

# Carbon Black Templated Gold Nanoparticles for Nitrate Capture and Detection by Surface Enhanced Raman Spectroscopy

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Surface-enhanced Raman scattering (SERS) spectroscopy is an ultra-sensitive spectroscopic technique carried out on nanostructured plasmonic materials such as gold nanoparticles. Upon excitation with the appropriate light, the nanoparticles intensify the electric field that couples with the vibrational modes of the molecule under study, increasing its characteristic Raman signals and making possible its ultrasensitive or even single-molecule detection.

We used this analytical technique for fast and reliable detection of nitrate, which in excess amount in water bodies can cause large increases in aquatic plant growth, leading to local hypoxia that negatively affects aquatic life.

A good SERS substrate is the essential prerequisite for reliable SERS measurements with high detection limits. We describe a simple strategy to grow gold with multiple hot spots on carbon black nanoparticles as highly effective SERS substrates for the detection of a wide range of analytes in aqueous solution. We show that this gold-carbon hybrid nanoparticle can improve the affinity of different analytes including nitrate to the surface of SERS substrate and produce strong signals.