Dry Etching Cluster

Our Dry Etching Cluster consists of the Oxford RIE Plasmalab System 100 with ICP 380 source and the Oxford RIBE Ionfab 300. (RIE: Reactive Ion Etching, ICP: Inductively Coupled Plasma, RIBE: Reactive Ion Beam Etching). The Dry Etching Cluster is an advanced tool for micro- and nanomachining of various materials. The basic feature is a high frequency generator (RF) working at 13.56 Mhz, combined with a high vacuum chamber for wafers with a diameter of 4”. The power varies in the range of 1-2500 W. Available process gases are SF_6 and O_2 for silicon etching; Cl_2, He, Ar and O_2 for chromium and other metals.

Contact

See KNMF website or contact the KNMF User Office.

Features

- Silicon etching via the cryo process (process temperatures are between -80 and -150 °C)
- Production of highly vertical, highly parallel and smooth sidewalls
- Critical lateral dimensions down to the range of 100 nm
- Aspect ratios (ARs) up to 6 are possible.
- Laser end point detection
- Metal etching via RIBE

Limitations/constraints

Silicon:

- Min. lateral dimensions: 100 nm
- Min. depth: 50 nm
- Max. aspect ratio at critical dimensions: 4
- Total max. depth: 40 µm

Chromium:

- Min. dimensions in lateral: 100 nm
- Selectivity over resist: 1:1
- Etch rate: 25...35 nm/min

Materials

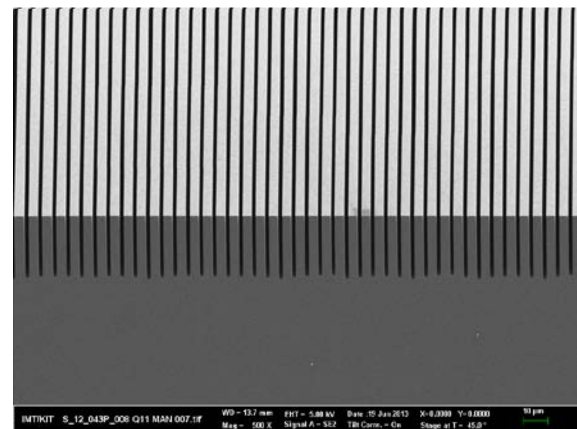
- Mask material: PMMA, SiO_2, ma-N 2401
- Structures on Si fragments or complete 4” Si wafers

Notice: Only silicon and chromium substrates can be processed reproducibly with standard processes at the moment.

Design rules

- Explicit and unambiguous layout according to the mentioned limitations.
- Markers for the better localization of the structures, e.g. in the SEM
- If the micro/nano structure is already written onto the substrate, the mask material has to be PMMA, SiO_2 or ma-N 2401
- If combined with the KNMF e-beam, specific limitations concerning the e-beam design rules have to be considered

Typical structures and designs



Deep etched silicon gratings

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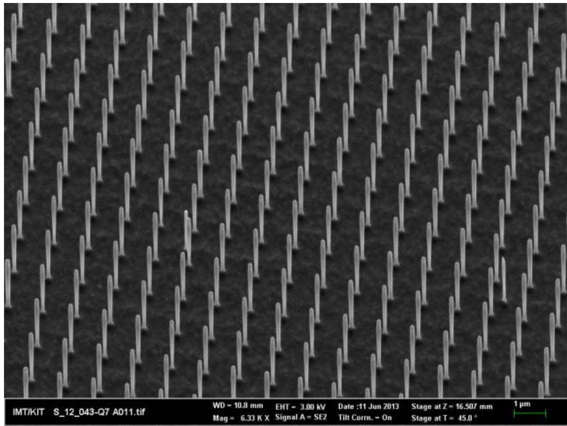
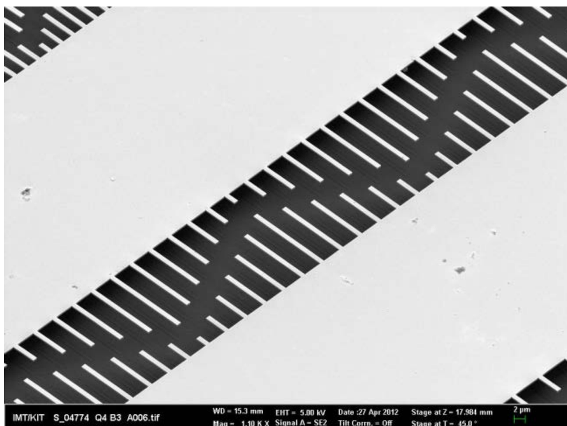
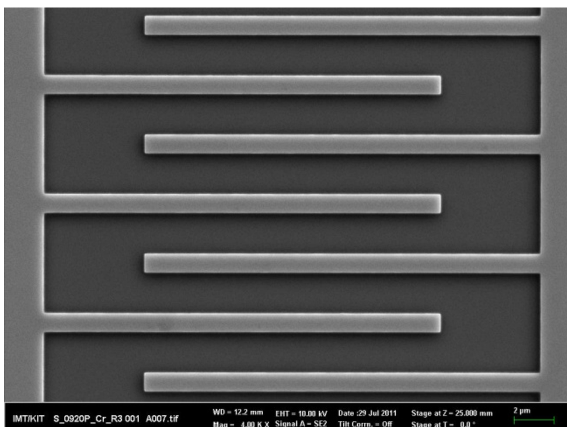
Typical structures and designs
(continued)



Silicon nanopillars with high aspect ratio



Freestanding cantilevers in silicon



Cantilever structures in chromium

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