairer et al., "Biochip for DNA amplification and label-free DNA detection", accepted for publication at the IEEE Sensors 2007 Conference in Atlanta, Oct. 28-31, **2007**.