Advanced microfabrication exam

December 16ᵗʰ, 2021. Time 9.00-13.00. Place: MyCourses

Open book exam, all material allowed.

Individual exam, no collaboration or human help is allowed.

Each question is worth 6 points. **Answer 3 out of 4 questions**.

The structure of your answer is even more important than the individual facts.

Use headings and subheadings, make lists, draw simple graphs and figures.

Plain text without structure is rather worthless.

You can copy-paste figures from articles (with due citation) to support your answers.

Note that in an open book exam facts cannot be wrong because you can check them.

Return one pdf-file into exam return box.

1. Okmetic is going to buy a new fusion bonding machine for C-SOI process. Your task is to design the evaluation experiments that will be done at tool manufacturers factory, prior to purchase decision. Write a document that outlines what tests need to be done, how many, how they are analyzed, which party is responsible for what, etc.

2. Read the article "Pseudo Epi—Cost Reduction Approach and a Paradigm Shift in Substrate Material" by Aminzadeh et al, IEEE 2002, and explain what pseudo-epi is and what silicon wafer issues it is going to solve, and how.

3. You have grown epi-poly structure on a Si 100 surface (i.e. thick polycrystalline layers using an epitaxial reactor). The grown film has both n- and p- doped layers. You have also polished the film by chemical-mechanical means. The application of the grown film is very sensitive to thickness, composition (impurities, dopants) and microstructure. Make research plan how to characterize the material. Explain needs for sample preparation. How would you obtain quick results with medium precision and what needs to be done for very high precision results?

4. In SOI wafers the insulator is almost always oxide, but according to article Reck et al: "Fusion bonding of silicon nitride surfaces", JMM 2011, nitride to nitride bonding can be done. Explain how this is achieved and discuss remaining open issues and possible applications.