OceanOptics

Surface-Enhanced Raman Spectroscopy (SERS) Substrates

USER MANUAL

RAM-SERS-LP-1/RAM-SERS-MS-1/RAM-SERS-MS-5

Locations

Americas

Manufacturing & Logistics
3500 Quadrangle Blvd.,
Orlando, FL 32817, USA

Sales: info@oceanoptics.com
Orders: orders@oceanoptics.com
Support: support@oceanoptics.com

Phone: +1 727-733-2447
Fax: +1 727-733-3962

www.oceanoptics.com

Europe, Middle East & Africa

Sales & Support
Geograaf 24, 6921 EW Duiven,
The Netherlands

Logistics
Maybachstrasse 11,
73760 Ostfildern,
Germany

Email: emeasales@oceanoptics.com

Netherlands: +31 26-319-0500
Netherlands Fax: +31 26-319-0505
Germany: +49 711-341696-0
UK: +44 1865-819-922
France: +33 442-386-588

Asia

Ocean Optics China
3F, Building 16, No. 155
Yuanke Road, Minhang District
Shanghai 200336
People's Republic of China

Email: asiamkt@oceanoptics.com

China: +86 400-623-2690
China Fax: +86 21-6295-6708
Japan & Korea: +82 10-8514-3797
Ocean Optics India: +91 81 7847-0108
Prestige Shantiniketan, Gate No. 2,
Tower C, 7th Floor, ITPL Main Road,
Whitefield, Bengaluru, Karnataka 560 048, India

Table of content

OceanOptics

Chapter 0: Warning & Handling

Opening the package:

Use gloves and **do not touch the SERS active surface**

The OceanOptics substrates are packed individually under dry conditions. Open an individual package only shortly prior to use. Avoid hot and/or humid conditions. Storage temperature max. 60°C / 140°F, short term drying temperature up to 60°C/140°F. See specifications for further details.



When cutting open one film substrate, be careful not to damage the package of the adjacent film substrate. Once a film substrate is opened, all 4 single SERS active chips may be utilized within 24 hours. Storage of the opened film substrate in a cool and dry place is required to guarantee its performance over 24 hours after opening the original package.

Chapter 1: Introduction

Surface Enhanced Raman Scattering (SERS) is a powerful sensing tool amplifying a weak Raman signal from molecules of the analyte to be detected

Features and Applications

The surface enhanced Raman spectroscopy substrate enhances the Raman scattering light from molecules, enabling high sensitivity Raman spectroscopy. Four active SERS sensitive ships are embedded on an adhesive film, compatible with a standard microscopy slide allowing for easily attaching the analyte. It is noted that this is a disposable product and cannot be reused once the 4 active areas are used.

Features

01 | SECURE | A Signal Enhancing Heat sink provides a high damage threshold for maximum Raman signal at full laser power

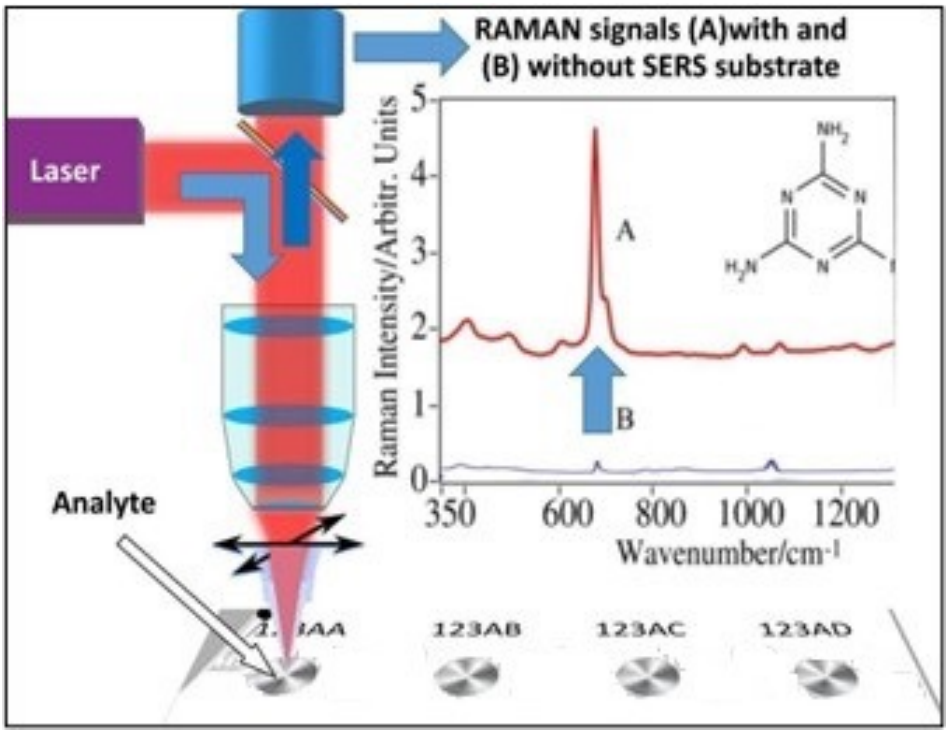
02 | SENSITIVE | Powerful amplification lowers the limit of detection and a unique design allows for flexible application

03 | REPRODUCIBLE | proprietary nanomaterials and processes guarantee batch reproducibility. An identification code guarantees 100% traceability SERS provides new perspectives in:

- Biochemistry
- Forensics
- Food safety
- Threat detection, and
- Medical diagnostics

Field based POC devices potentially outperform their expensive laboratory based counterparts in speed due to minimum sample preparation.

An amplification of the Raman signal occurs because of the enhancement of the electric field provided by the SERS substrate. When the incident laser-light strikes the active surface of the SERS substrate, localized surface plasmons are excited. The specific nanoparticles employed are responsible for this resonant enhancement. The SERS effect is so pronounced because the field enhancement occurs twice. First, the resonant field enhancement amplifies the intensity of incident laser light, which excites the Raman modes of the molecules of the analyte. The resulting enhanced Raman signal is then further amplified by the SERS substrate due to the same resonant effect that amplifies the electric field of the incident laser light.



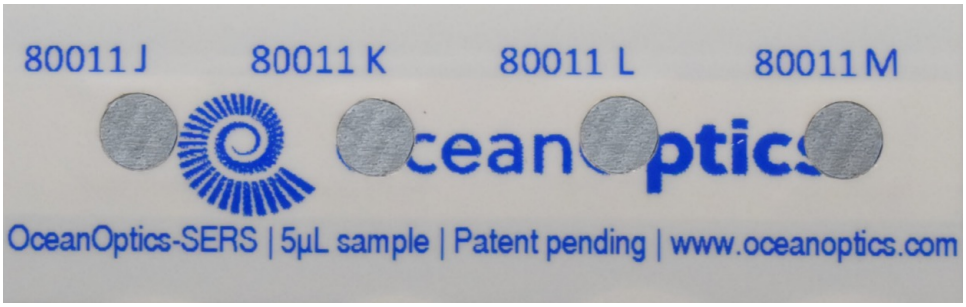
Chapter 2: Product description

The OceanOptics substrate

The OceanOptics substrate comes as a flexible adhesive film, with 4 SERS active areas embedded. It can be adhered to any plane or curved surface, which generally allows adhesion. The surface should be free from dust or fat to ensure good adherence for best stability and reproducibility during the Raman measurement.

1) Flexible, adhesive film SERS substrate
2) Unique identifier (e.g.: 80011J, K, L,M) for each individual chip on the substrate for 100% tra ceability
3) 4 SERS active chips featuring a unique signal enhancing heat sink, embedded in the substrate

Each of the 4 SERS active chips can be identified by a unique identifier. This allows 100% traceability during and after the characterization.



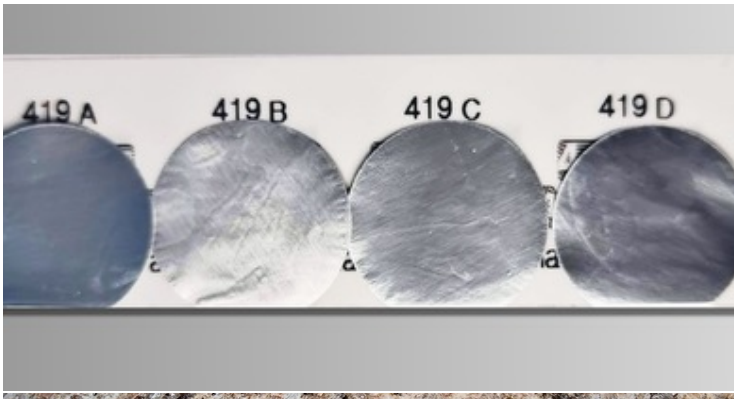
RAM-SERS-LP-1

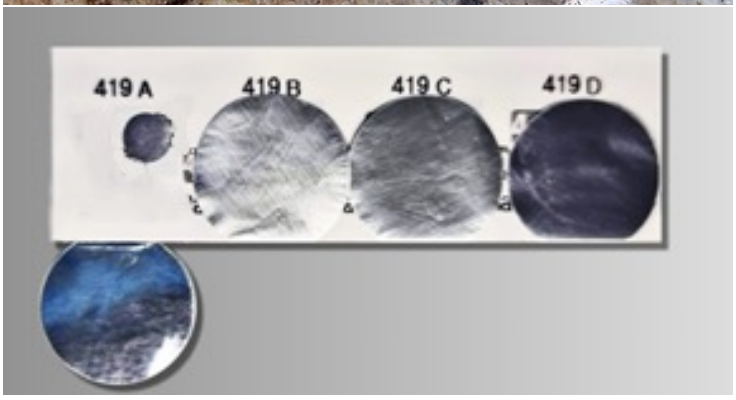
1-unit 1x3” flexible & adhesive substrates with 4 SERS active chips each. Offering a total of 4 SERS chips

1) When opening the package and handling the SERS substrates, always wear protective gloves, use a clean environment and avoid direct contact with the SERS active chips. Touching the SERS active chips easily may contaminate them and make any further characterization impossible.
2) Prepare a microscopy slide with a clean and dry surface
3) Peel off the protection film on the back side of the substrate and adhere it to the microscopy slide.
4) Alternatively, feel free to adhere the OceanOptics substrate on any other plane or curved surface, as your characterization requires.
5) Once the package is opened, please keep it in a dry and cool place. Humidity may never exceed 50% and the temperature should not exceed 25°C / 77°F.
6) The OceanOptics film substrate is a disposable product. After use, it can be peeled off the microscopy slide allowing for reuse of the said glass slide after cleaning.

Application to a standard microscopy slide

4-SERS Strip (No microscope slide) Envelope/Bag ***4 SERS Total***





Step 3:

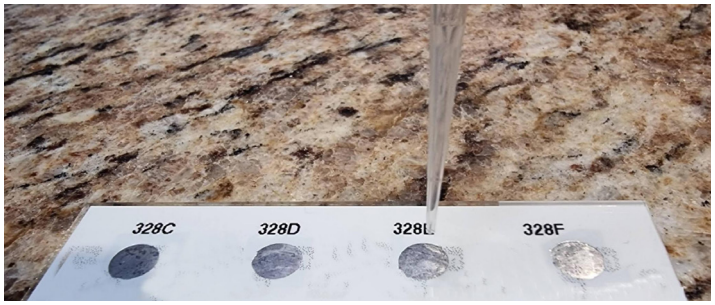
Top Left: Peeling off the protective film;

Top right: [To be replaced] The SERS substrate is equipped with 4 protecting lids, covering the 4 SERS chips.

Bottom left: [To be replaced]Open or remove the lids for the characterization. Chips that are not in use can be left closed for better protection.

Bottom right: all 4 lids are removed and the SERS substrate is applied to a microscope slide.

Application of the analyte



1) For best reproducibility, a constant volume of 5µL shall be applied in the center of the SERS active chip for each measurement.
2) The polymer top layer of the OceanOptics substrate shows good resistance against most solvents. Nevertheless, avoid contact between the analyte and the polymer layer, in which the SERS active chips are embedded. Each chip has a free aperture of 6 mm in diameter , which allows the analyte being applied, without wetting the polymer film.
3) Let the analyte fully dry. No liquid will be absorbed into the substrate. Therefore all analytes remain at the surface and the solvent needs to evaporate.
4) To accelerate drying, the substrate can be placed in a drying oven with temperatures of up to 50°C / 122°F for up to 1 hour. We recommend 45°C for 10-15 minutes. Contamination of the oven might interfere with the analyte. The Raman laser itself may serve for drying the substrate. An increase of the signal with longer measuring time indicates that the analyte is not yet fully dried.

5) Make sure that the spectrum has stabilized as a sign that the analyte's solvent has fully evaporated. Wet substrates generally yield lower but broader Raman signal response.
6) The best signal is obtained with a fixed focal spot. There is no need for scanning the substrate, as it stands high laser fluence.

You can also choose from the following two versions. These two versions are already pasted on the microscope slides at the factory.

RAM-SERS-MS-1

1 substrate, containing 4 SERS chips on a microscope slide, in a plastic box.Offerin a total of
4 SERS chips

RAM-SERS-MS-5

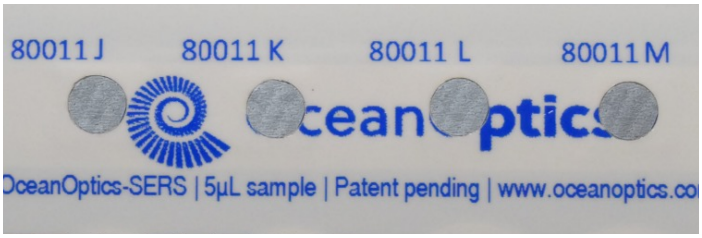
5 substrates, Each substrate containing 4 SERS chips on a microscope slide ,in a plastic box. Offering a total of 20 SERS chips

Chapter 3: Specifications

Specifications (typical values)

Parameter	Specification	Units
Substrate dimensions	75 x 24 x 0.2	mm
Active area (free chip size)	ø6	mm
Number of active areas (chips)	4	-
Analyte volume	5	µL
Substrate surface	Polyethylene flexible adhesive film	-
Raman laser excitation wavelength range	633 / 671 / 785 / 1064	nm
Shelf life after manufacturing date	12	months
Storage temperature	5 - 60 (40 - 140)	°C (°F)
Storage humidity	< 50, non condensing	% RH

Dimensions: (mm)



Total dimension: 75 x 24

Total dimension:
75 +0/-1 x 24 +0/-1; Pitch: 18 +/- 0.25

A unique serial number system allows traceability of each SEHS-SERS active chip. The active chips are embedded in a flexible, adhesive substrate, compatible with a standard microscope slide.

Each individual SERS ship is scanned prior to shipment. Its response is available in the form of an individual performance indicator for calibration of your Raman setup for quantitative SERS.

Chapter 4:
Examples of Raman spectra:

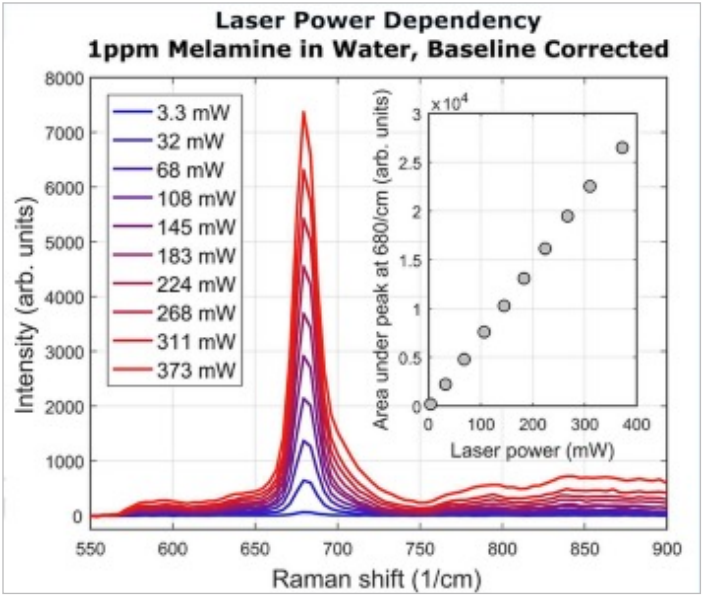
Robust and easy to use. A unique **SIGNAL ENHANCING HEAT SINK supports EXTREMELY HIGH DAMAGE THRESHOLD of > 5kw/cm².** Full laser power of a >400 mW Raman laser can be utilized for the generation of the strongest Raman signal. Distinct strong **LOCALIZED SURFACE PLASMON RESONANCE (LSPR)** effect of HighQuant nanoparticles unlocks orders of magnitude improvement of the limit of detection.

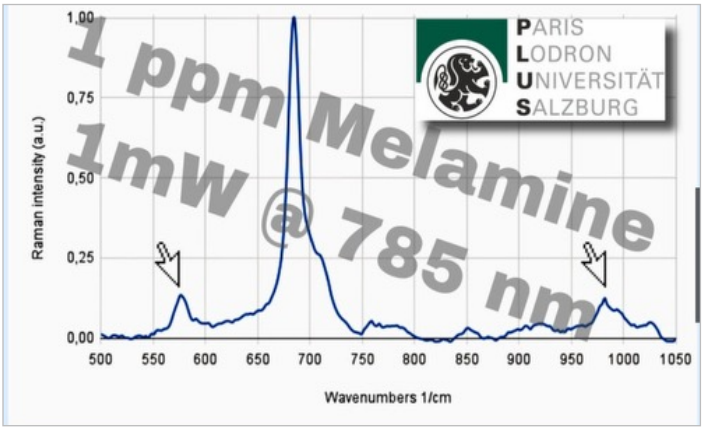
Enhancement factor of the Raman signal of >10⁶ has been determined. At a record low Raman laser power of only **1 mW** a set of characteristic Raman peaks of **1 ppm Melamine** in water has been recorded using the new **OceanOptics 4x4** substrates.

Parameter of characterization:

Raman laser fluence: 5 kW/cm²

Exposure time: 20 s





Questions?

Chat with us at www.oceanoptics.com.
info@oceanoptics.com

US +1 727-733-2447
EUROPE +31 26-3190500
ASIA +86 400-623-2690