Label-free optical detection technologies, for example, surface plasmon resonance, interferometers, resonant waveguides gratings, fiber gratings and ring resonators, have been widely used to characterize biomolecular interactions without having to label the target molecules. Noble metal nanoparticles exhibit a strong UV-Vis absorption band, which is resulting from the resonance between the incident photon frequency and the collective oscillation of the conduction electrons and is known as the localized surface plasmon resonance (LSPR). The LSPR is dependent on the size, shape, interparticle spacing and dielectric properties of the materials, as well as the dielectric properties of the local environment that surrounds the nanoparticles. Basing on an ordered array of noble metal nanoparticles, which is made by nanosphere lithography and stabilized by polyelectrolyte multilayer or thermally annealing, the molecular adsorptions on nanoparticles coated solid substrates can be sensitively and conveniently detected by shifts of surface plasmon resonance peaks. The peak shifts to long or short wavelength in case of polymer film, DNT or mercury vapor and the peak shifts are sufficiently large in certain range that color changes can be directly visualized by naked eyes. Meanwhile, the plasmonic substrate can be regenerated and reused after a linear temperature rise process and desorption of the molecules from the nanoparticle surfaces. Such high mass detection sensitivity, combined with the remote detection capability and high temperature operation of the plasmonic sensors, allows the in-situ detections of the masses of material and thermally desorbed molecules, and stand-off mass detection of explosive materials, which extends the applications of plasmonic nanoparticles.

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The public is welcome to attend.