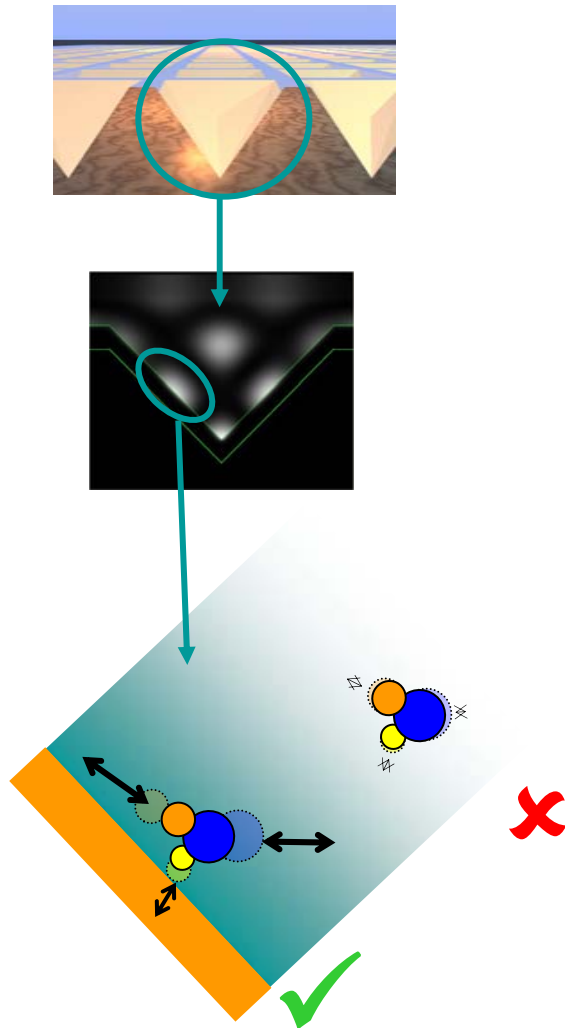




Sample deposition on Klarite

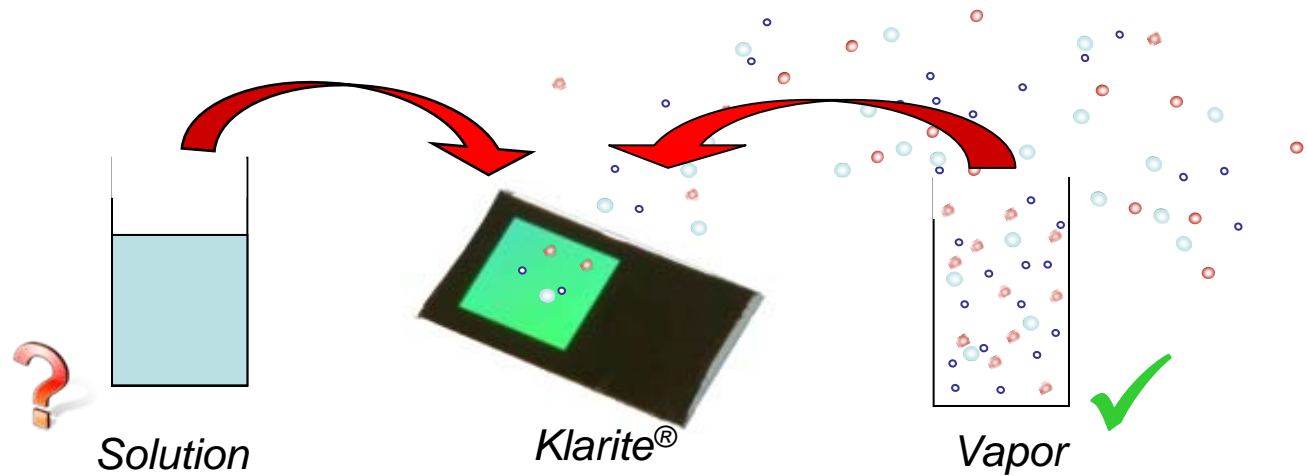
- How Klarite works
- Sampling on Klarite
- Drop coat technique
 - Solvent role
 - Molecule distribution
 - Concentration vs molecules probed

How Klarite[®] works



- Details of Klarite[®] morphology
 - Regular array of inverted pyramids with carefully designed dimensions and engineered gold surface.
- Electric field distribution at surface
 - Depends on metal, its geometrical factors (hole size, shape, spacing) and excitation wavelength
 - Surface field distribution can be engineered to fit applications
- SERS intensity dependence
 - Molecular adsorption in areas of high electric field gives increased SERS signals.
 - Molecules must have an affinity for metal surface, and be intrinsically Raman active.

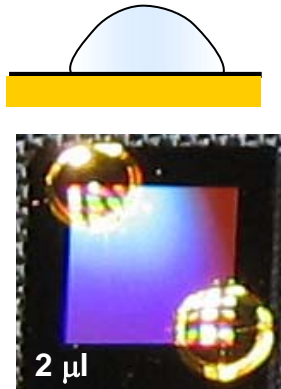
Sampling on Klarite



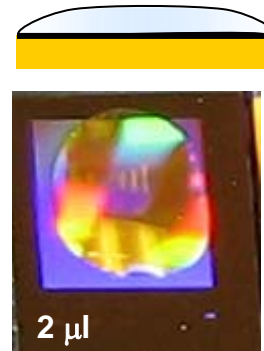
- Delivering molecules in close proximity to metal surface is a prerequisite for measuring good SERS signal
 - Easy for vapours
 - Less straightforward for solutions
- Molecule attachment can be strong or weak depending on
 - Molecule affinity to metal
 - Presence/absence of surface chemistry

Wetting properties of Klarite

Aqueous solutions
no surface chemistry



Aqueous solutions
with surface chemistry



Volatile solutions
no surface chemistry

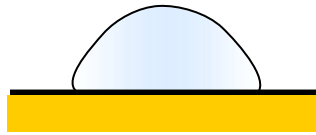


Droplet formation depends on:

- Nature of solution *and* nature of surface!
- Bare Klarite is hydrophobic
- Aqueous solutions will form large volume droplets
- Surface chemistry can give better surface ‘wetting’ of aqueous solutions
- Volatile solvents which are wetting agents will disperse well across the bare Klarite surface

Molecule distribution at surface

Aqueous solutions
no surface chemistry



Aqueous solutions
with surface chemistry



Volatile solutions
no surface chemistry



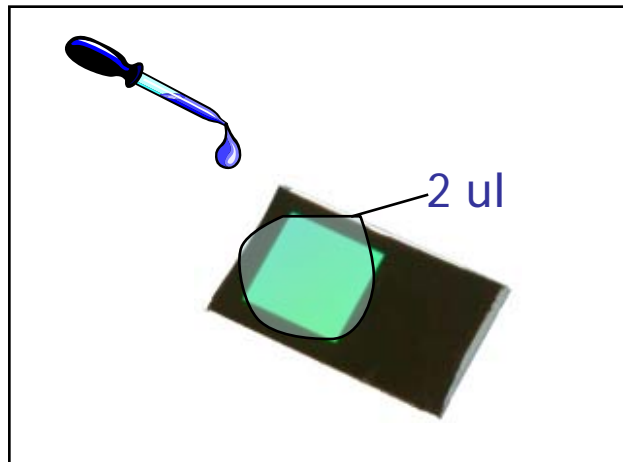
For qualitative studies all three situations can give a good result.

Quantitative studies require:

- More uniform distribution of molecules at surface
- Known volume of analyte in measurable area
- Sampling of analyte deposition will be important

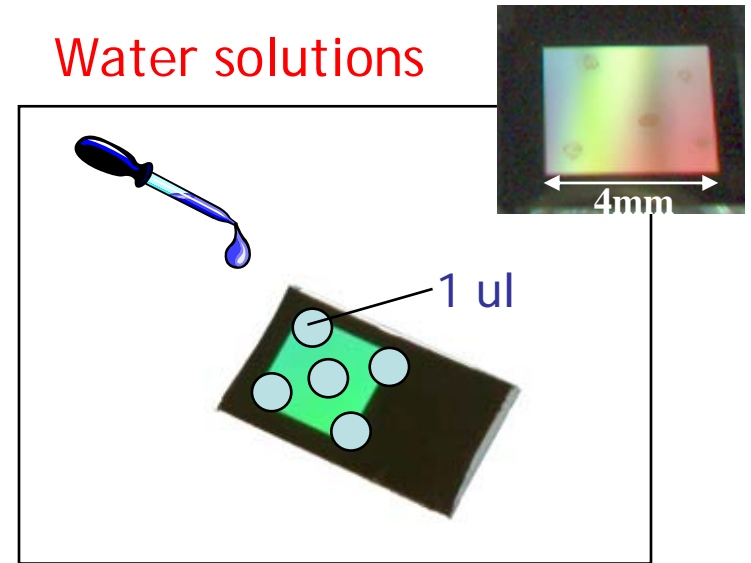
Drop deposition on Klarite

Volatile solvents



Volatile solvents (e.g. methanol, ethanol, acetone, etc) will spread across the whole surface even if small volumes are used

Water solutions



Water solutions allow multiple points to be arranged on the same chip, depending on volumes.

- 1ul usually allows 5-6 drops onto Klarite (see picture)



Conclusions

- SERS is capable of interrogating remarkably low concentrations of analyte molecules, (equating to low ppm ranges and analyte masses in the picograms range) even when simple instrumentation and basic deposition techniques are used
- Quantitative analysis of low concentrations is possible if sample deposition is controlled and substrate sampled accordingly.