Charged Particle Nanopatterning (CHARPAN)

Elmar Platzgummer* and Hans Loeschner**

IMS Nanofabrication AG, A-1020 Vienna, Austria

Charged Particle Nanopatterning (CHARPAN) techniques based on electron and ion multi-beam projection techniques are finding increased industrial interest for the fabrication of leading-edge complex masks, nanoimprint templates and for nanosystem devices.

Recently a programmable Aperture Plate System with integrated CMOS electronics (CMOS-APS) with 43 thousand switchable beams was inserted to a CHARPAN tool (Figure 1) operated with ion multi-beams.

Using this configuration, first exposure results in non-chemically amplified resist materials have been achieved using 10 keV Hydrogen ion beams of 12.5 nm spot size working in parallel at the substrate (Figure 2).

The realized CHARPAN tool can be operated as well with heavier ions (Argon, Xenon) enabling maskless and resistless 2D and 3D nanopatterning. Corresponding CHARPAN application fields (Figure 3) will be discussed.

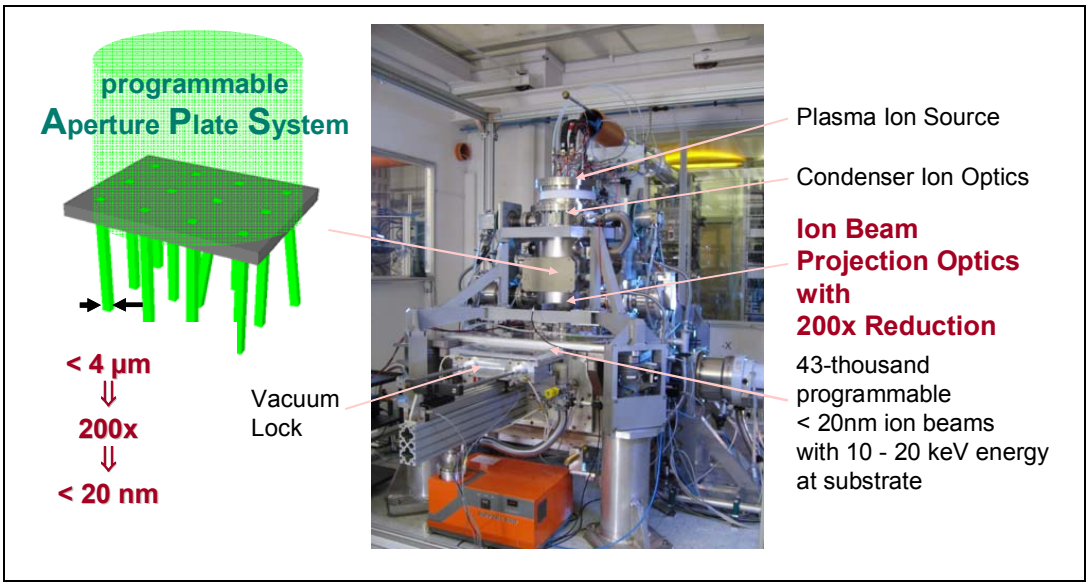

Figure 1: CHARPAN tool for ion multi-beam nanopatterning

* elmar.platzgummer@ims.co.at ** hans.loeschner@ims.co.at

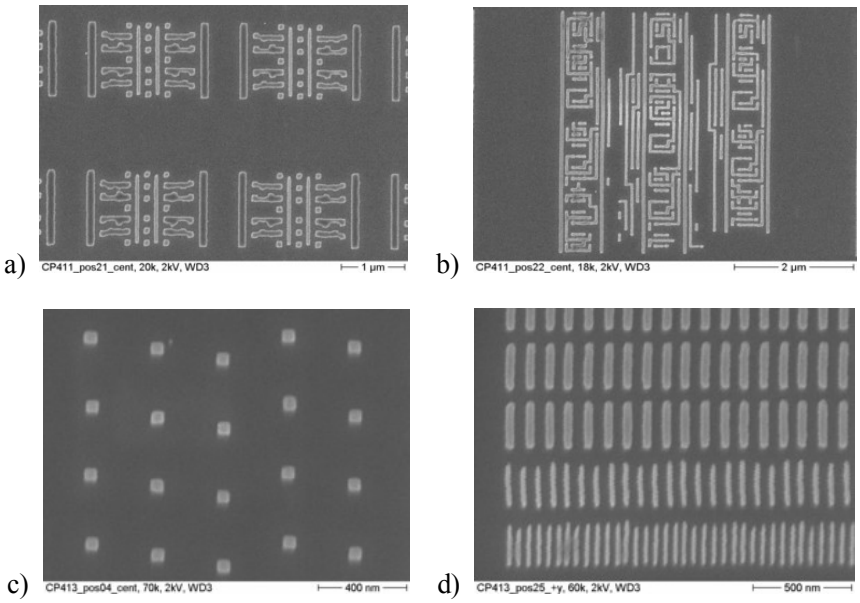

Figure 2: CMOS-APS operated CHARPAN tool exposure results as obtained with 10 keV Hydrogen ions in 50 nm HSQ resist with: a) 60 nm minimum feature size (20 µC/cm^2 exposure dose); b) 50 nm minimum feature size (20 µC/cm^2; c) 50 nm squares (90 µC/cm^2); d) 25 nm minimum feature size (20 µC/cm2).

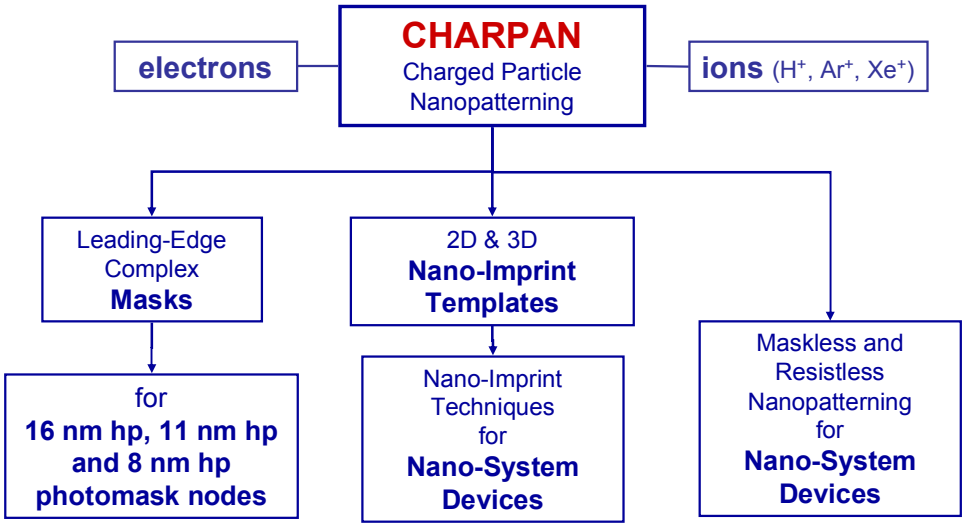

Figure 3: CHARPAN application fields