

Fellowship Presentation

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SERS Detection of Perchlorate Using Ag NPs immobilized substrates

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Perchlorate and its analysis

- Perchlorate (ClO_4^-): a widespread contaminant in GW and surface water and believed to disrupt thyroid function.
- Rapid, sensitive and in-situ detection: very important in GW & drinking water.
- Analysis technologies: Ion chromatography (IC), IC-MS, Ion-selective electrodes etc.
- Disadvantages: not suitable for rapid, sensitive and in-situ detection, especially trace analysis.
- SERS technology: has been investigated for perchlorate detection as a new analysis approach expected to realize the qualitative and quantitative analysis.



Bench
Raman
spectrometer

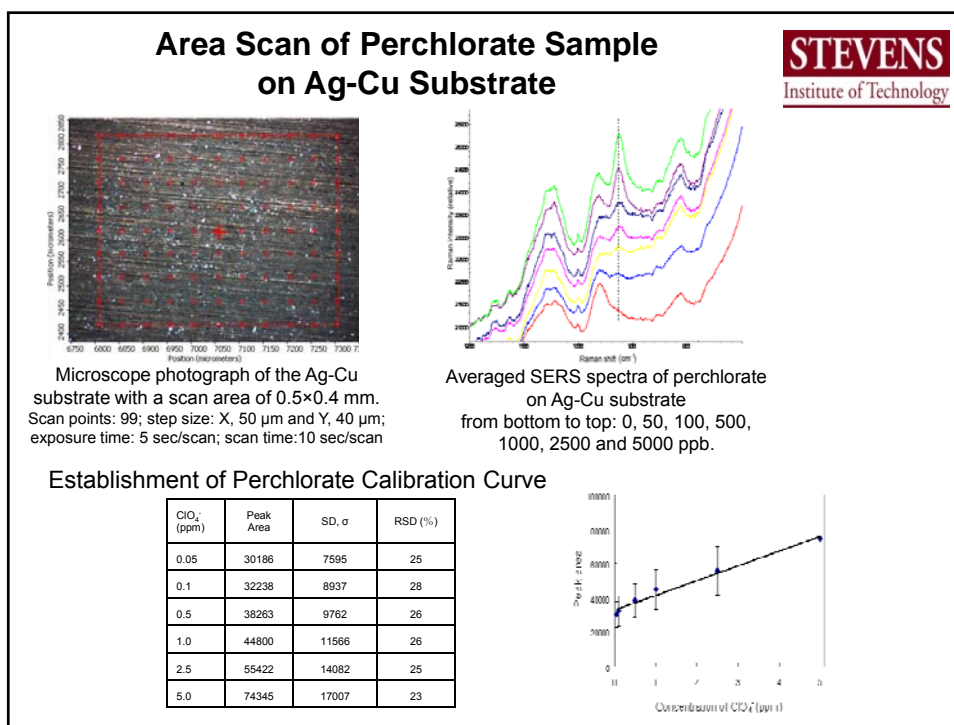
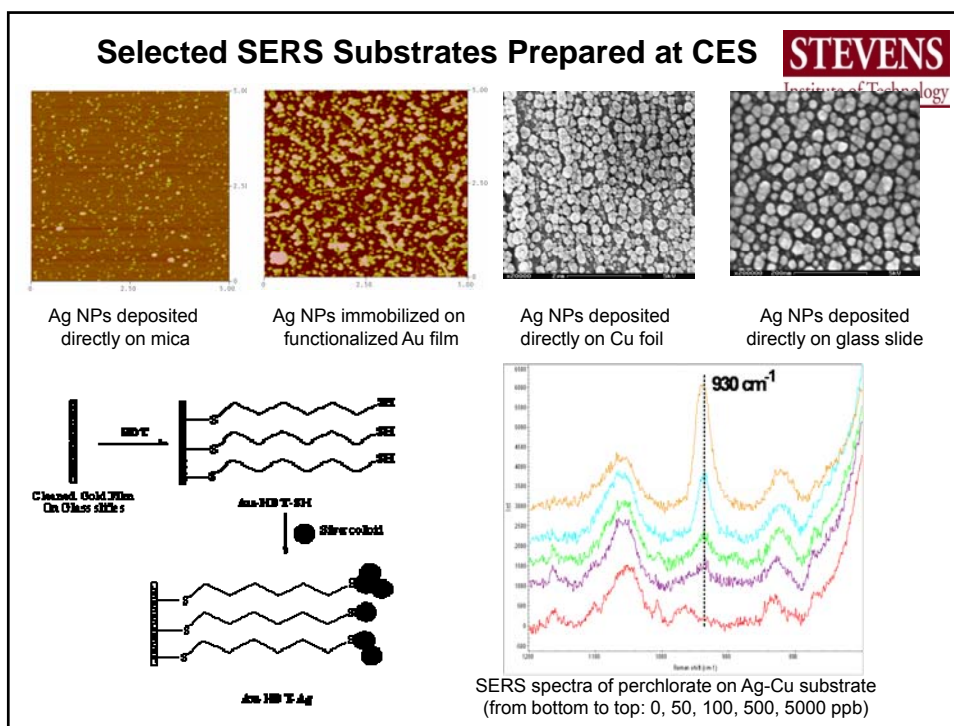
SERS technology

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- SERS (Surface Enhanced Raman Scattering /Spectroscopy) is a surface sensitive technique that results in the enhancement of Raman scattering (signal) by molecules adsorbed on rough surfaces of metallic nanostructures (Ag and Au).
- Advantages:
 - > Rapid: a few seconds to minutes;
 - > Sensitive: probe single-molecule;
 - > In situ: portable Raman spectrometer systems coupled with fiber-optic probes are commercially available.



Portable
Raman
spectrometer



Advantages of this research



1. The simple and inexpensive preparation of SERS active substrates.
2. Improved sensitive for perchlorate detection (as low as 50 ppb (0.5 μ M)).
3. Reliable and reproducible for quantitative analysis using mapping integration method.

Limitation

- Samples dropped on the substrates the need to dry before SERS spectra collection.
The perchlorate conc. as high as 100 ppm could not be detected under wet condition probably because of its high mobility in water and weak adsorption on Ag surface.

Next steps of research

- Chemical modification of the substrates for immediate measurements of wet samples.
The Ag-Cu substrates have been modified using a chemical reagent and the new substrates have a high affinity for perchlorate and 100 ppb has been detected immediately under wet conditions.
- Optimization of the modification conditions
Type and conc. of reagents,
Reaction time,
pH effectc



Thank you!

Questions?