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## **Influence of thermal effects on combinatorial plasmonic nanostructure for bio-detection**

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In recent decades, Au nanoparticles (NPs) have been utilized in a wide range of sensor applications, such as photodetection, bio-detection, and thermal-detection, because of their unique optical and chemical properties. Among the optical sensors, surface-enhanced Raman spectroscopy (SERS) has attracted extensive attention, being used in the identification of unknown substances in analytical chemistry. In this work, we investigate in situ sputtering Ag on highly ordered Au NPs substrate probe by Grazing incidence small angle X-ray scattering (GISAXS). In addition, we explore the effect of thermal on silver growth kinetic of different sizes of Au substrate. Furthermore, by correlating the growth steps of the composite Au/Ag nanostructures with the SERS performance, we could obtain the plasmonic “hot spot” performance corresponding to the combinatorial nanostructure.

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