Novel nanoarray SERS substrates for high sensitivity microarray sensing

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We have investigated the use of aligned Ag nanorod arrays, prepared by oblique angle vapor deposition (OAD), as surface-enhanced Raman scattering (SERS) substrates for the identification of binding reactions on microarrays. The current talk will address aspects of the fundamental nanostructural design of metallic nanorod arrays and their influence on SERS enhancement, as well as the development of a spectroscopic assay for biomolecule detection based on these unique nanostructured SERS probes. Two separate systems will be discussed. In the first, we have developed a spectroscopic assay for virus detection based on these unique nanostructured SERS probes. We will also present results of multivariate statistical analyses on the SERS spectra of different pathogenic species that indicate that it is possible to identify, differentiate and classify viruses and other biomolecules based on their intrinsic SERS spectra, even down to the individual strain level. Our second approach uses SERS to develop a new methodology for label free detection of carbohydrate-protein binding in glycan microarrays. In this approach, novel Cu-free click chemistry reactions are employed to modify the Ag nanorods with oligosaccharide ligands. Binding of an analyte, such as a protein, virus or cell, gives a Raman spectrum that has a unique intrinsic molecular fingerprint for each analyte. The advantages of these methods for differentiation between specific and non-specific binding and the possibility to develop multiplex detection schemes will be described.