Nowadays, there is a renewed interest in the use of Ge for advanced CMOS technology because of its superior electrical characteristics and lower temperature processes compared with Si, as well as its compatibility with the well-established silicon technology. Laser thermal annealing (LTA) process is gaining interest in the context of the 3D sequential integration where a locally confined thermal budget is needed for top FET to preserve the bottom FET from any degradation. Our aim is to investigate the effects of LTA on Ge based n-type ultra-shallow junctions to gain highly activated dopant concentrations.
We doped Ge with As or P by ion implantation with a dose of 10^{15} atoms/cm^2 at 28 keV and 15 keV, respectively. Then we compared a LTA with a conventional thermal treatment in order to remove ion implantation damage and increase the dopant activation. We performed Raman spectroscopy, Transmission Electron Microscopy and Secondary Ion Mass Spectroscopy to study the disorder and the dopant diffusion after the LTA process. In detail, we studied the amorphous to crystalline phase transition as a function of the increasing LTA energy density. We found that using LTA, higher carrier concentration (above 10^{20} cm^{-3}) was achieved in n-type doped regions with respect the conventional thermal annealing.
These fundamental studies clarify the thermal effect of LTA on very thin (tens of nm) Ge films and could be considered for the fabrication of junctions in advanced 3D Ge-based devices.

#P032 - Low temperature properties of unconventional ferromagnetic Josephson junctions

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Josephson junctions incorporating non-conventional barriers such as ferromagnetic insulators have been widely investigated in recent years [1,2]. These devices show a wide range of interesting properties such the low dissipation and spin polarization of the supercurrent, which makes them quite attractive for the realization of superconducting magnetic memories.
We have focused our attention on the study of the temperature dependence of the critical current and the characteristic voltage of ferromagnetic tunnel junctions down to low temperatures. Our preliminary results show different trends for junctions with different spin filter efficiencies. An anomalous behavior in presence of an external magnetic field is also observed. Results are discussed in the wide context of weak links to trace possible unconventional effects.

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#P033 - High-throughput drug screening by Printing Biology

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Printing biology is our way to define a novel field employing material printing techniques generally used in plastic electronics to solve important issues of biology by miniaturized and high-throughput platforms. In this field, we already showed the possibility to use Dip Pen Lithography to fabricate single-cell biochips [1]. Also,we employed non-contact patterning methods such as inkjet printing methods to fabricate microarrays for drug screening at solid-liquid interfaces [2] or in picoliter-scale liquid droplets [3] so enabling high-throughput screening of chemical libraries onto disease-based targets. In this regard, printing methods would greatly reduce times and costs of standard drug screening campaigns which are commonly based on complex liquid handling robotics and are time and reagent consuming (micro-, nanoliter scale). In this work, we show a low-cost, general and miniaturized printing biology approach for drug screening, by combining Inkjet Printing and Dip Pen Lithography to develop the biochip. We show the possibility to precisely deliver femtoliter scale droplets of protein targets by Dip Pen Lithography by finely tuning the deposition parameters and ink formulation. Protein solutions are spiked with glycerol at 30 % v/v and are deposited at defined values of humidity (50 % -70 % R.H.). This permits to obtain microscale droplet arrays where picoliter volumes of drug candidates solutions are readily deposited by inkjet printing. In this way, it is possible to produce different drug targets concentration directly on-chip. Fluorescence confocal microscopy is here used to quantify drug-ligand interaction by means of standard intensity based imaging and fluctuation techniques that permit mapping concentration and important biophysical parameters including diffusion coefficients of fluorolabeled (or intrinsically fluorescent) ligands at nanomolar concentration. Outputs obtained on different systems by means of such a miniaturized approach are compared with the ones obtained on standard microliters volumes samples, confirming the ability of our *biochip printing* methodology to discriminate ligand-target interactions in different compounds. MiUR and the PRIN2012 program are acknowledged for fudings.

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#P034 - Electrochemical investigation of recovery mechanisms in dye sensitized solar cells. Evidence of lifetime improvement

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Electrochemical investigation of recovery mechanisms in dye sensitized solar cells. Evidence of lifetime improvement

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In this work we study the spontaneous recovery phenomenon present in solar cells sensitized with a Ruthenium complex based dye N719, which manifests with the increase over the time of the short circuit current (Isc) and the open circuit voltage (Voc) after the cell is illuminated, for durations of minutes up some days. We investigate the effects of temperature and type of components used in the electrolyte, based on iodide/iodine redox couple, using current-voltage measurements and electrochemical impedance spectroscopy (EIS) under dark and open-circuit conditions. The characteristic frequency peaks observed in the spectra, identified by Nernstian diffusion in the electrolyte, the diffusion and recombination of the photoinjected electrons in the TiO_2 and the charge transfer at the platinum counter electrode, allow to determine the mechanism which causes the observed drifts. By impedance spectra modelling we determine the time evolution of the effective lifetime of the electrons in the TiO_2. The main result is that the life time of electrons in the oxide increases over time, confirming the recovery of the performances and that the phenomenon depends on the charge transport mechanism at the TiO_2-electrolyte interface. In particular the instability is induced by electron trapping by the defects present in the TiO_2 created by ionic and molecular components present in the electrolyte that limit the recombination of electrons from TiO_2 to the triiodide.

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#P035 - Characterization and development of a low cost system to evaluate beam quality in diagnostic radiology

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In our previous work a commercial silicon PIN-photodiode (Hamamatsu, mod. S2506-02) was tested and characterized as ionizing radiation detector for radiological applications in a wide range of configurations and effective energies: 17-19 keV (mammography) and 23-72 keV (conventional radiography and CT). In order to validate the dose response, the photodiode voltage output was compared to the readout of a Barracuda device (a semiconductor device used in clinical application), and Monte Carlo simulations were performed. Novel acquisition electronics was designed to amplify the PIN diode signal, based on a transresistive, non-polarized amplification current-to-voltage conversion stage using an OPA2340 operational amplifier. In order to investigate the reproducibility of devices from different production batches, two lots of 14 photodiodes each were irradiated simultaneously with X-rays and a small systematic difference (below 10%) was observed between the two batches: the difference is low but required different calibration factors. The angular sensitivity of the devices was investigated during CT and mammography acquisitions: the dose response showed a growing dependence on radiation angle of incidence moving toward lower effective energies. The sequential single slice CT acquisition, performed at slow rotational speed, showed a low angular dependence over the range of effective energies used. The photodiodes, inserted in a modular phantom, allowed the optimization of CT acquisition protocols in terms of diagnostic quality and dose received, which is especially important for pediatric subjects. The response uniformity was investigated in mammography over a large FOV: moving the devices along the axis of the acquisition plane showed a significnt angular dependence over the range of low energies used, requiring different calibration factors. A low cost system was developed