Designing a SERS Substrate: from Colloidal Synthesis to Plasmonic Metamaterials

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This contribution will recompile the most important designing rules that regulate the design of an efficient and robust plasmonic SERS sensor. Starting from the bottom-up preparation of colloidal nanoparticles, the seminar will rationalize the use of colloidal self-assembly and its derivation for the fabrication of SERS analytical devices, with particular emphasis on their use for bio-detection. In the last part of the talk, I will introduce the concept of *in situ* growth, a family of bottom-up synthetic methods where nanostructures are chemically formed directly on the target substrate, an emerging strategy with promising implication for the rational design of biosensors through scalable and efficient fabrication techniques. The focus will be on our recent progresses in the field, with the microlfuidic *in situ* growth of gold nanorods and gold nanostars with a yield > 90%, and the site-directed *in situ* growth of nanscaled ordered plasmonic arrays with quality factors >75.