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

S Partel[1], S Zoppel[1], G Hairer[2], G Stangl[2], L Matay[3], P Hudek[1]

[1]Vorarlberg University of Applied Sciences, Research Center for Microtechnologies, Hochschulstraße 1, 6850 Dornbirn, Austria
[2]Vienna University of Technology, Institute of Sensor and Actuator Systems, Gusshausstr. 27-29/366, 1040 Vienna, Austria
[3]Institut of Informatics, Slovak Academy of Sciences, Dubravska 9, 84507 Bratislava, Slovakia

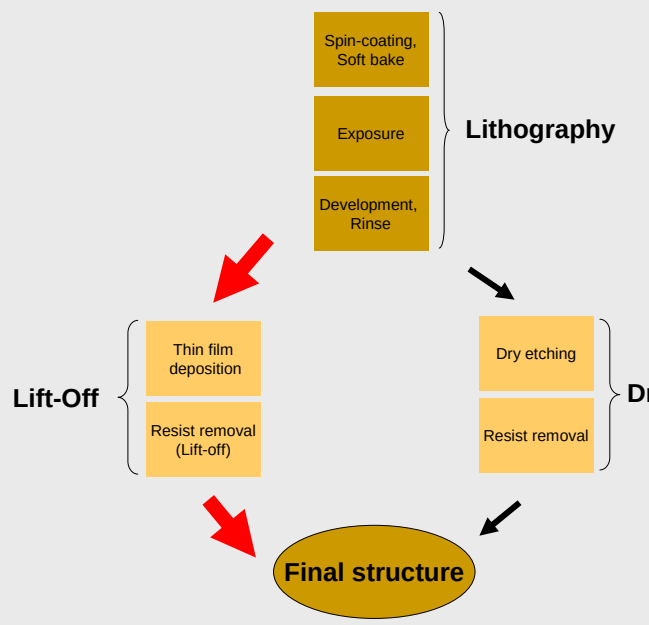
abstract

We present recent results on UV contact lithography in the sub-0.5µm range. Using a high resolution master mask and a conventional broadband resist material we were able to fabricate submicron structures down to 200nm. A subsequent additive or subtractive pattern transfer (Lift-off and dry etching) was accomplished to visualize the structures and to show the ability of this technique.

Concrete application is the fabrication of a capacitive biochemical sensor for detecting DNA bindings. This sensor includes large interdigitated electrode arrays with a half pitch of 500 nm or smaller.

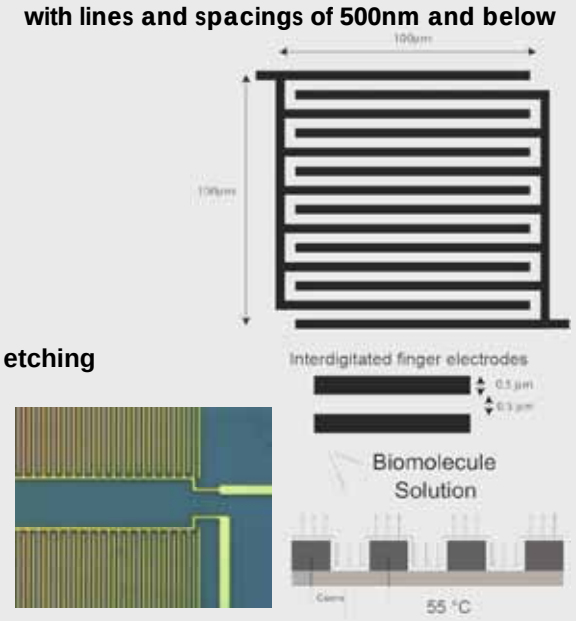
experimental

Process sequence



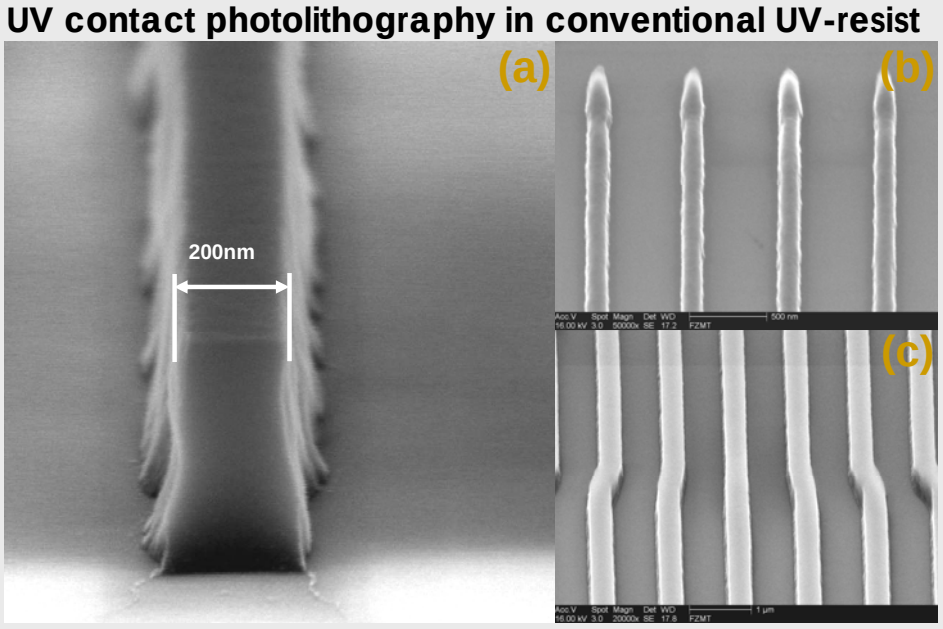
Layout of one interdigitated finger electrode array

with lines and spacings of 500nm and below



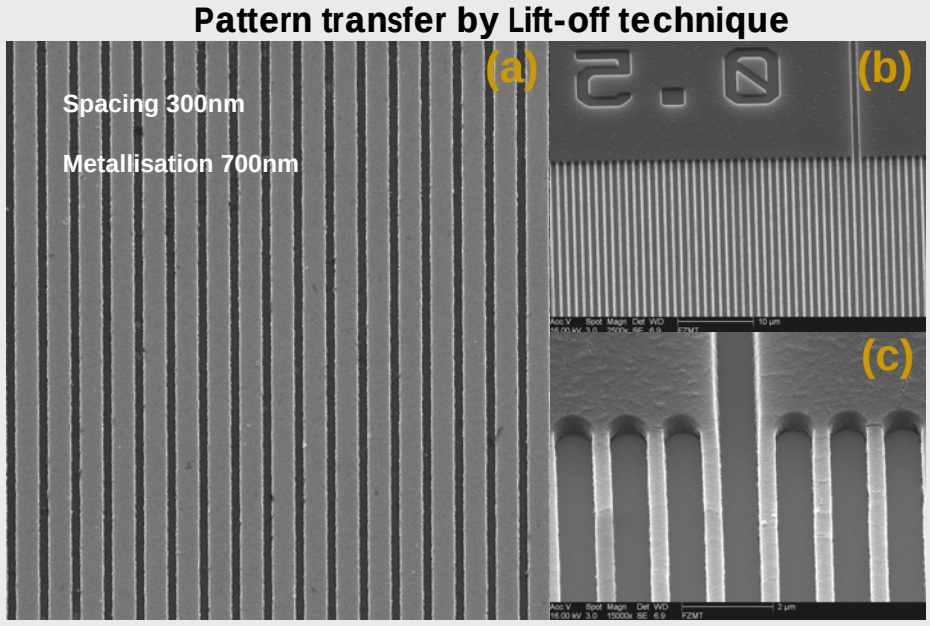
results & conclusions

UV contact photolithography in conventional UV-resist



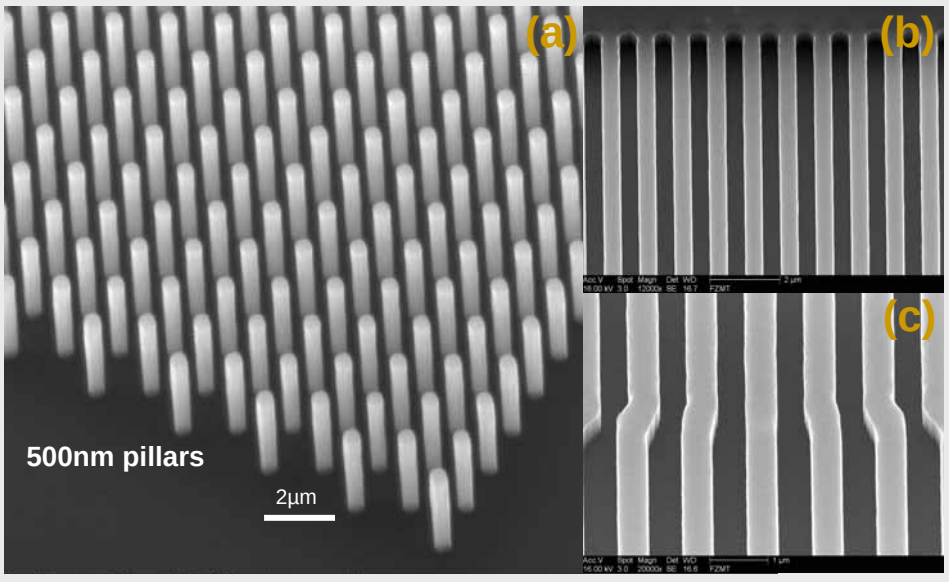
(a) Detail of a 200nm wide line profile in conventional photoresist AZ6612
(b) 200nm resist lines in array (c) 500nm lines in arrays.

Pattern transfer by Lift-off technique



(a) Lines (700nm metal) and 300nm spaces
(b and c) Metal deposited resist patterns immediately before Lift-off.

Pattern transfer by dry etching into silicon



3,6µm deep patterning of (a) array of pillars (500nm in diameter)
(b) 500nm lines and spaces in varying duty ratio (c).

Equipment:

Exposure tool:
conventional Maskaligner
Broadband illumination 350W
Vacuum contact mode

Resist material:
Diluted AZ6612 (Clariant)

Metallization:
1000Å Chromium
(Evaporation)

Dry-Etching tool:
ICP RIE with gas chopping

Conclusions:

We demonstrate a low cost photo-lithography technique by using a conventional contact maskaligner. The developed technique allowed us to draw high resolution patterns in conventional broadband resist materials down to 200nm by using a high resolution/quality chromium master mask.

We have also shown both, additive and subtractive pattern transfer possibilities through the obtained resist patterns.