Synthesis of substrates for SERS sensors with DE-LIL (Double Exposition Laser Interference Lithography) technique.

E. Ciotta[1]*, T.H. Dao[2], M. Casalboni[2], F. De Matteis[2], P. Prosposito[2,3], R. Francini[2]

[1]*Istituto per la Microelettronica e Microsistemi (IMM) CNR Roma Tor Vergata, Italy*
[2]*Dip.to di Ingegneria Industriale, Università di Roma Tor Vergata, Italy*
[3]*INSTM & CiMER, Università di Roma Tor Vergata, Italy*

Arsenic (As) is one of the most harmful heavy metal ions, thus the maximum permitted value in water is 10 ppb. Among the various techniques used for its detection, the Surface-enhanced Raman spectroscopy (SERS) technique is widely use thanks to high sensitivity and selectivity. In order to perform the SERS analysis, it is fundamental to obtain an ordered distribution of metal nanoparticles in contact each other. In this work we realized a substrate in which deposited in orderly way silver nanoparticle for SERS analysis. Thanks to DE-LIL (Double exposure Laser interference lithography) technique, we obtained a rigid master with a cross weave lattice formed by valleys and pillars. The master was replicate with soft-lithography techniques, and the 3D stamp was transfer in a silicon substrate covered with a photosensitive sol-gel film (Ti/TMSPM). The silver nanoparticles were deposited on this substrate by drop casting getting a homogeneous and ordered pattern, made by the self-aggregates inside the valleys, greatly suitable for SERS applications.