Valentina Mussi

Annalisa Convertino, Luca Maiolo

VisLab

Tech4Bio

Key Enabling Technologies

Development

&Transfer

4

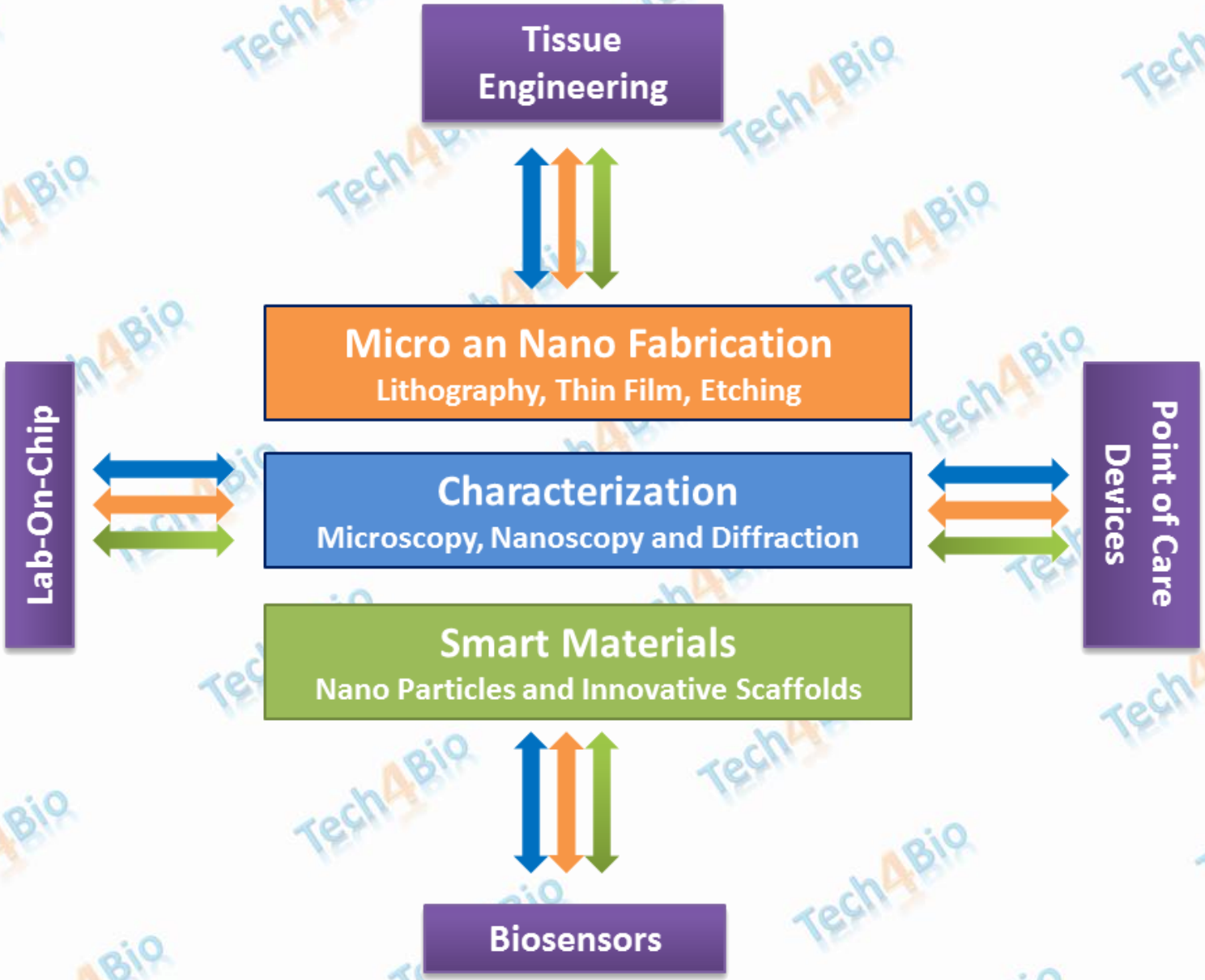
Italian Industry

www.tech4bio.eu

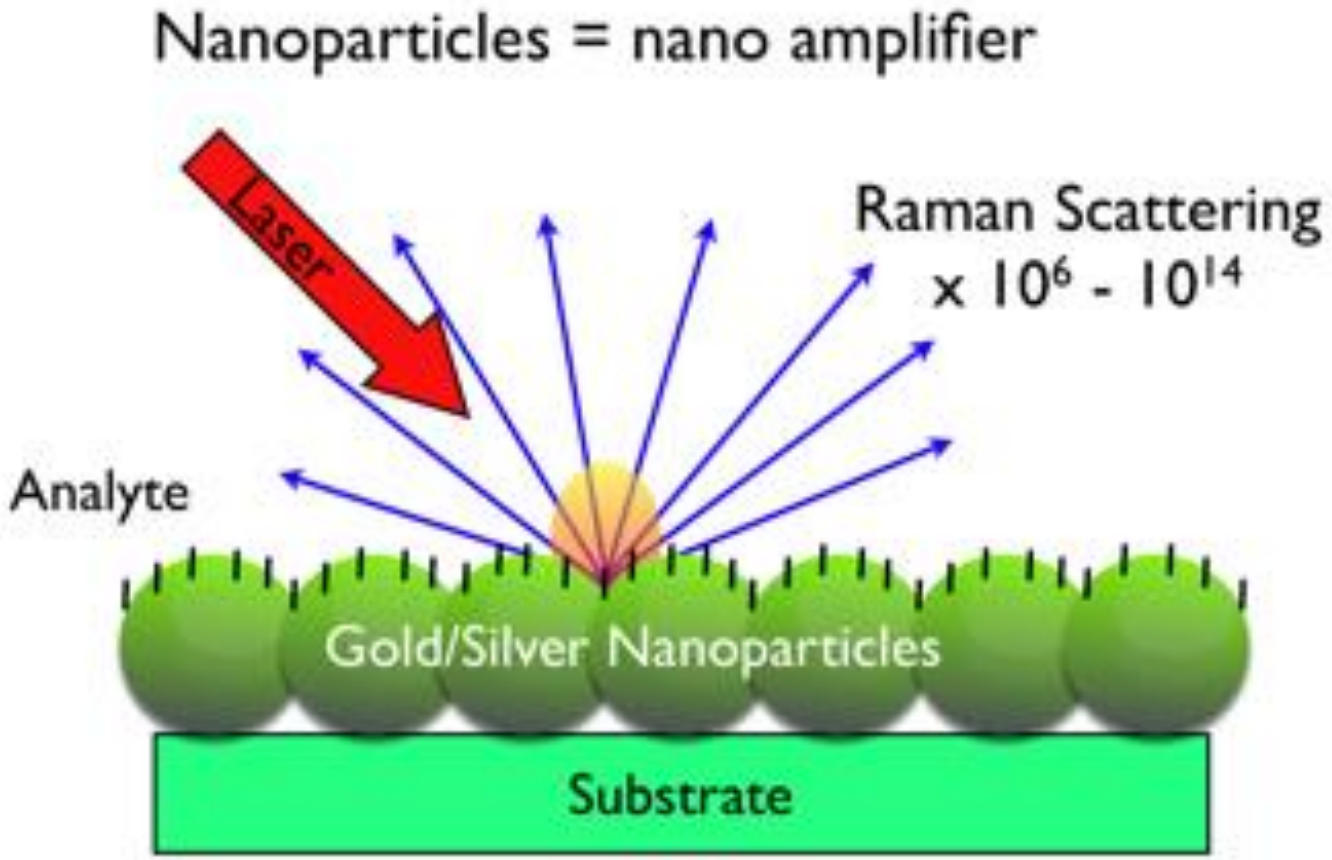
Consiglio Nazionale delle Ricerche

ThermoFisher SCIENTIFIC

A VIRTUAL LABORATORY: RESOURCES AND FIELD OF APPLICATION



SERS BIOSENSORS



Field enhancement occurs TWICE and is greatest when the plasmon frequency, ωp, is in RESONANCE with the incident radiation

BIOANALYTICS

DIAGNOSTICS

ENVIRONMENTAL MONITORING

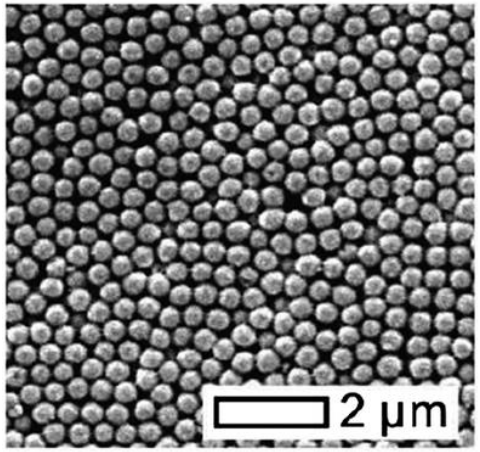
TRACE CHEMICAL ANALYSIS

PRACTICAL SENSING METHODOLOGY → ***EFFECTIVE SERS ACTIVE SUBSTRATES***

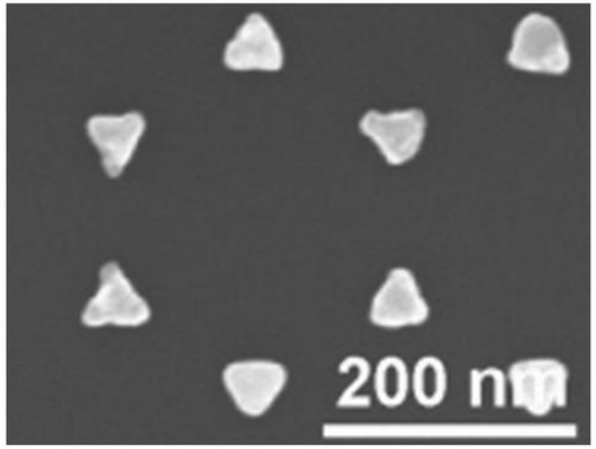
SERS SUBSTRATES

FABRICATED

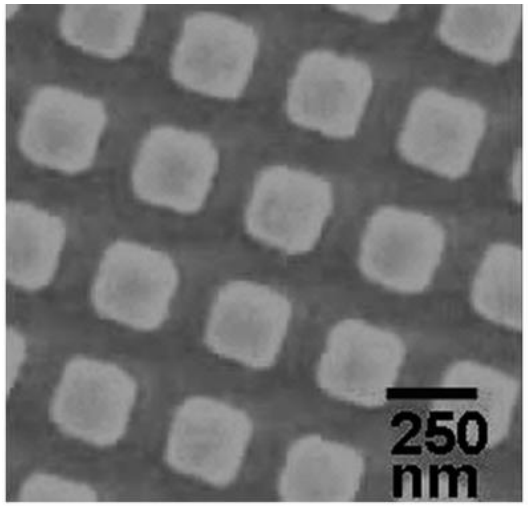
Metal film over fabricated nanospheres



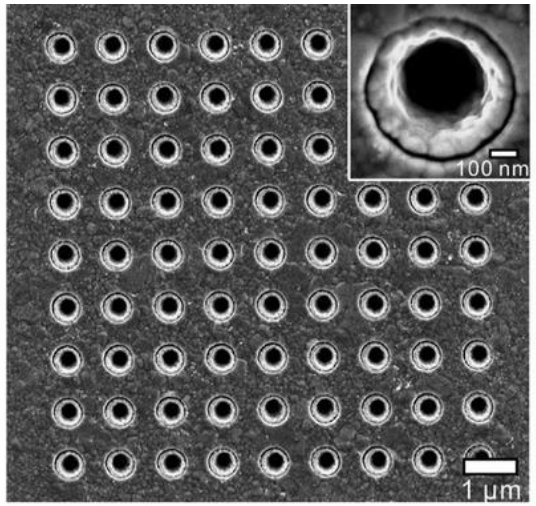
Metal island film



EBL substrate

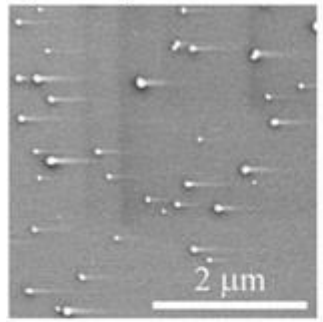


Plasmonic nanoholes

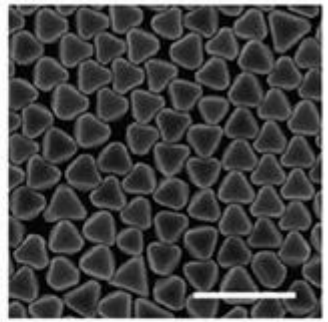


SELF-ASSEMBLED

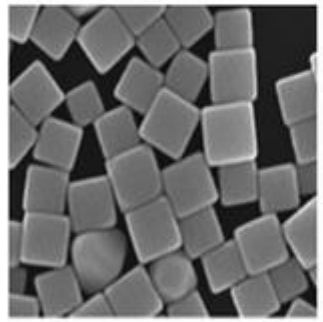
a) Nanoparticles



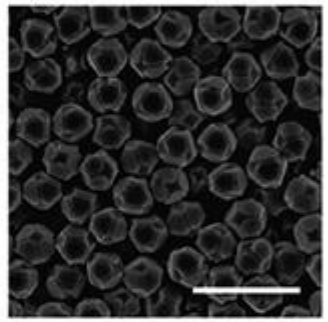
d) Octahedra



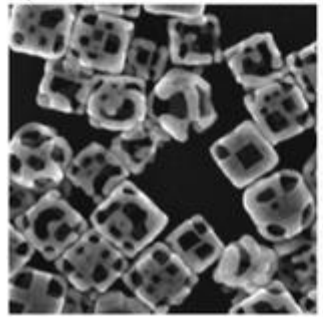
b) Nanocubes



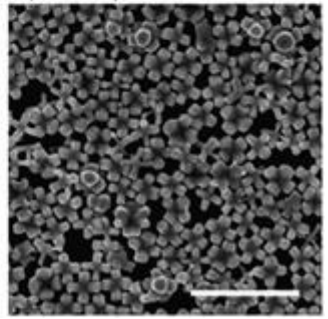
e) Etched Octahedra



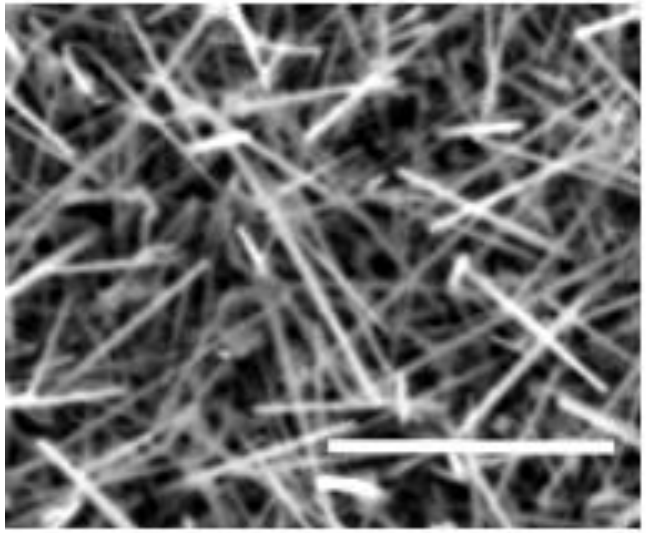
c) Etched Nanocubes

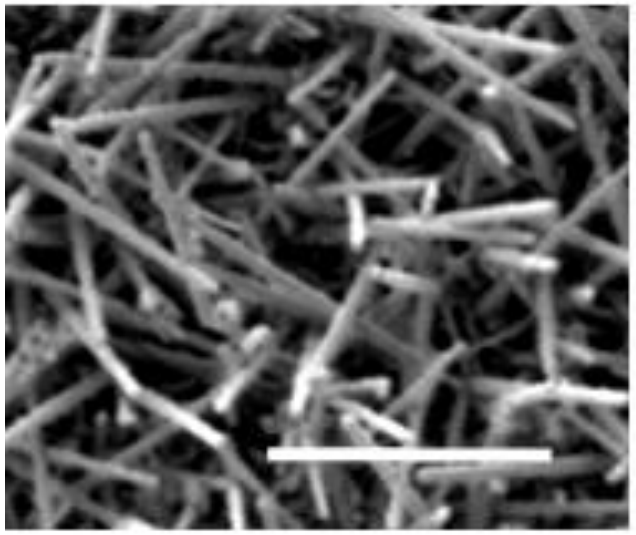


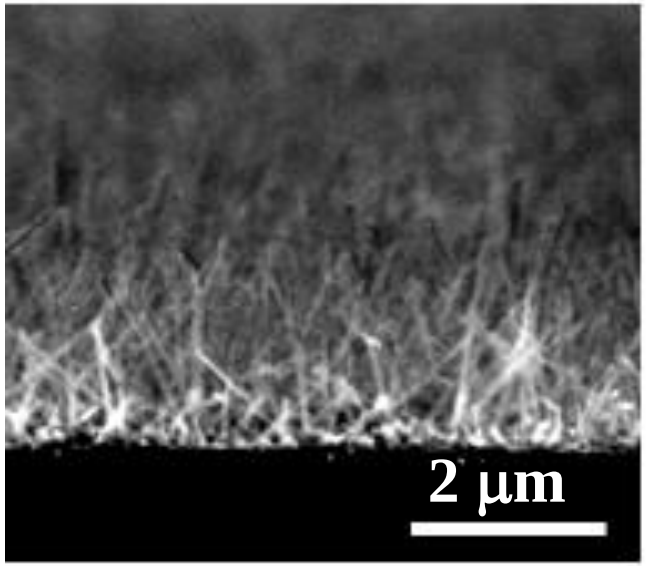
f) Octapods

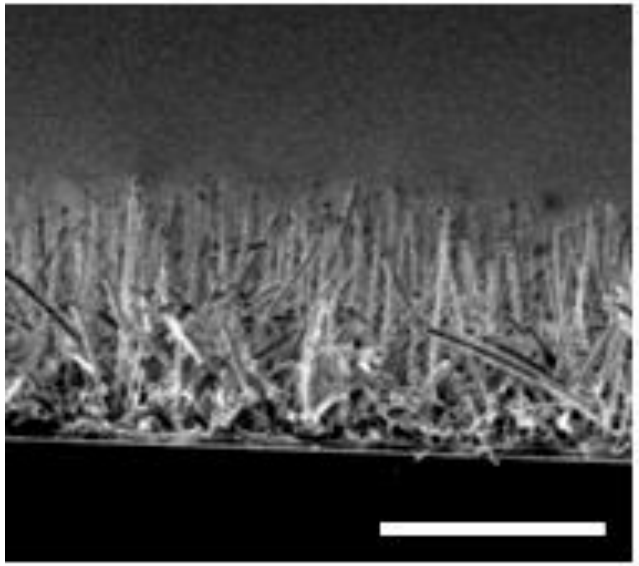


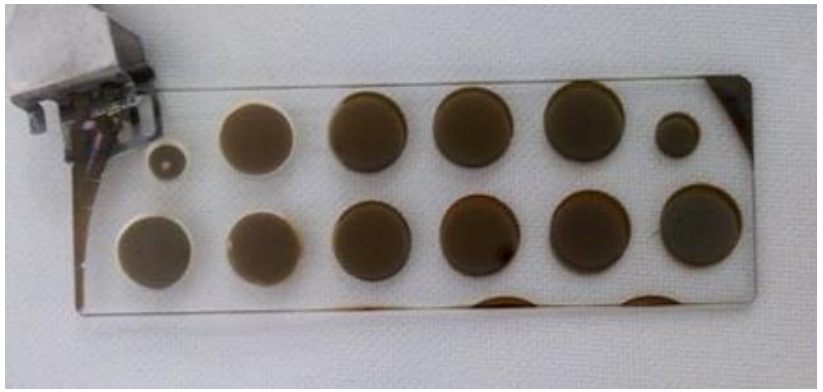
BENEFITS FROM DISORDER..











HIGH YIELD

LARGE AREA

SCALABLE

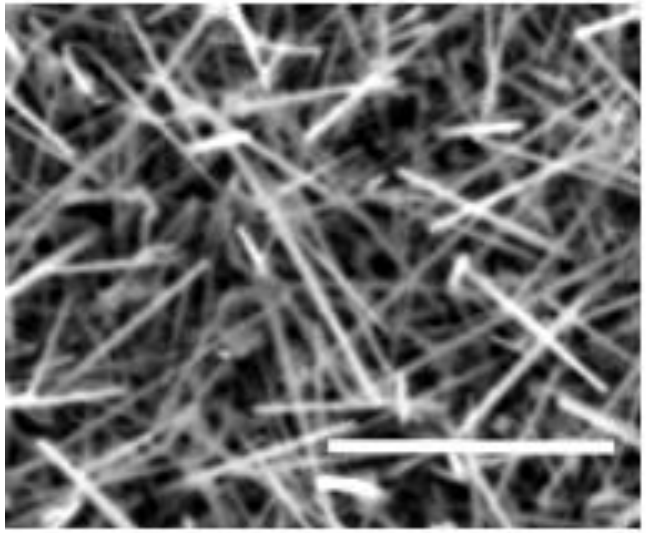
LOW COST

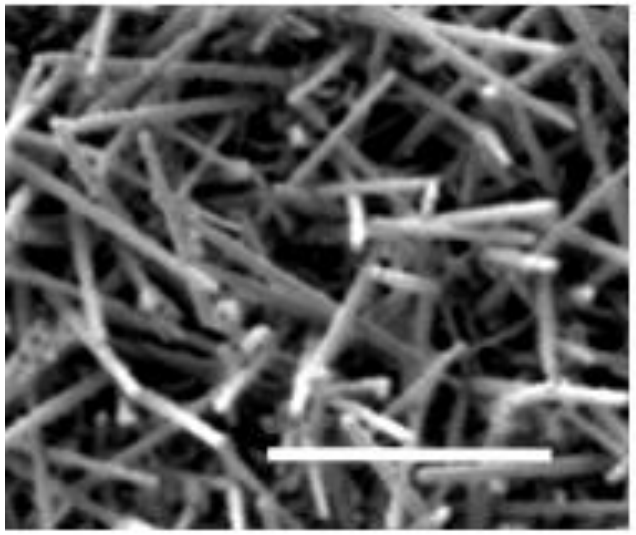
COMPATIBLE WITH INDUSTRIAL INTEGRATED Si BASED TECHNOLOGY

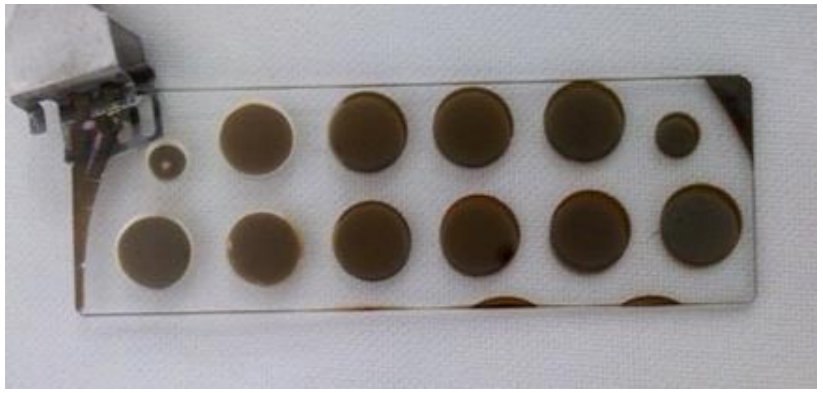
RELATIVE LOW TEMPERATURE

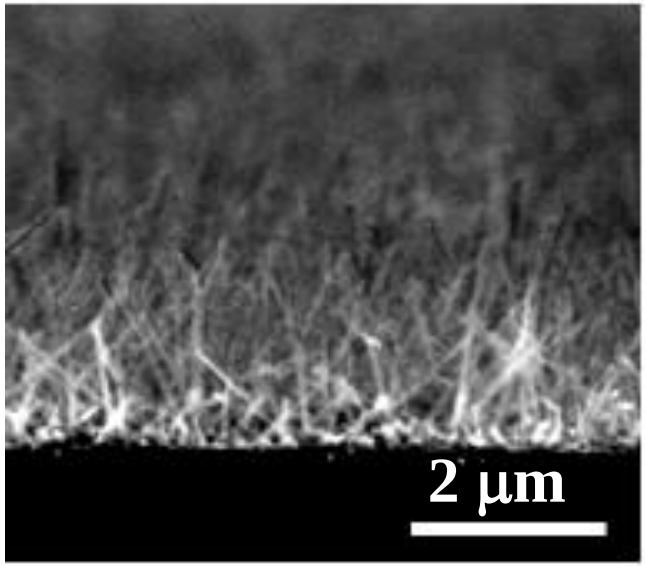
COMPATIBLE WITH COMMERCIAL READOUT DEVICES

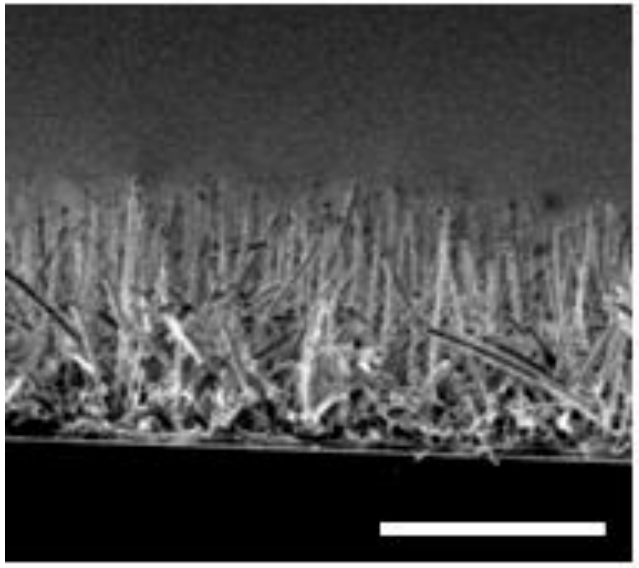
BENEFITS FROM DISORDER..

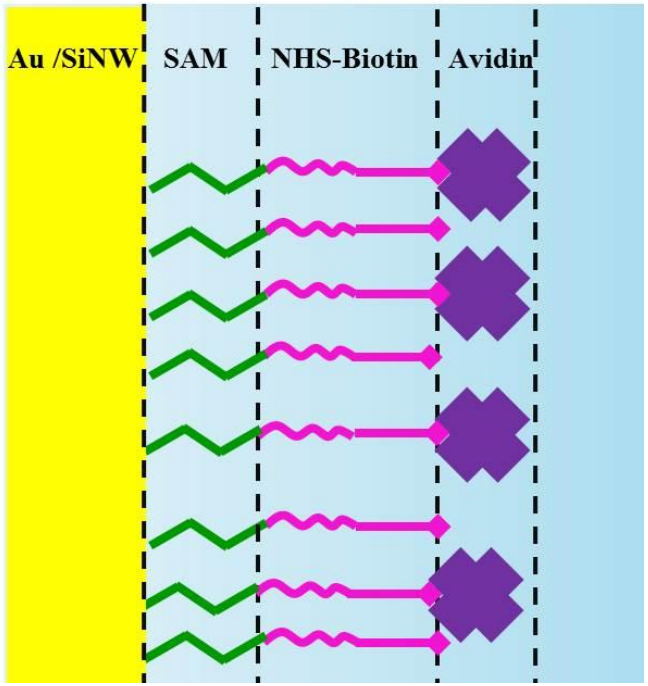






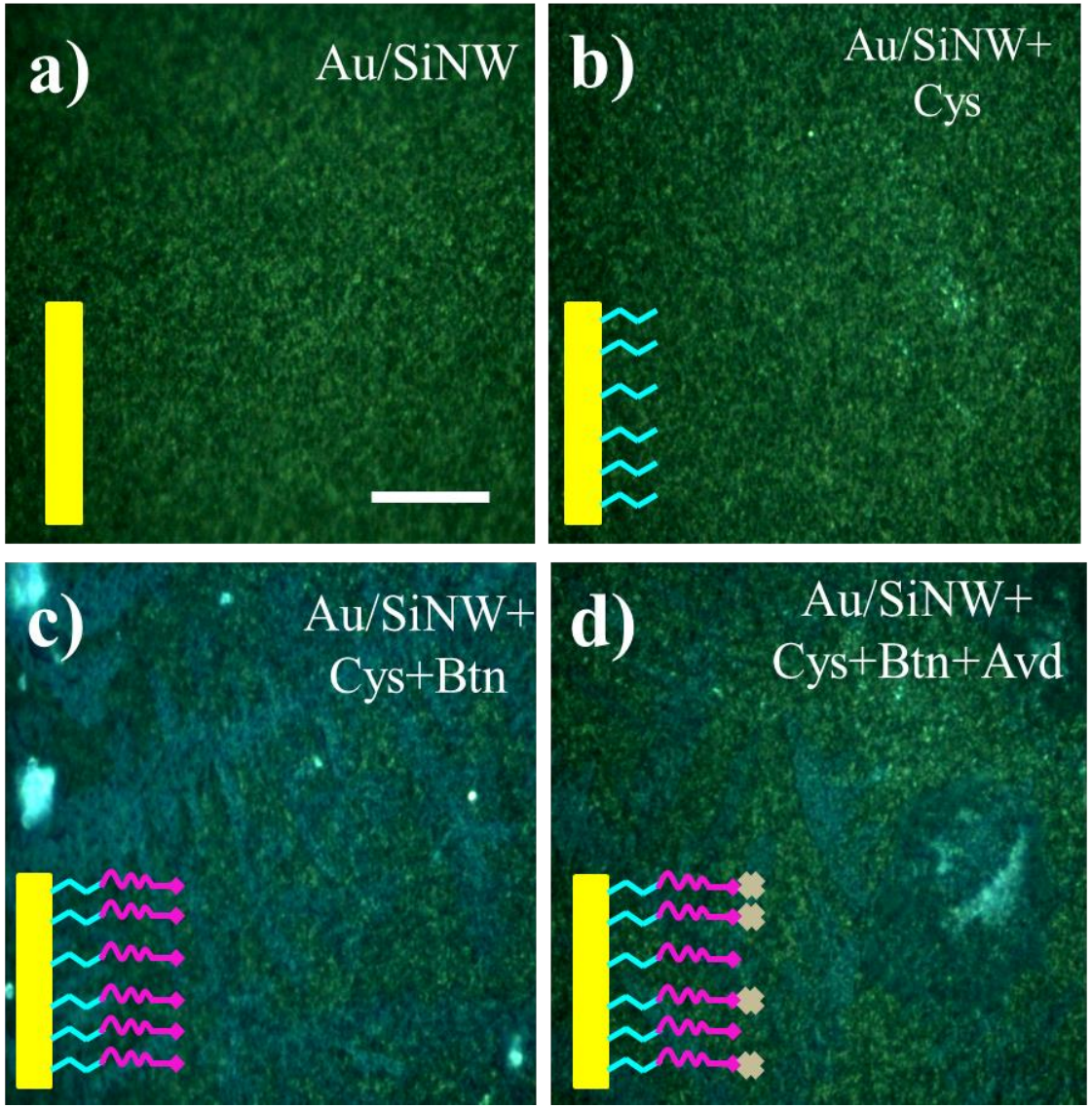


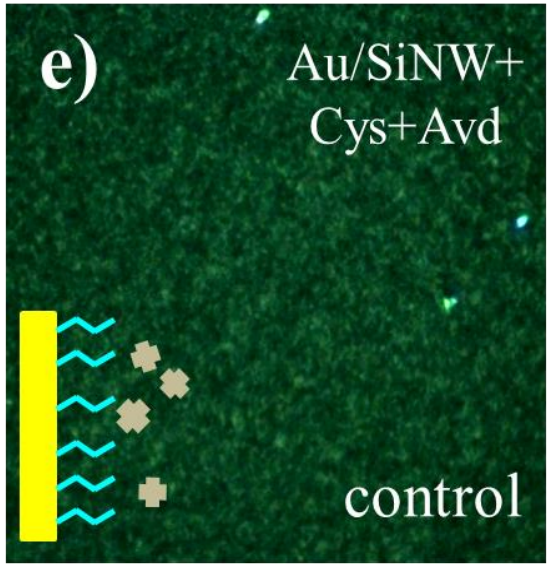




OPTICAL IMAGING

ThermoFisher
SCIENTIFIC





RAMAN «STEPPING»

ThermoFisher SCIENTIFIC

λ_{exc} = 532 nm

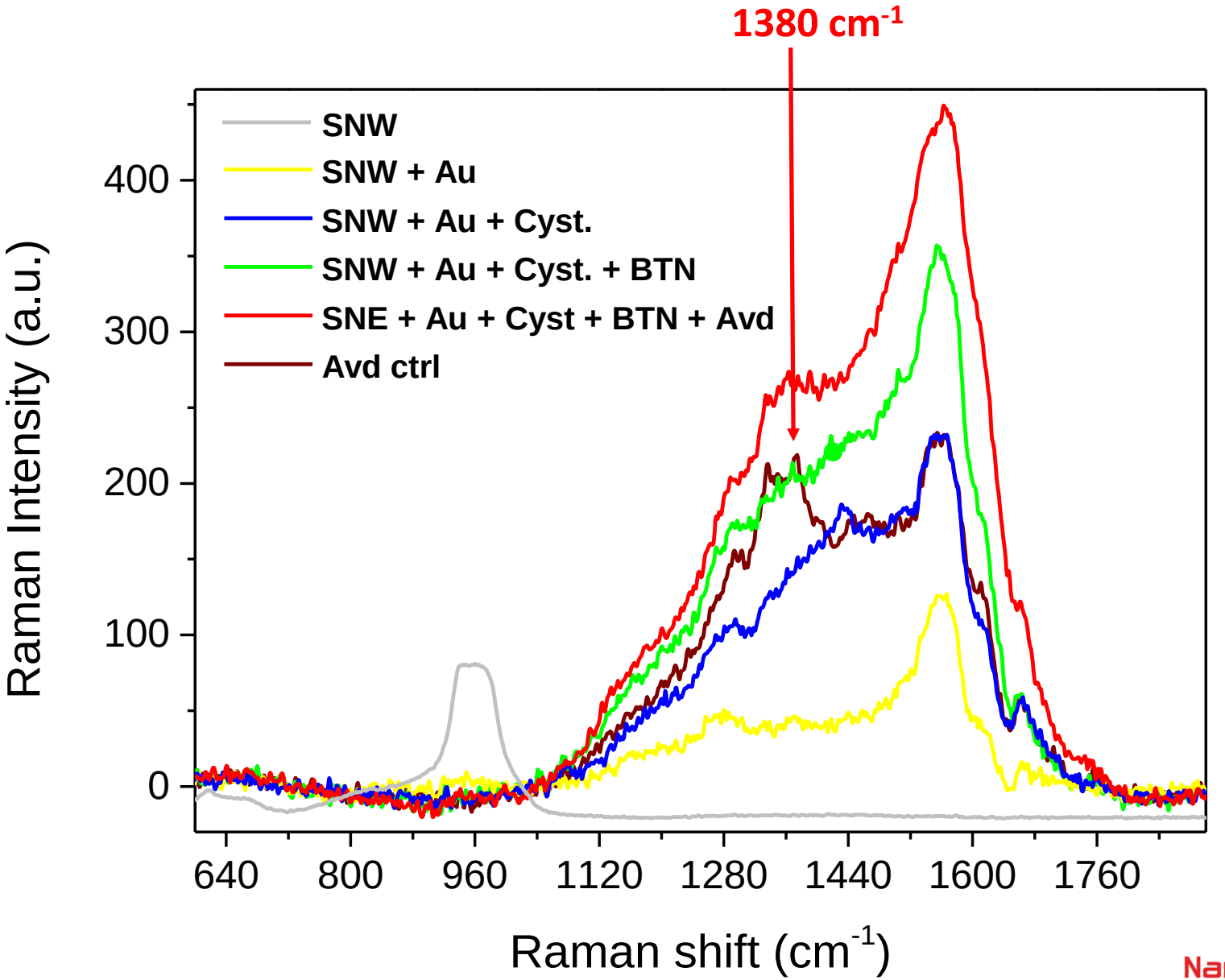
P = 5 mW

Obj = 50X

Acquisition time = 1s

Accumulation = 200

Laser spot ≈ 800 nm



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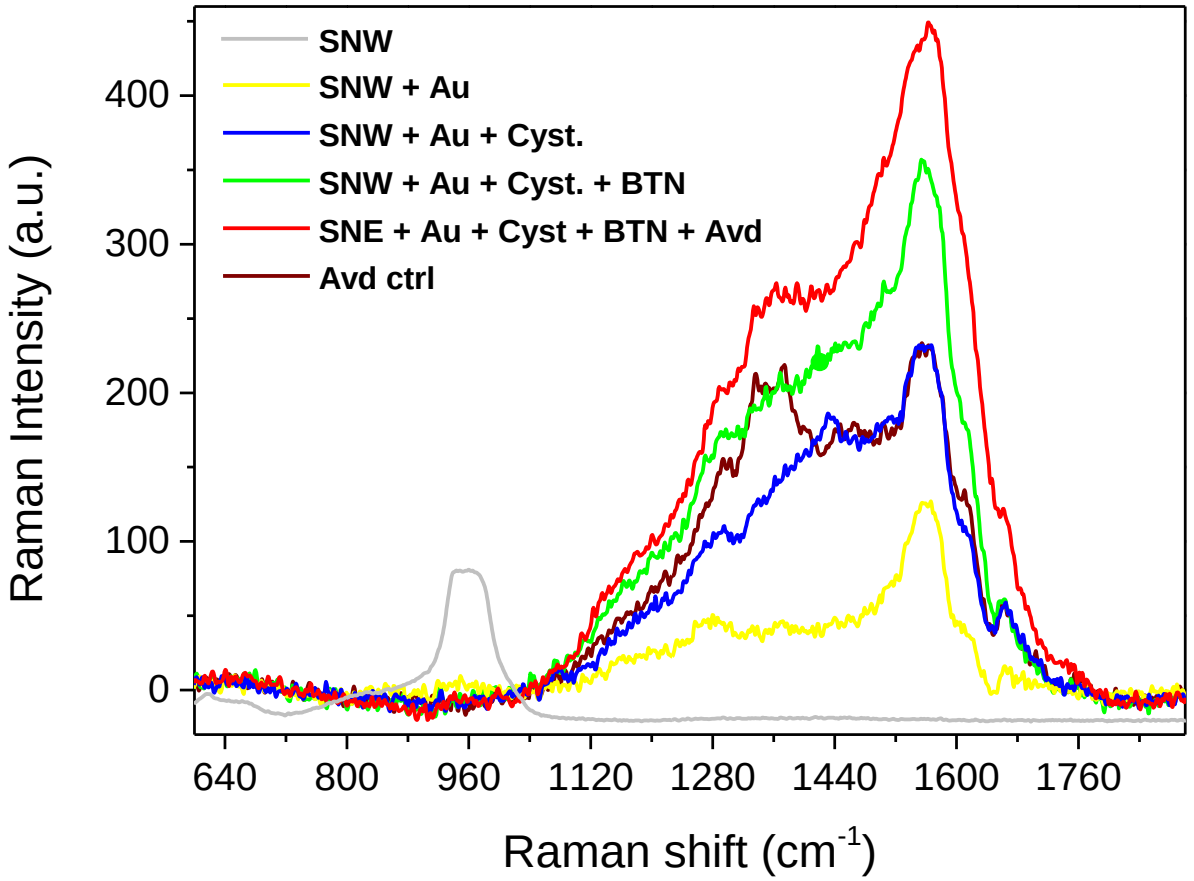
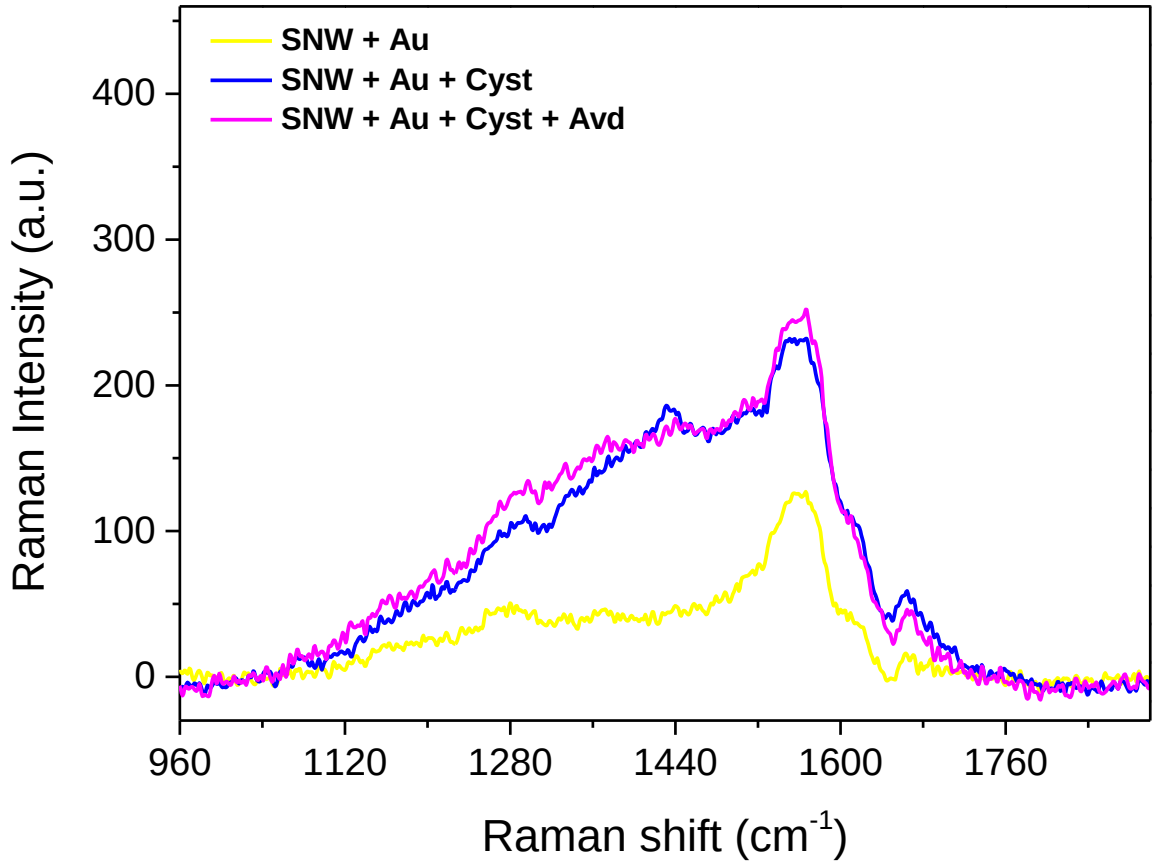
SPECIFICITY





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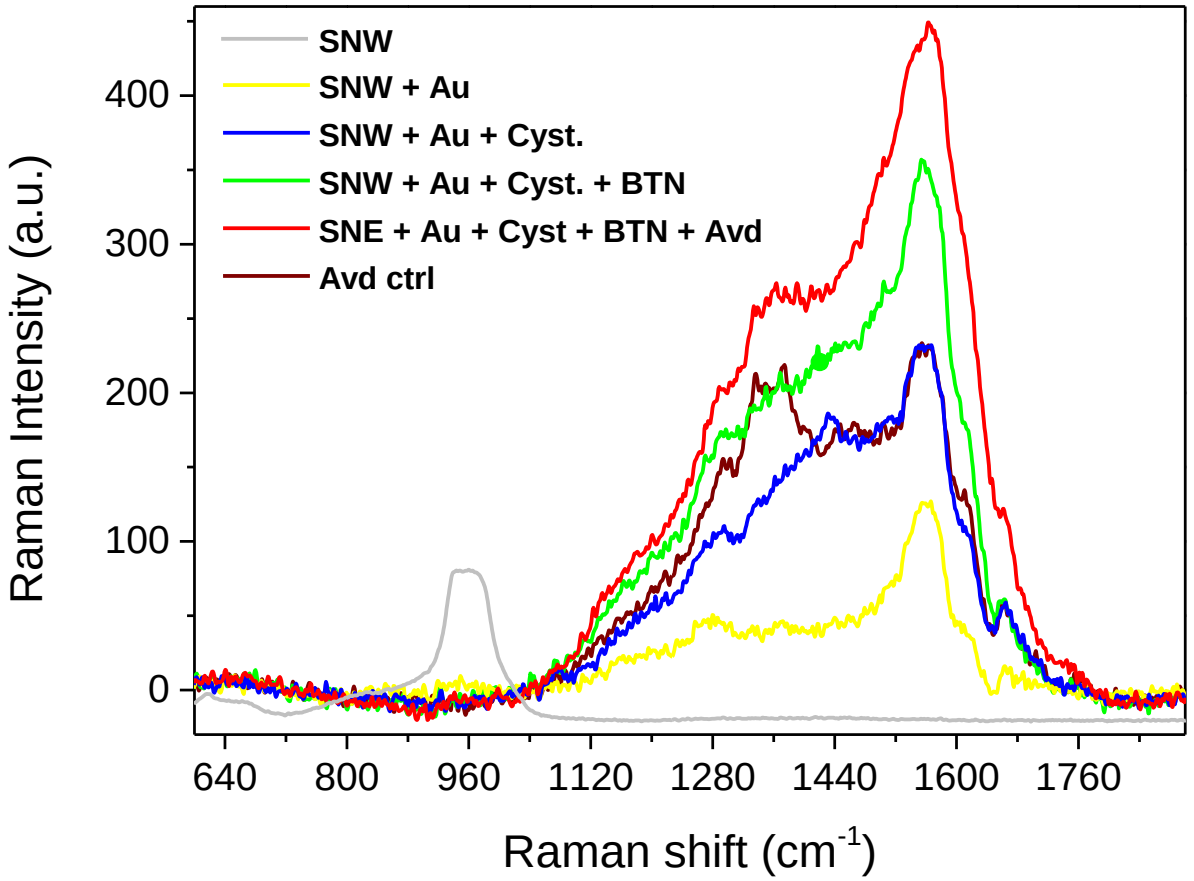
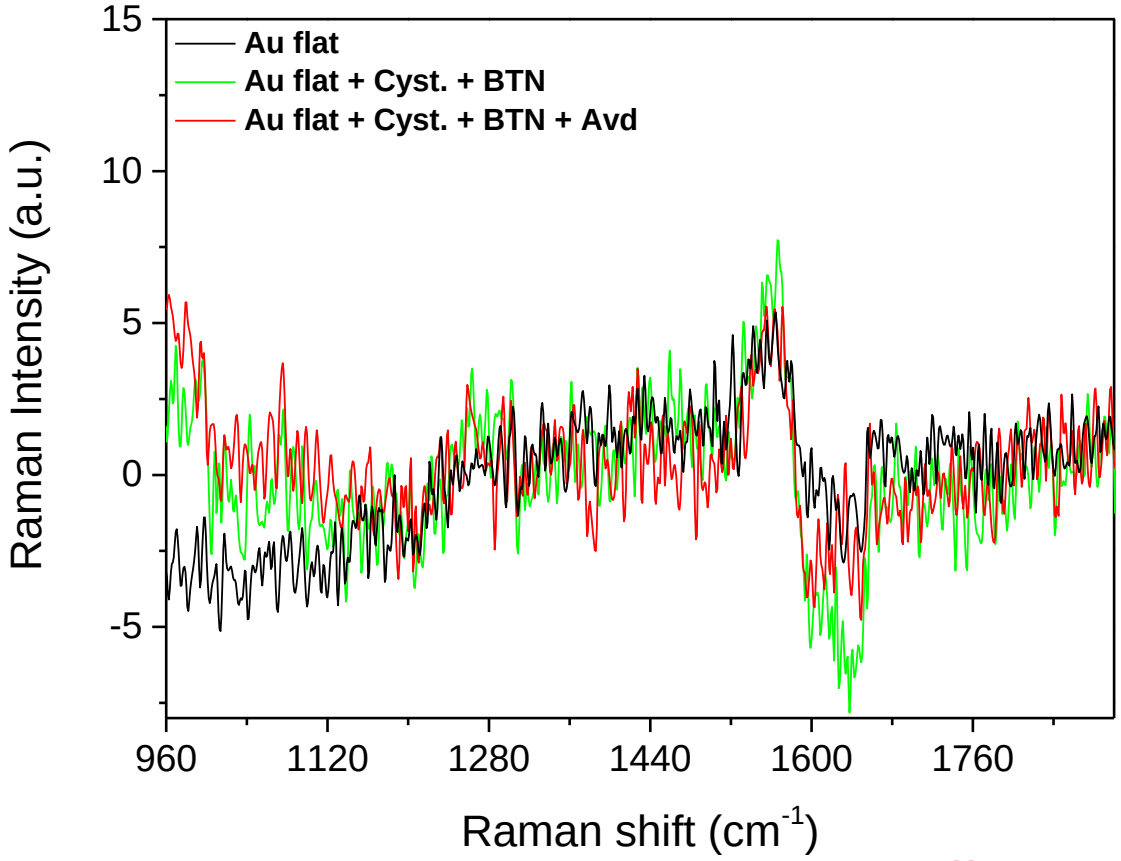
THE ROLE OF THE SUBSTRATE: SIGNAL ENHANCEMENT DUE TO NANOSTRUCTURING





The Raman signal enhancement is due to the Au film nanostructuring induced by the SiNWs

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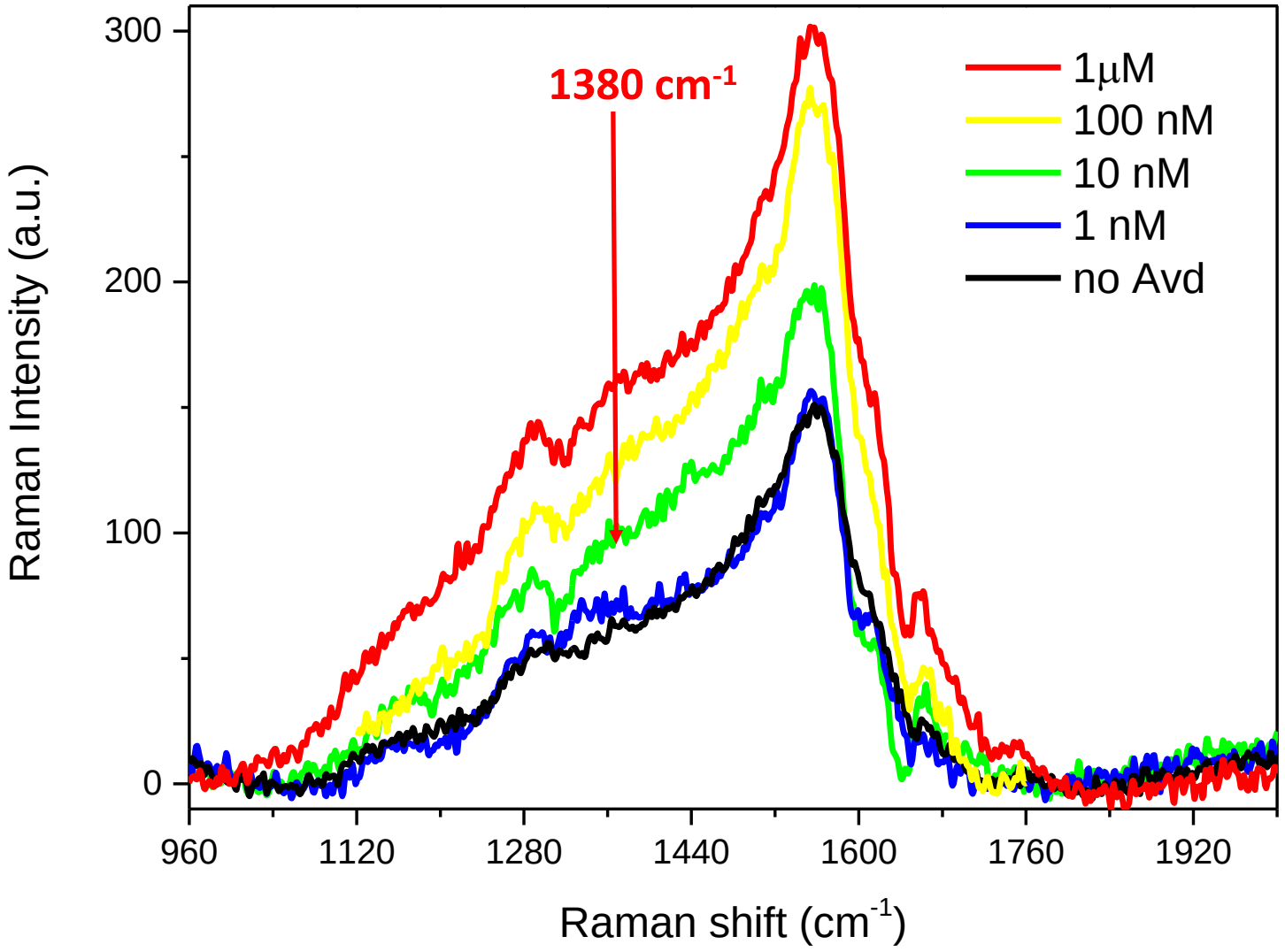
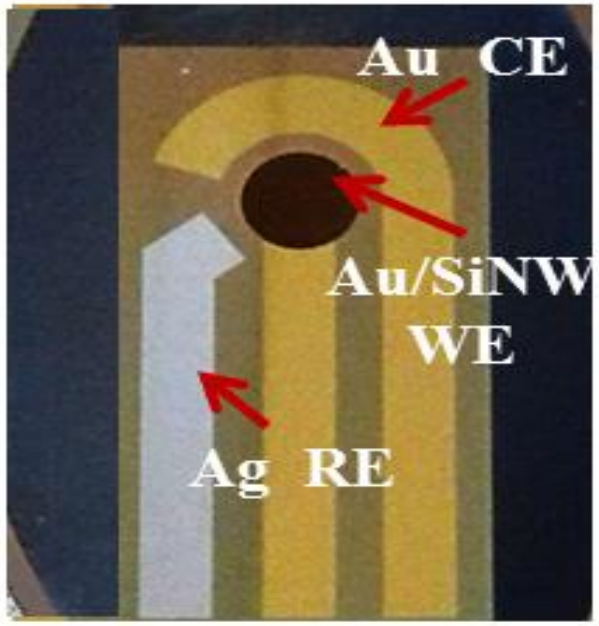
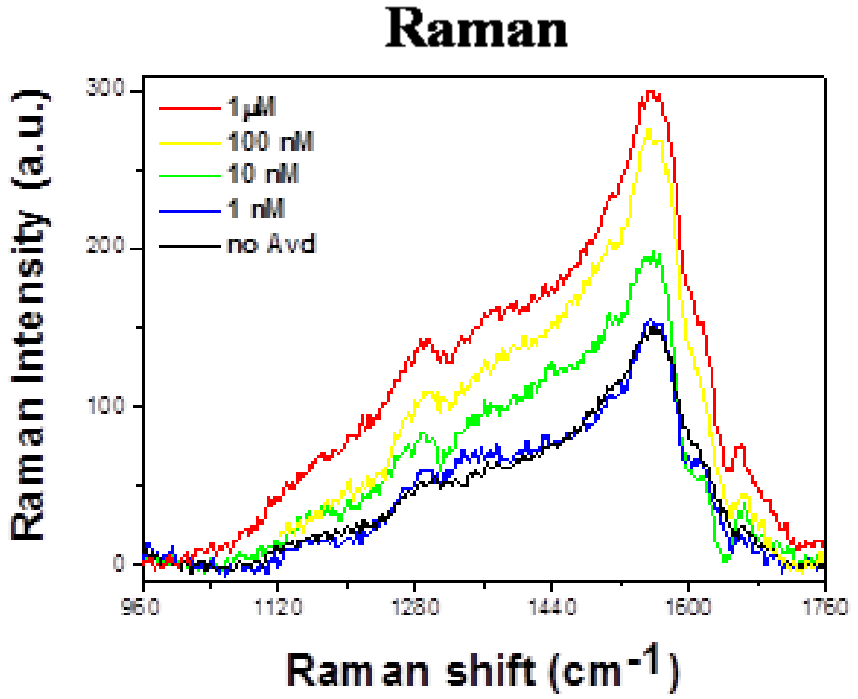
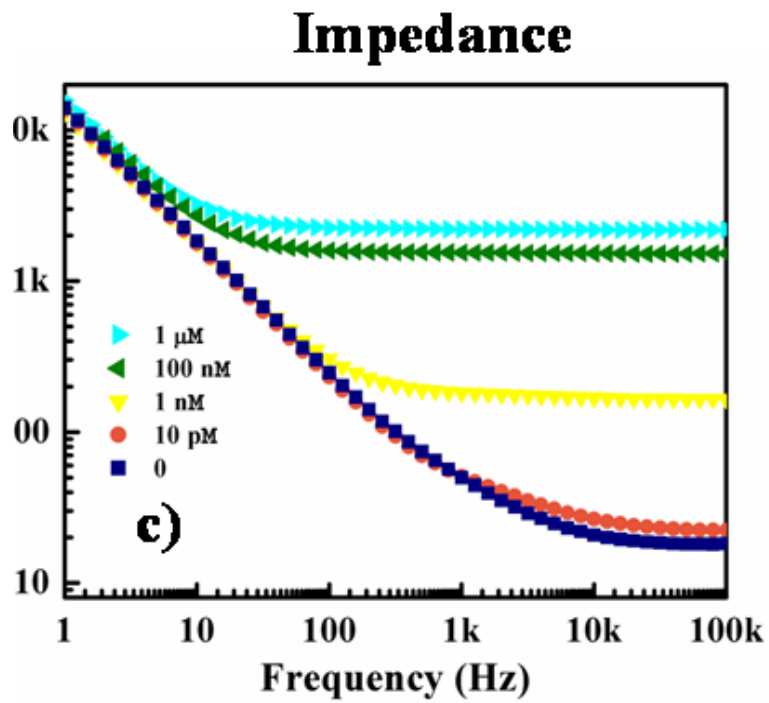
SENSITIVITY









A. Convertino, V. Mussi & L. Maiolo,

"*Disordered array of Au covered Silicon nanowires for SERS biosensing combined with electrochemical detection*"

Scientific Reports 6:25099 (2016)

V. Mussi, A. Convertino, L. Maiolo, M. Rocchia

"*Efficient and Versatile SERS Biosensing with Disordered Array of Au Covered Silicon Nanowires* "

Thermo Fisher Application Notes (to be published)

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Valentina Mussi

Annalisa Convertino, Luca Maiolo

Massimiliano Rocchia

FOR NOW....

Sensitivity and **specificity** are statistical measures of the performance of a binary classification test, also known in statistics as classification function:

Sensitivity (also called the **true positive rate**, the **recall**, or **probability of detection**[1] in some fields) measures the proportion of positives that are correctly identified as such (e.g., the percentage of sick people who are correctly identified as having the condition).

Specificity (also called the **true negative rate**) measures the proportion of negatives that are correctly identified as such (e.g., the percentage of healthy people who are correctly identified as not having the condition).