Attraction of Glucose on a Gold or Silver Nanoparticle Coated with Mixed Thiols

Chelsie Boodoo\textsuperscript{1}, Yil-Hwan You\textsuperscript{2}, Michael J. McShane \textsuperscript{2}
Florida International University\textsuperscript{1}, Texas A\&M\textsuperscript{2}

Abstract
Detecting body biomarkers through noninvasive techniques is crucial for monitoring progression of chronic conditions. Prior studies show that certain analytes such as glucose may be detected by using planar Surface-Enhanced Raman Scattering (SERS) substrates; however, these materials are rigid and usually cause discomfort when implanted. Soft hydrogel materials containing encapsulated SERS sensors offer an alternative which may circumvent problems such as being rejected by the body. In this project, we studied gold and silver nanoparticles that were coated with mixed thiols due to the possibility that their SERS peaks could provide a way to sense analytes. Gold and silver nanoparticles coated with 1-decanethiol (DT) and 6-mercapto-1-hexanol (MH) were expected to selectively partition glucose and other small molecules to the surface of the sensor. This coating can be used to sense analytes with SERS. The concentrations of the thiols and the analytes were changed to make the optimal sensor. The size, absorbance and the Raman scattering were also measured to show the properties of the sensors. The nanosensors were encapsulated in hydrogels and the SERS peaks were compared to the peaks of the freely suspended nanosensors. DT/MH was successfully coated on the silver and gold nanoparticles. The sizes of the nanosensors increased as the concentrations of the thiols increased. The absorbance spectra revealed that the nanoparticles aggregated. The SERS peaks in regards to glucose shifted relative to the peaks of DT/MH; however, they were not conclusively concentration dependent. Other analytes such as urea and lactate did not show any spectral changes.