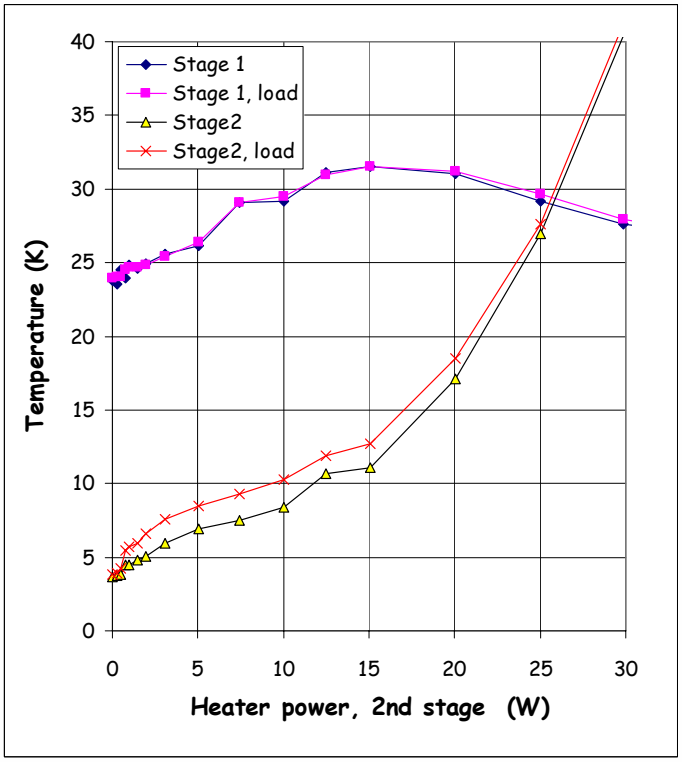
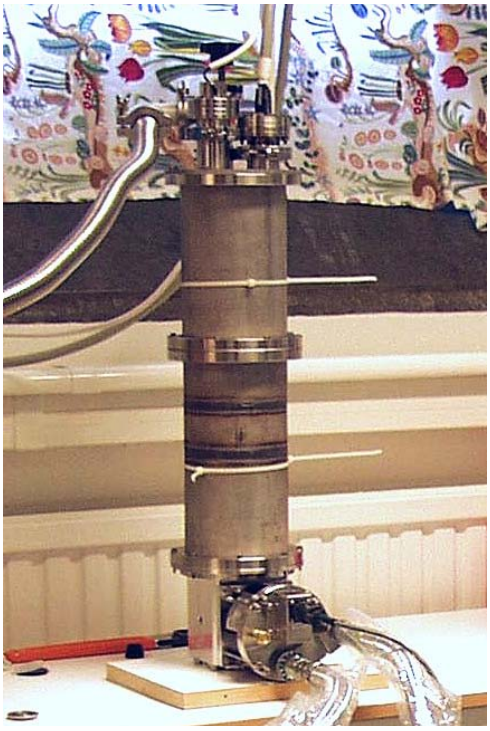
Nya MÅNADSBLADET
Information från Manne Siegbahnlaboratoriet
vid Stockholms universitet
Sommaren 2005
MSL

Test av kryogenerator för DESIREE





Den nyinköpta kryogeneratorn (Sumimtomo RDK-415D) har försetts med temperaturgivare samt värmeelement för båda stegen och därefter monterats i en vacuumkammare för tester av kyleffekt som funktion av temperatur.

De första prelliminära resutaten ges i figuren till vänster som visar temperaturen för de båda stegen när det andra steget värms från 0 till 30 W. Varje steg har två temperaturgivare, en direkt på kylhuvudet och en på bealstningselementet med värmeelementet.

Efter dessa tester kommer kryogeneratorn att monteras i DESIREE's testkammare.

Leif Liljeby

Experimentverksamheten

RING

Vecka 22: S Mannervik, Ba^{+}
Vecka 23: H Cederquist, p^{+}
Vecka 24: H Cederquist, p^{+}

CRYSIS

Vecka 24: SMILE, $^{6}Li^{3+}$ och $^{40}Ca^{19+}$

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Highly-Charged Ions are Bent by Nano-Capillaries

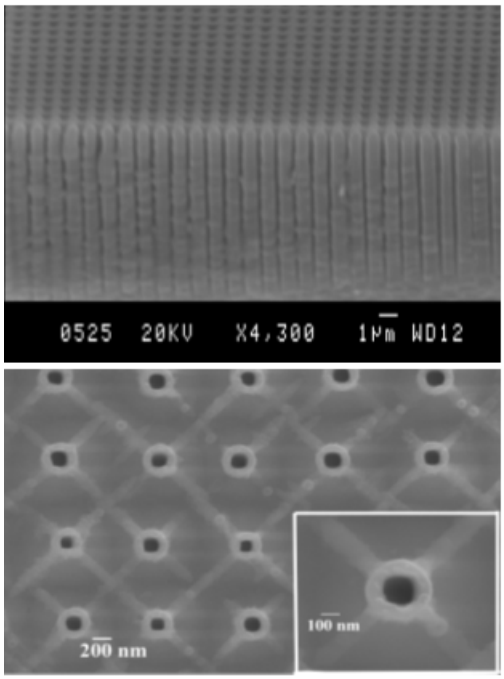

Fig. 1. A cut through the silicon wafer with the capillaries (top), and an end-view of the capillaries (bottom).

During the past year our group in Stockholm managed to produce nano-sized capillaries in silicon wafers in collaboration with Microelectronics and Information Technology of KTH. (R.T. Kumar et al. Nanotechnology, to be publ.) Applying optical lithography, we were able to fabricate capillaries of versatile lengths, openings and pitch (distance between the pores). The capillaries can be given different electrical properties, e.g. insulating by oxidizing the inside capillaries, semiconductive, or metallic. The size after oxidation is around 100 nm and the thickness of the silicon membrane is after back-etching 10 – 25 μm. Fig. 1 shows one of our fabricated capillary wafers.

Bombarding the insulating or semiconductive capillaries with highly-charged ions shows interesting effects: The insulating capillaries charge up and form self arranged ion guiding, bending keV ion beams by a few degrees (see Fig. 2) without changing their charge or energy (see Fig. 3). The angular distribution of the guided beam is very narrow, given by the capillary geometrical aspect ratio, quite different from the results with PET capillaries by Stolterfoht et al. For the experiments we used Ne^{7+} beams from the ECR source at MSL. The charge changing and the guiding effect time dependency are being studied as well.

One could use this feature to bend HCI beams by a few degrees without electric or magnetic fields and one could also think of developing HCI focusing elements based on the guiding effect of insulator capillaries. The effect can also be used to investigate and characterize the electric properties of the nano-capillary walls due to the sensitivity of the HCIs on electric properties. Non-linear effects can be studied with very highly charged ions (Bi^{80+}) from the new REBIT. Nano-capillaries have applications as filters for macro-molecules. The electric properties of the capillary membrane can be exploited for a selective capture of bio-organisms (Letant et al., Nature 2, 391, 2003).

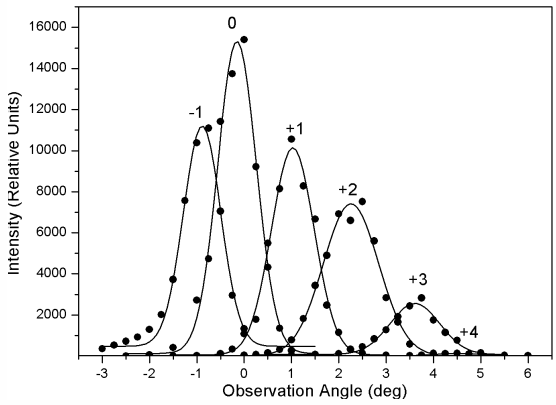

Fig. 2. Angular distribution of the ions guided through SiO_2 nano-capillaries.

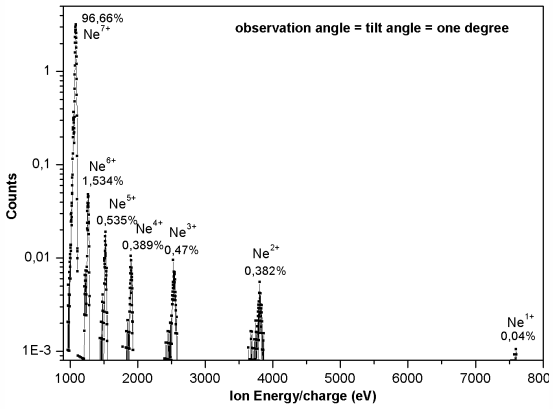

Fig. 3. Charge distribution of the ions guided through SiO_2 nano-capillaries tilted 1°.

The Nano-Capillary Group (Atomic Physics, SU)

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