

MEMS: Training in Microsystems: Simulation and Characterization of Various MEMS and MOS Devices on a Chip

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We have chosen to illustrate the specificities of MEMS technologies through the simulation and characterization of volume and surface micro-machined devices such as pressure sensors, cantilevers, bridges, thermal deflectors, capacitive mirrors, etc.

The participants will be given an overview of the main technological steps commonly used in IC processing: wafer cleaning, photolithography, etching (wet/RIE), ion implantation, metal and polysilicon deposition (sputtering/CVD), annealing (RTP), ...

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sont requis pour visionner cette image.



Figure 1. Left: A MEMS wafer similar to the ones that will be simulated and characterized during the practical. Right: Double-side photolithography tool in clean room.

The practical includes electro-mechanical, technological and electrical simulations using commercial simulators: ANSYS, ATHENA and ATLAS respectively. It helps in giving an insight into the physical and electrical phenomena involved. The influence of different parameters is also revealed.

We also focus on the characterization of the pressure sensor membrane: the thickness is determined with the profilometer and optically [5]. An IR camera is used to check the gauge position relative to the membrane edge. Basic microelectronics devices: diodes, MOS capacitors and transistors are implemented close to the MEMS on the same wafer. This helps in highlighting both the possibility and difficulty of integrating electronic functionalities together with sensing availability on a single chip. Finally, the devices are electrically characterized with a semiconductor parameter analyzer and a probe station equipped with a calibrated pressure sensor [5].

References

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