# Au nanostructure-based surface-enhanced Raman scattering sensor for bio/chemical application

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Surface-enhanced Raman scattering (SERS) is a fascinating phenomenon that increases Raman signals from molecules located in metallic nanostructure by a factor of $10^6$ or more. Over the last decades, SERS has emerged as one of the most promising analytical techniques for sensitive and trace analysis or detection in bio/chemical applications. SERS relies on the enhanced Raman scattering of molecules near SERS-active surfaces, so called SERS hot spot, such as nanostructured Au or Ag. The SERS technique offers orders of magnitude increases in the Raman intensity of molecules, allowing the detection of even single molecules. Moreover, the SERS technique provides a molecular fingerprint spectrum and quenching resistance. Consequently, numerous SERS-based molecular-sensing approaches have been developed, advancing several fields, such as the diagnosis and treatment of disease, food safety, and environmental monitoring. In this presentation, I will introduce Au nanowires (NWs) based SERS sensors for the detection of toxic metal ions, miRNAs, and proteins. The use of Au NWs is highly advantageous for the SERS-based detection of biochemical species because their well-defined geometric architecture provides reliable reproducibility, time stability, and excellent sensitivity. Secondly, I will present Au@zeolite imidazolate framework-8 (ZIF-8) SERS paper for food spoilage detection. The platform is simply prepared by ZIF-8 coating on a Au nanoparticle (NP)-impregnated paper and successfully applied to the determination of freshness for salmon, chicken, beef, and pork samples. In the last part of talk, CRISPR/Cas9-mediated SERS assay for multidrug-resistant (MDR) bacteria will be discussed. This assay was developed *via* a synergistic combination of the specific gene-recognition ability of the CRISPR system, superb sensitivity of SERS, and simple separation property of magnetic nanoparticles. We found that this assay could detect three MDR bacteria, species *Staphylococcus aureus*, *Acinetobacter baumannii*, and *Klebsiella pneumoniae*, without purification or gene amplification steps.

**References**

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