# Plasmonic Cap Arrays with Facile Tunability for High-Fidelity SERS Applications

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Surface enhanced Raman scattering (SERS) based on the surface plasmon resonance (SPR) has been widely used for label-free molecular recognition of chemicals and biomolecules. Recently, tunable SPR structures have been emerged to obtain on-demand optical properties for high resolution sensing platform. Here, we have demonstrated the active plasmonic cap arrays on the flexible substrate with real-time optical tunability for effective SERS sensor. The uniform plasmonic cap arrays were fabricated over a large area via colloidal lithography combined with lift-up soft lithography, and electrostatic assembly of gold nanoparticles. Plasmonic properties could be controlled by changing of the arrangement of plasmonic caps and SERS signals were intensified resulting in the additional EM field enhancement from nanogaps between caps under mechanical manipulation. Small change of arrangement of plasmonic caps was much more effective to enhance the sensitivity than 100-fold concentrated analytes. It is noteworthy that we showed real-time tuning of the optical properties and SERS sensitivities using a single plasmonic substrate.