

# Klarite™ Instruction for Use

Version 1.5

25<sup>th</sup> October 2007



## 1. Introduction

D3 Technologies Klarite™ substrates provide a unique solution for Surface Enhanced Raman Spectroscopy (SERS). As well as generating unrivalled levels of Raman signal reproducibility, the very high signal levels achieved when using these substrates make taking Raman spectra as easy as obtaining fluorescence spectra, with significantly lower detection limits for many analytes.

## 2. Warning to avoid contamination prior to use;

- Do not open unless in a controlled lab environment and shortly before use.
- Avoid contamination before use.
  - Recommended to store in a freezer
    - Ensure product at room temperature before opening sealed pouch
  - Use powder free cleanroom gloves when handling slide mailer and glass slides
  - Store unused slides in slide mailer.
- Avoid contact with active area - refer to section 8.
- Do not clean - refer to section 7.
- Epoxy used to attach substrate may react with some chemicals.

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## 4. Description

Klarite™ surface enhancing Raman substrates feature 4 mm x 4 mm active area mounted on standard 3" microscope slides as illustrated in Figure 1. A detailed mechanical drawing is given in section 11.

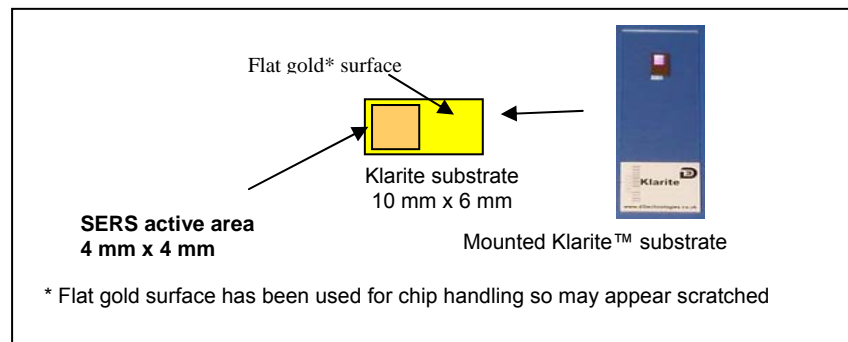


Figure 1: - Klarite™ slide and details of the SERS active area

Klarite™ devices are fabricated on silicon wafers coated with gold. The 4 mm x 4 mm patterned area which is SERS active is on one side of the mounted chip as shown in Figure 1.

Klarite™ substrates are shipped within a Nitrogen atmosphere in protective packaging to ensure optimum performance and contamination free shipment. Each protective package contains a slide mailer with 1 mounted Klarite™ substrates enclosed.

## 5. Handling

**Powder free clean room gloves must be worn at all times whilst unpacking and handling the Mounted Klarite™ substrate to avoid contamination resulting in spurious signals.**

### 5.1 Unpacking

Once in a controlled lab environment, the protective packaging can be opened by cutting along a line indicated by the dotted line as shown in Figure 2.



Figure 2:- Opening protective packaging

## 10. Disclaimers

All statements, information and recommendations related to products herein are based upon information believed to be reliable or accurate. However the accuracy or completeness is not guaranteed and no responsibility is assumed for inaccuracies. D3 Technologies retains the right to change design, function, specifications, fit or form of products described herein at any time without notice. Copyright of D3 Technologies Ltd 2005.

Klarite™ is a trade name used by D3 Technologies.

D3 Technologies Klarite™ substrates for surface enhanced Raman spectroscopy are subject to US and Worldwide patent applications.

## 6 Storage

### 6.1 Recommended storage conditions

Once the protective packet is opened, store the unused slides within the shipped box to avoid contamination from airborne dust or other contaminants.

Storage at freezer temperature (~ -15 Degrees Celsius) is recommended to extend the lifetime of the product. **If storing in a freezer ensure the product is at room temperature before opening the sealed pouch.** Avoid storing in a damp environment.

Contamination can also be avoided if the devices are stored under a controlled Nitrogen atmosphere i.e. nitrogen cabinets.

### 6.2 Shelf life

Due to the active nature of the surface, current recommended shelf life is in excess of 3 months from shipment when enclosed in the un-opened foil protective packaging at room temperature. A longer lifetime can be achieved if stored at lower temperatures; but the product has only been tested down to minus 15 Degrees Celsius. Once the protective packaging seal has been broken, a gradual degradation in performance will be seen over several days. Storage under clean dry nitrogen will reduce this. For further details on shelf life please contact [sales@d3technologies.co.uk](mailto:sales@d3technologies.co.uk)

## 7 Cleaning

### 7.1 Before use

Klarite™ substrates are shipped ready to use – **no pre cleaning is required.**

### 7.2 Re-use

Klarite™ SERS substrates are designed to be single use disposable substrates. Cleaning and re-use is not recommended and D3 Technologies can not guarantee device operation if re-used.

## 8 Analysis tips

Klarite™ substrates are supplied pre-mounted on a standard 1"x 3" microscope slide to enable ease of use with existing Raman spectrometers and microscopes. Observe all handling instructions associated with the Raman instrument. D3 Technologies accept no responsibility for any damage to instruments caused by improper use of Klarite or Raman instruments. If in doubt call your instrument manufacturer.

Klarite™ substrates are only designed for detection of SERS signal using conventional Raman instruments and D3 Technologies will not guarantee operation for any other test.

### 8.1 Sample deposition

Dispense the sample on to the active area (the 4mm x 4mm patterned area) of the device. If micro pipetting is used, multiple sample spots may be placed on one device, but care must be taken to avoid cross contamination.

Be careful not to touch the substrate itself with pipettes or other sample deposition equipment as this will damage the substrate and affect the operation of the device.

The Klarite™ active area is bonded to the substrate with a solvent-free UV curing Epoxy adhesive. If tests are done using solvents known to affect epoxy adhesives then care should be taken to avoid analytes flowing outside active area.

D3 Technologies do not accept any liabilities for the handling of chemicals or samples during the use of Klarite™ substrates. It is recommended that only experienced laboratory personnel dispense chemicals onto the Klarite™ substrates.

### 8.2 Excitation Wavelength

Klarite™ substrates are optimised to work with 633nm and 785nm wavelengths.

Different excitation wavelengths can provide a difference in performance due to the wavelength dependence of the Photonic Crystal SERS enhancement.

Operation at shorter wavelengths such as 532nm is possible. However the Gold coating on Klarite™ is partially absorbing at this wavelength and very low powers should be used to avoid heating the substrate and sample. As sample fluorescence is commonly inversely proportional to the wavelength, more fluorescence will be observed at the shorter wavelengths.

### 8.3 Typical excitation power & parameters

Typical micro Raman system setup parameters:-

Power at substrate surface	1-10mW*
Microscope Objective	20x
Integration time	1-10s
Spot size diameter	$5\mu\text{m} \leq \text{Ø} \leq 50\mu\text{m}$
wavelength	633nm/785nm

- depends on analyte damage threshold and spot diameter.

Klarite™ devices will also work with fibre coupled Raman spectrometers and imaging spectrometers. When imaging spot sizes  $<5\mu\text{m}$  reproducibility may decrease, as localisation of the SERS signal will begin to be resolved. This may be apparent with 100x microscope objectives with some micro Raman configurations.

**It is recommended to use a focussing objective with magnification less than 20x.**

Data has successfully been taken with excitation spot sizes as large as 5mm.

If fluorescence or other backgrounds are seen, the following procedures are recommended:-

- Operate in confocal conditions
- Reduce the excitation power
- 

### 8.4 Typical performance

For examples of Raman spectra obtained with Klarite™ substrates, please consult the D3 Technologies website at [www.d3technologies.co.uk](http://www.d3technologies.co.uk)

## 9 Re-ordering & additional enquiries

To request quotation for additional Klarite™ substrates or to reorder using a previous valid quotation; Please contact:

[sales@d3technologies.co.uk](mailto:sales@d3technologies.co.uk)

Tel: +44 (0)141 557 7900

Fax +44 (0)141 557 7949

Inside the protective packaging there will be a plastic slide mailer, as shown in Figure 3, which will contain 1 mounted Klarite™ substrate.



Figure 3:- Plastic slide mailer containing mounted Klarite™ substrates

**Once a substrate has been coated with a particular analyte, DO NOT put back into a slide mailer with any other clean substrates as you may contaminate the rest of the substrates. Klarite™ substrates are single use only.**

### 5.2 Marking

Each Klarite™ slide is marked with a unique 6 digit serial number. The serial number of delivered slides, as shown in Figure 4, and can also be found on paper work and the foil protective bag,

The raised opaque coating is a perfect system for identification and can easily be marked with a pencil or ink.

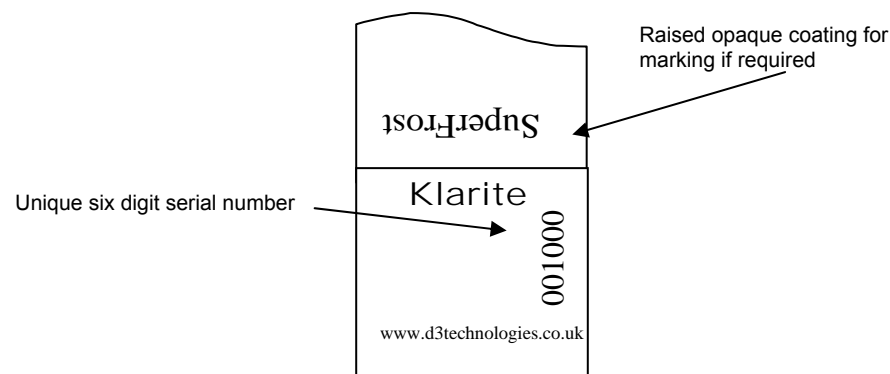


Figure 4:- Glass slide identification