PAN-LAB—PLASMONIC BIOSENSORISTIC FOR EARLY DIAGNOSTIC

Principal Investigator ***Francesco Bisio, CNR—SPIN***

Other Partners ***Istituto Italiano di Tecnologia, Dipartimento di Fisica - Università di Genova***

Main Sponsor

Compagnia di San Paolo

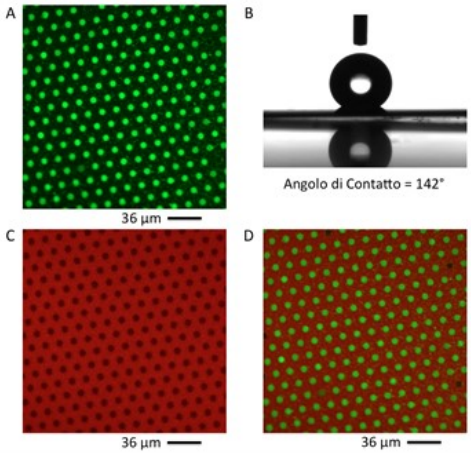
Project objectives

The development of sensors for detection and identification of molecular species at ultralow concentration within biologic samples is a research field with huge fallouts in biomedics, allowing the early diagnosis of pathological states via detection of specific markers The ability to detect the presence of very few molecules in a bio sample, either because rare or because at ultralow concentrations, is nowadays one of the main targets of biomedics.

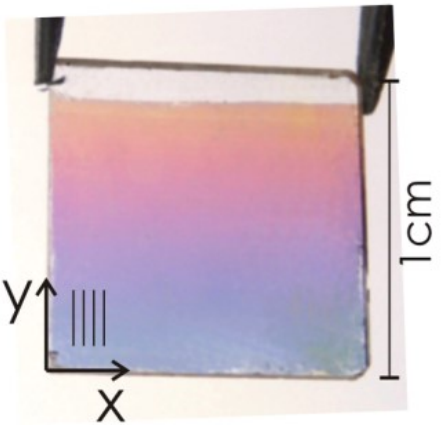
The project targets the development of innovative ultrasensitive bio-detectors based upon the combination of superhydrophobic (SHF) concentrators for delivering molecular species within predetermined nanovolumes, and ultradense lattices of plasmonic nanoparticles for molecular-specific detection by surface plasmon-enhanced Raman spectroscopy (SERS), located within the "target" nanovolumes.

Within the PanLab project, SHF systems have been successfully realized, capable of selectively delivering a given molecule to pre-determined micro-wells endowed with sensitive structures (see top Figure). It can be observed that the green fluorescence signal of the target-molecule only originates from selected areas, corresponding to the concentration volumes.

In parallel with the development of SHF systems, micro-chips with spatially-graded plasmonic resonances for plasmon enhanced SERS have been developed and validated against specific test molecules, reaching a potential sensitivity to 1nM concentration. The next objective will be represented by the integration of the two types of structure to yield an empowered sensor, and the test of the hybrid plasmonic/SHF system with molecules of biological interest.



Representative images of the SHF platform. The test fluorescent molecule (green) is selectively delivered to specific areas.



Plasmon-graded sensor.