

Examination in FMI 015 Microfabrication: Processes and Materials (3 credits) LP4 2005.

A604-MC2, May 26, 2005, 9-14

Responsible teachers: August Yurgens 772-3474, Sergey Kubatkin 772-5475

- 1) Describe and compare main techniques and applications for bulk and surface Si-micromachining. (15 points)
- 2) Describe and compare pumps for high and ultra-high vacuum. (15 points)
- 3) Describe and compare dry etching techniques. (15 points)
- 4) What limits the resolution of different photolithographic techniques? Which methods or tricks do you know can improve the resolution? (15 points)
- 5) A thin layer of Cu ($d = 10 \text{ \AA}$) has been deposited on the surface of a thick Si wafer by evaporation. The wafer is then placed in an oven at 1000 C and held there during 5 h.
 - a) What is the uniformity of Cu concentration within 10 micron from the surface after the annealing?
 - b) When did the constant-source regime of diffusion change over to the limited-source one?

Take the solid-solubility limit of Cu in Si as $N(T) = 10^{24} \exp(-18420 / T) [1/\text{cm}^3]$; and diffusion coefficient of Cu in Si as $D(T) = 1.61 \times 10^{-2} \exp(-10900 / T) [\text{cm}^2/\text{s}]$. Density of Cu = $8.96 [\text{g}/\text{cm}^3]$; molar weight = $63.55 [\text{g}/\text{mol}]$.
(20 points)

In total, 80 points. 20 points for the literature project.

>40 points "passed" (G); >60 points well passed (VG); >80 points excellent (MVG)

När: Fredagen den 26 Maj 2005, kl. 9-14.

Var: (A604-MC2)

Hjälpmedel: Ett A4 blad med egna handskrivna anteckningar och formler, Physics Handbook, TEFYMA, Standard Math Tables, el. liknande, valfri kalkylator.