Investigating Mono- and Divalent Cation Induced Aggregation of Gold Nanoparticles in Aqueous Environments via Surface-Enhanced Raman Spectroscopy

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Surface-enhanced Raman spectroscopy (SERS) was used to examine the interactions between dissolved sodium/calcium halides and gold nanoparticle (AuNP) surface. SERS data were compared with data from ultraviolet-visible light spectroscopy and dynamic light scattering. Data revealed that chloride salts were much more effective at aggregating AuNP and the resulting aggregates were highly fractal networks that were significantly different from those produced by non-chloride salts. SERS provided insight on the surface interactions between AuNP and halides via observation of changes in the surface-enhanced Rayleigh band and the characteristic Au-X- bands (Figure 1: peaks at lower wavenumber are the surface-enhanced Rayleigh bands, while the Au-X- SERS bands are located at the higher wavenumbers). Comparison of SERS kinetic data showed a positive correlation between rates of halide attachment to AuNP and salt concentration. SERS proved to be a valuable tool to investigate the complex dynamics of AuNP behaviour in aqueous environments.

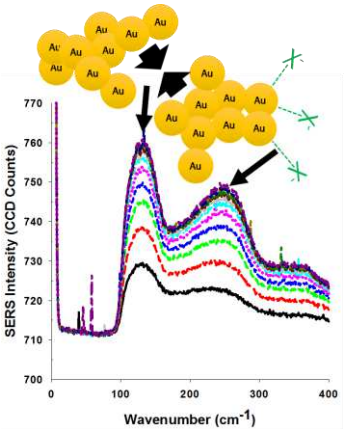

Figure 1