Plasmonic Nanolens Arrays for Enhanced Raman Spectroscopy[1]

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— Surface-enhanced Raman scattering (SERS) is the 4th-order process with regards to a local electric field, $\sim E^4$, and therefore, may be extraordinarily enhanced well in excess of 10-11 orders of magnitude. The "chemical' enhancement factor of less clear origin may also reach few orders of magnitude. We are looking at engineering various nanoparticle arrays that may focus local field and may be fabricated in top-down manner or self-assembled. Nanocrystals of Au and Ag with different shapes, such as octahedra, cubes, stars etc and their 2-dimensional and 3-dimensional assembly have been studied for plasmonic applications. One promising way of reaching the enhancement $\geq 10^{12}$ is to use arrays of plasmonic nanolenses with with binary or even ternary nanoparticles arrangements with certain patterns. The nanoparticles arrangements were modeled numerically using Finite Difference Time Domain method. and results are compared with the data collected by our team on some fabricated high-performance SERS substrates.

[1]In colaboration with Peidong Yang's Group at UC Berkeley.

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