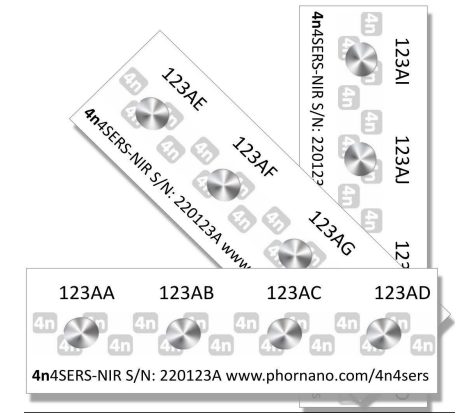
4n PHORNANO
SECURE | SENSITIVE | REPRODUCIBLE

HP-SERS substrate
4n4SERS Type 4



Surface Enhanced Raman Scattering (SERS) is now an even more powerful sensing tool amplifying a weak Raman signal from molecules to be detected.

4n's HIGH PERFORMANCE (HP) SERS substrates feature **SEHS**, a unique **SIGNAL ENHANCING HEAT SINK.**

Four large active HP-SERS spots with **SIGNAL ENHANCING HEAT SINKS** are embedded in each flexible and adhesive SERS substrate, which allow for easy attachment of the analyte.

HP-SERS substrate

01 | SECURE | 4n's **SIGNAL ENHANCING HEAT SINK** protects the analyte from overheating. Maximum signal is guaranteed at full power from the Raman laser

02 | SENSITIVE | The **SIGNAL ENHANCING HEAT SINK** compensates for low Raman signal in the NIR range, where autofluorescence is lowest

03 | REPRODUCIBLE | The **SIGNAL ENHANCING HEAT SINK** allows for long averaging and reproducible results.

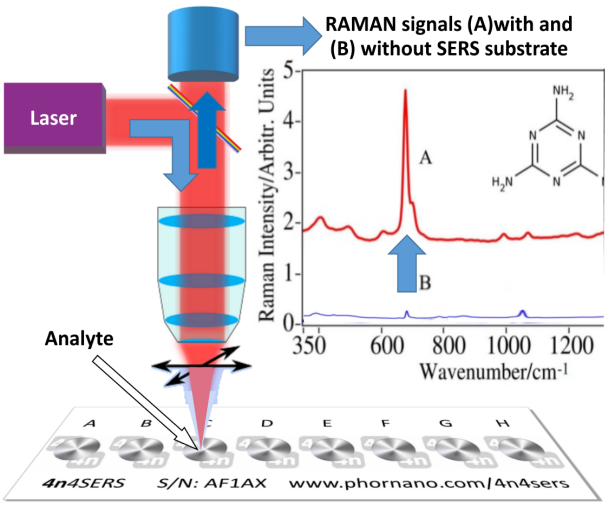
Applications

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 is caused by the enhancement of the electric field provided by the SERS substrate. When the incident laser-light strikes the active spot 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: (i) The resonant field enhancement amplifies the intensity of incident laser light, which excites the Raman modes of the molecules of the analyte and (ii) the resulting enhanced Raman signal is then further amplified by the SERS substrate due to the same resonant effect.



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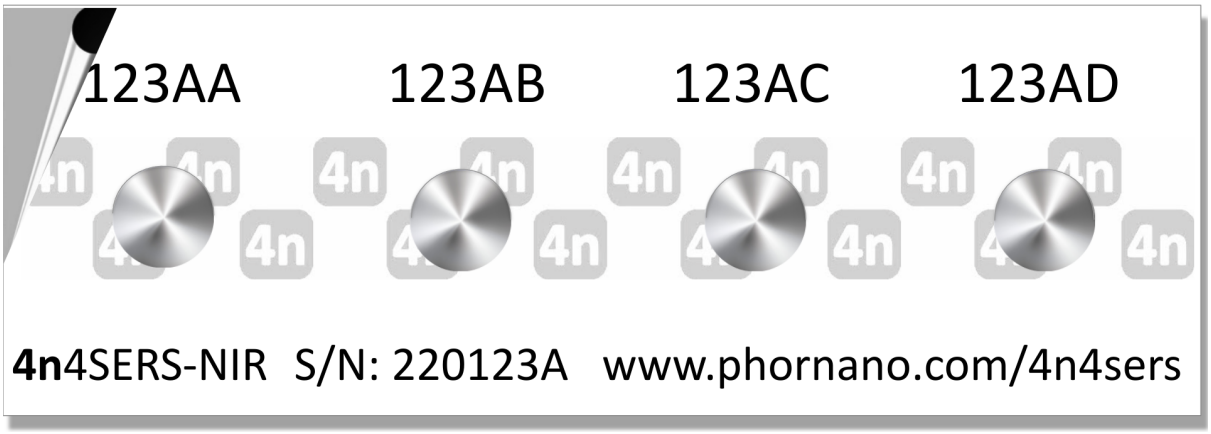
HP SERS Specifications (typical values)

Parameter	Specification	Units
Raman laser excitation wavelength range	785 to 1064	nm
Raman laser threshold (Gaussian beam)	3	kW/cm²
Raman laser power at ∅ 150 µm focal spot size	500	mW
Substrate dimensions	75 x 24 x 0.3	mm
Active spot (SEHS)	∅ 6	mm
Number of active spots (SEHS)	4	-
Analyte volume	5-10	µL
Flexible adhesive substrate (carrier material)	Polyethylene film	-
Shelf life after manufacturing date	6	months
Storage temperature	5 - 60	°C
Storage humidity	< 50, non condensing	% RH

Dimensions: (mm)

Total dimension: 75 x 24**;** Pitch: 18



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

Technical information is current as of May 2022, Version 20220519

It is noted that this is a disposable product and cannot be reused once the 4 active areas are used.

PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION, DESIGN OR OTHERWISE.

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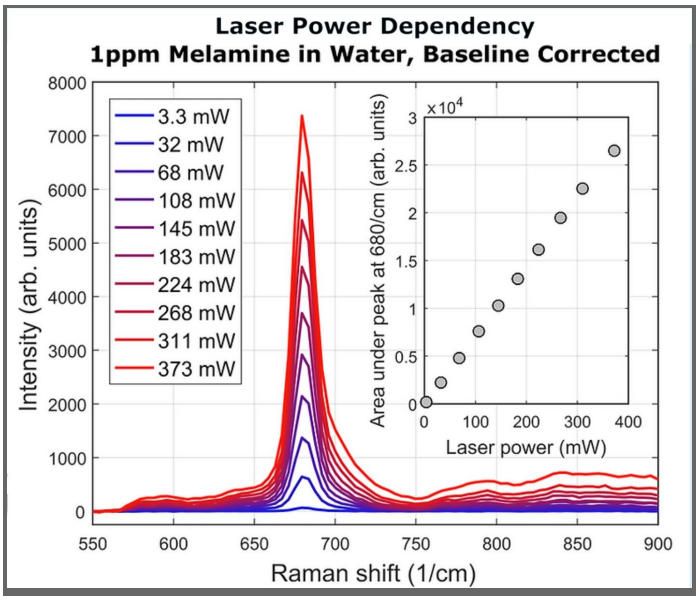
Examples of Raman spectra:

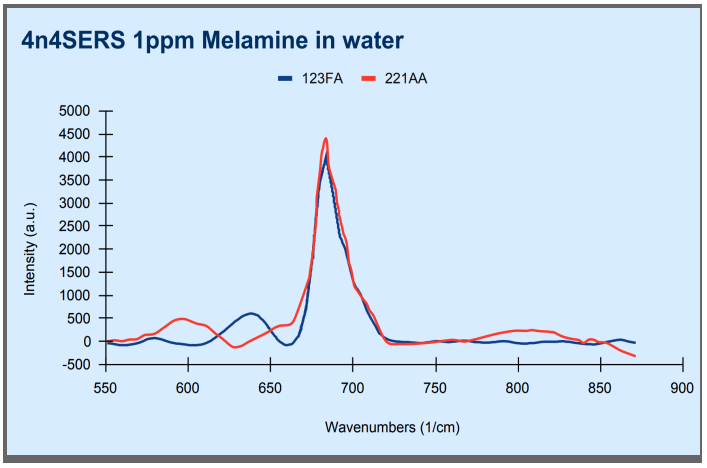
Robust and easy to use. With their **EXTREMELY HIGH DAMAGE THRESHOLD of > 3kW/cm²**, 4n4SERS substrates won't let you down, even when full power of your 500 mW Raman laser is utilized for best results. Distinct strong **LOCALIZED SURFACE PLASMON RESONANCE (LSPR)** effect of HighQuant nanoparticles unlocks orders of magnitude improvement in the limit of detection.

Figure: linear enhancement of the Raman signal with increasing power.



BATCH TO BATCH REPRODUCIBILITY is of highest standards due to the proprietary process and nanoparticles applied. Sensitivity, speed and reliability of the characterization offer a cost advantage, compared to other methods.

Figure: Deviation of the Raman peak signal between 2 batches is < 10%.



Specific measurements were provided by RECENDT Research Center for Non Destructive Testing GmbH, Linz, Austria in collaboration with:

RECENDT RESEARCH CENTER NON DESTRUCTIVE TESTING
JKU JOHANNES KEPLER UNIVERSITÄT LINZ
UNIVERSIDADE FEDERAL DE PERNAMBUCO
FFG Austrian Research Promotion Agency