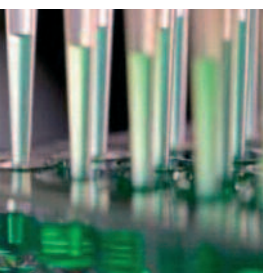




# Highly Specific, sensitive and fast molecular detection

## The D3 Technologies' SERS solutions

### Application Note



#### INTRODUCTION

The demand for rapid molecule recognition at trace level is required in many application areas such as molecular diagnostics, theranostics, chemical analysis and chemical and biological threat detection.

Using its unique expertise in Surface-Enhanced Raman Spectroscopy (SERS), D3 Technologies Ltd provides customer specific solutions with outstanding sensitivity and specificity on a unique flexible platform.

D3 Technologies' solutions also include:

- High-throughput capability
- Fast detection
- Handling of small volumes of samples or specimens
- Quantitation capability
- User-friendly kits and flexible platform

#### KLARITE® SERS TECHNOLOGY

D3's Klarite® technology is a unique combination of highly sensitive and reproducible SERS substrates with customised surface chemistry<sup>1</sup>.

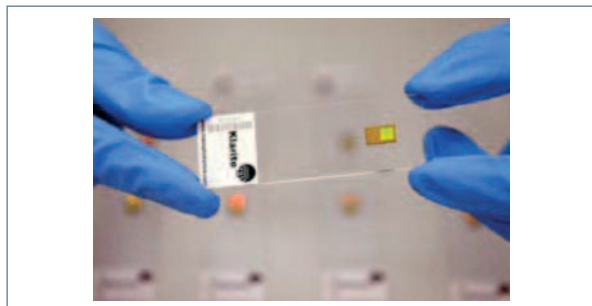


Figure 1 – D3 Technologies Klarite® SERS substrates

Comprising a 2D regular array, Klarite® features large area reproducibility with RDS <5% and over a million fold enhancement of the molecular specific Raman signal<sup>2</sup>.

Klarite substrates are a robust and reliable platform<sup>3</sup> for very selective detection of femtomoles to attomoles of analyte and are suitable for use with any Raman instrument. Novel surface chemistry adds outstanding specificity and quantitation capability for a large range of applications<sup>3</sup>.

#### KLARITE® FOR DNA ANALYSIS

This note shows an example using labelled oligonucleotides illustrating how the sensitivity, specificity and mass screening capability of Klarite substrates can be designed and customised by combining patterned SERS substrates with chemistry<sup>4-5</sup> (Figure. 2).

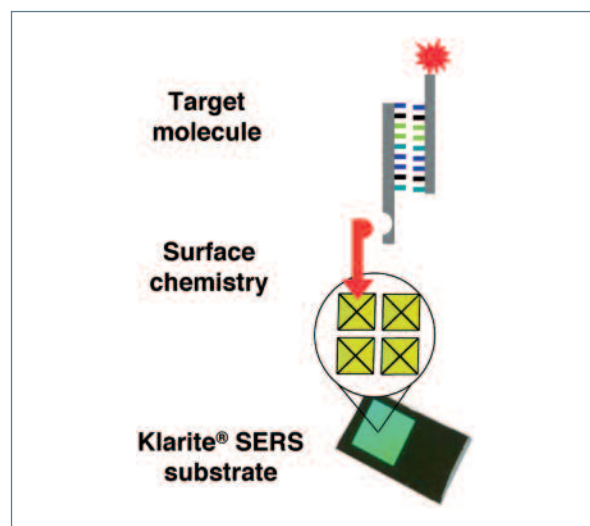


Figure 2 – Klarite SERS platform illustrating the combination of substrates and surface chemistry

Major advantages of functionalized SERS surfaces are: -

- High binding specificity
- High sampling uniformity over very large areas
- Very high sensitivity
- Quantitative analysis capability
- Unrivalled multiplexing

## Highly Specific, sensitive and fast molecular detection

### The D3 Technologies' SERS solutions

The comparison of the fluorescence and Raman spectrum of a commercially available dye (Figure.3) highlights the higher discrimination power of Surface-Enhanced Resonance Raman Scattering (SERRS) compared to fluorescence. The narrow lines of the Raman spectrum allow unambiguous signal recognition in a highly multiplexed configuration and with instrument platforms using single excitation wavelength and readout optics.

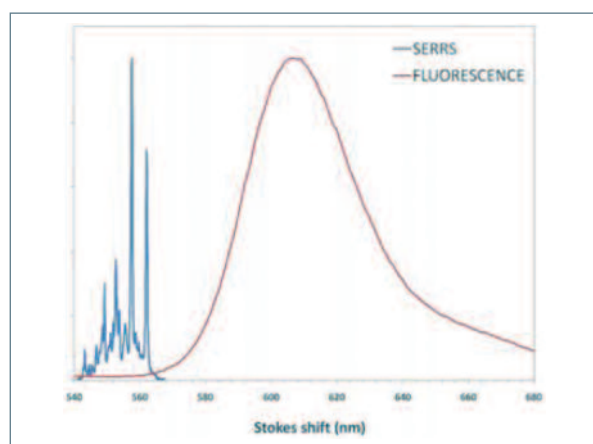


Figure 3 – Comparison of SERRS and fluorescence spectrum of a commercial dye (ROX)

In-situ identification of three analytes using the D3 Technologies' Klarite® SERS platform with a high performance Raman spectrometer (Streamline™, Renishaw) is illustrated in Figure. 4.

An oligonucleotide modified at one end with a group designed to adhere to the surface and at the other with a fluorophore was applied to Klarite® (Figure. 2). The scanning of the whole 4mm x 4mm surface, comprising over 4,000,000 substrate nano-wells, can be recorded by Streamline™ in <10 min using low power density and low numerical aperture optics.

The map in Figure. 4 illustrates the huge information content which can be achieved by the combination the Klarite® SERS platform with Raman mapping. Spatial resolution and multiple analyte identification can be obtained in a highly multiplexed configuration with very small volumes and concentrations (femtomole to attomole).

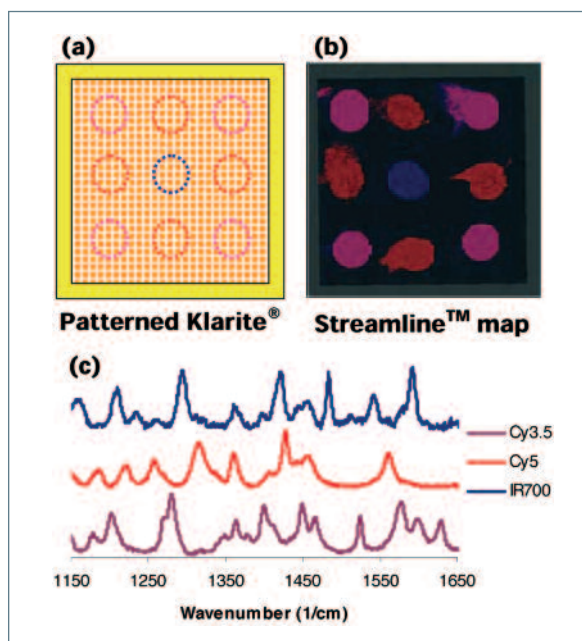


Figure 4 – Raman spectra taken from a Klarite surface patterned with 3 dye-labelled oligonucleotides (a) pattern applied; (b) false color map of the Raman scattering; (c) representative spectra from different spots

#### CONCLUSIONS

D3 Technologies' SERS platform delivers ultimate sensitivity and sensitivity and specificity for trace level molecular detection and identification. The combination of Klarite® SERS substrate technology, chemistry and instrumentation provide unique high value customer specific solutions.

#### REFERENCES

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