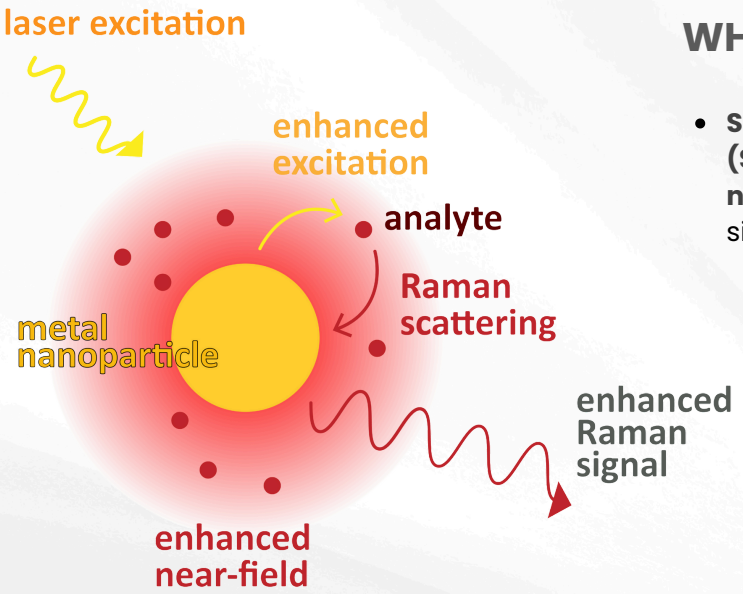
# SURFACE-ENHANCED RAMAN SPECTROSCOPY (SERS)

PurPest

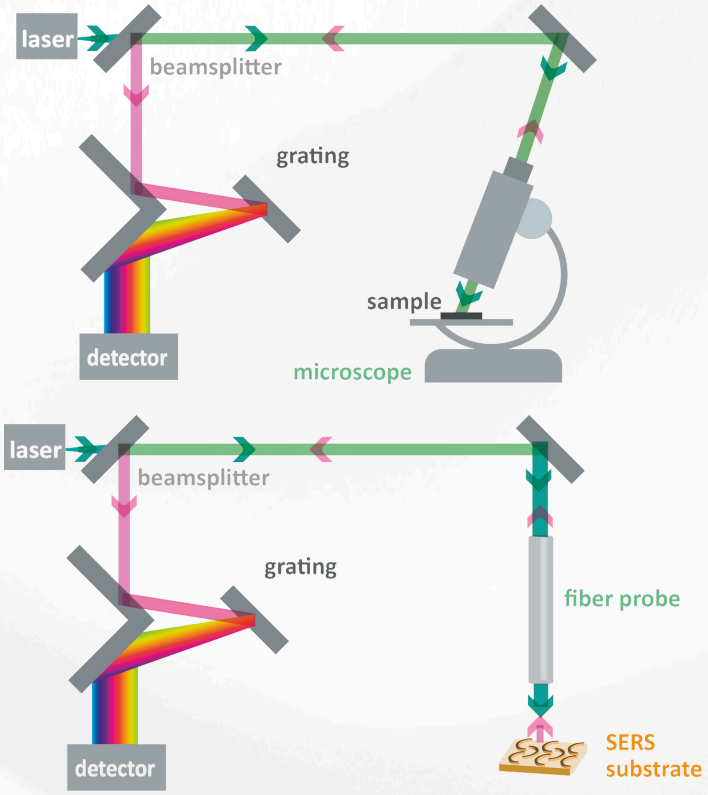
## WHAT IS RAMAN SPECTROSCOPY?




- Raman scattering occurs when light interacts with molecules, causing a shift in wavelength.
- This shift — called the **Raman shift** — reveals vibrational modes unique to each molecule.
- A laser excites the sample, and the scattered light is analyzed to determine chemical composition and molecular structure non-destructively.

## WHAT MAKES SERS DIFFERENT?

- **Surface-Enhanced Raman Spectroscopy (SERS)** amplifies the Raman signal using **nanostructured metal surfaces** (typically silver or gold).
  - Laser light excites **localized surface plasmons** around the nanostructured metal surface, generating intense electromagnetic fields.
  - These fields dramatically boost Raman scattering, enhancing signal strength.
- **SERS** produces a **highly sensitive molecular fingerprint**, even at **trace concentrations**.
- Enables **precise identification** in complex mixtures, making SERS invaluable for environmental monitoring.

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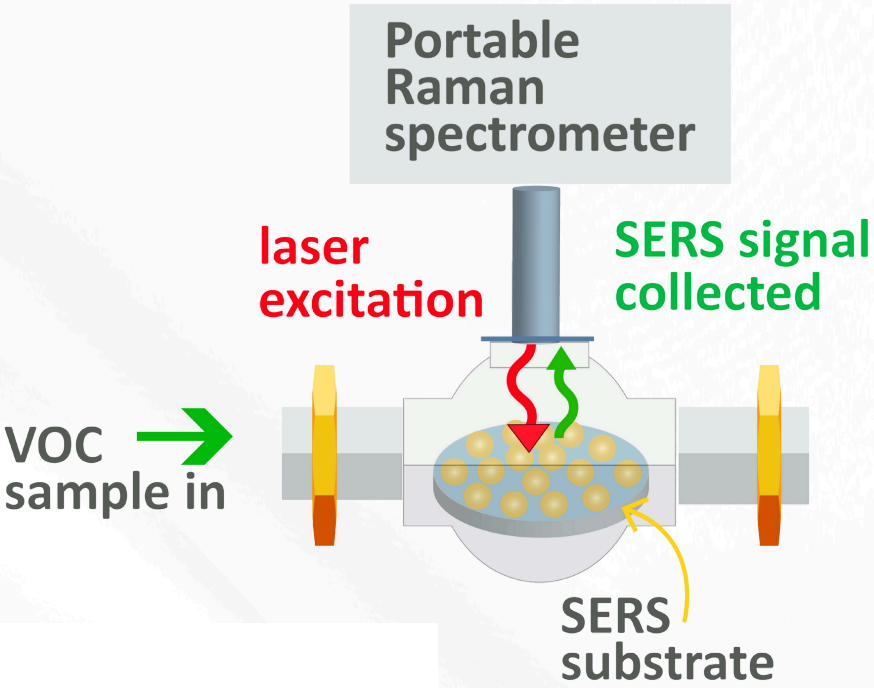
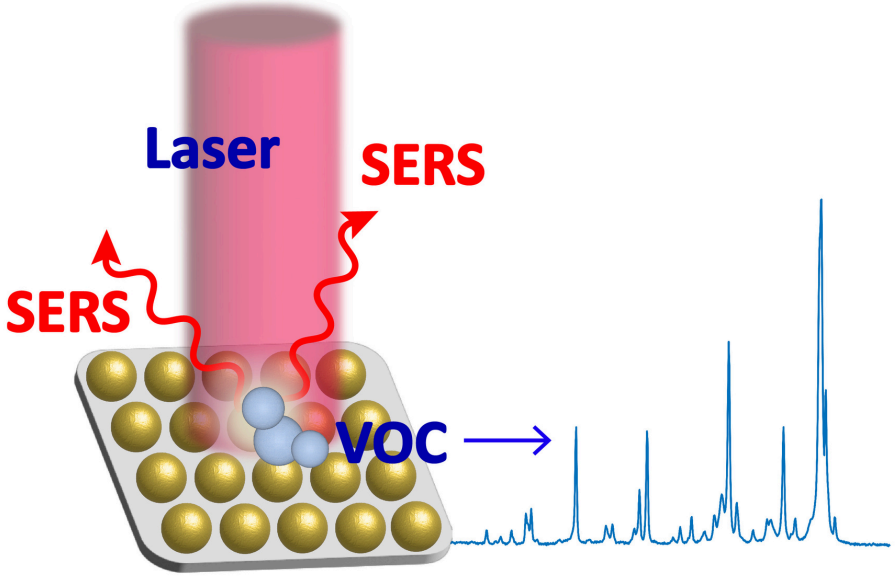
## DETECTING VOCS WITH SERS

- **Volatile organic compounds (VOCs)** are small, airborne molecules that are often difficult to detect due to their low metal affinity.
- SERS detection of VOCs requires **functionalizing nanostructured metal surfaces** with specialized coatings.
- These coatings are designed to attract and retain VOCs, increasing their interaction with the metal surface and excited localized plasmon resonance.




## VOCS IN PRECISION AGRICULTURE

- Plants emit **pathogen-specific VOCs** when under attack.
- Detection of VOCs allows for early diagnosis before visual symptoms appear.
- By catching infections early, growers can prevent yield loss, minimize crop damage, and promote sustainable farming practices
- SERS could enable rapid, on-site detection of harmful pathogens and pests in crops and other plants.

## VOC SENSORS & THE PURPEST PROJECT

In the PurPest project, we are developing **novel nanostructured SERS sensors** with advanced coatings to enable highly sensitive and non-destructive detection of plant pathogens and pests by amplifying disease specific volatile emissions.

The innovation of the **PurPest Sensor System Prototype (SSP)** supports real time field diagnostics, contributing to sustainable and precise plant protection.

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