Progetto STBIC

CULT.5 Materiali Nano-Strutturati per la Diagnostica di manufatti di interesse Storico-Artistico

Dott. Vincenzo Renda

Presentazione di fine anno

Tutor : Dott. Sebastiano Trusso
Responsabile scientifico: Dott. Rosina Celeste Ponterio

Lista delle attività sviluppate nell'arco dell'anno:

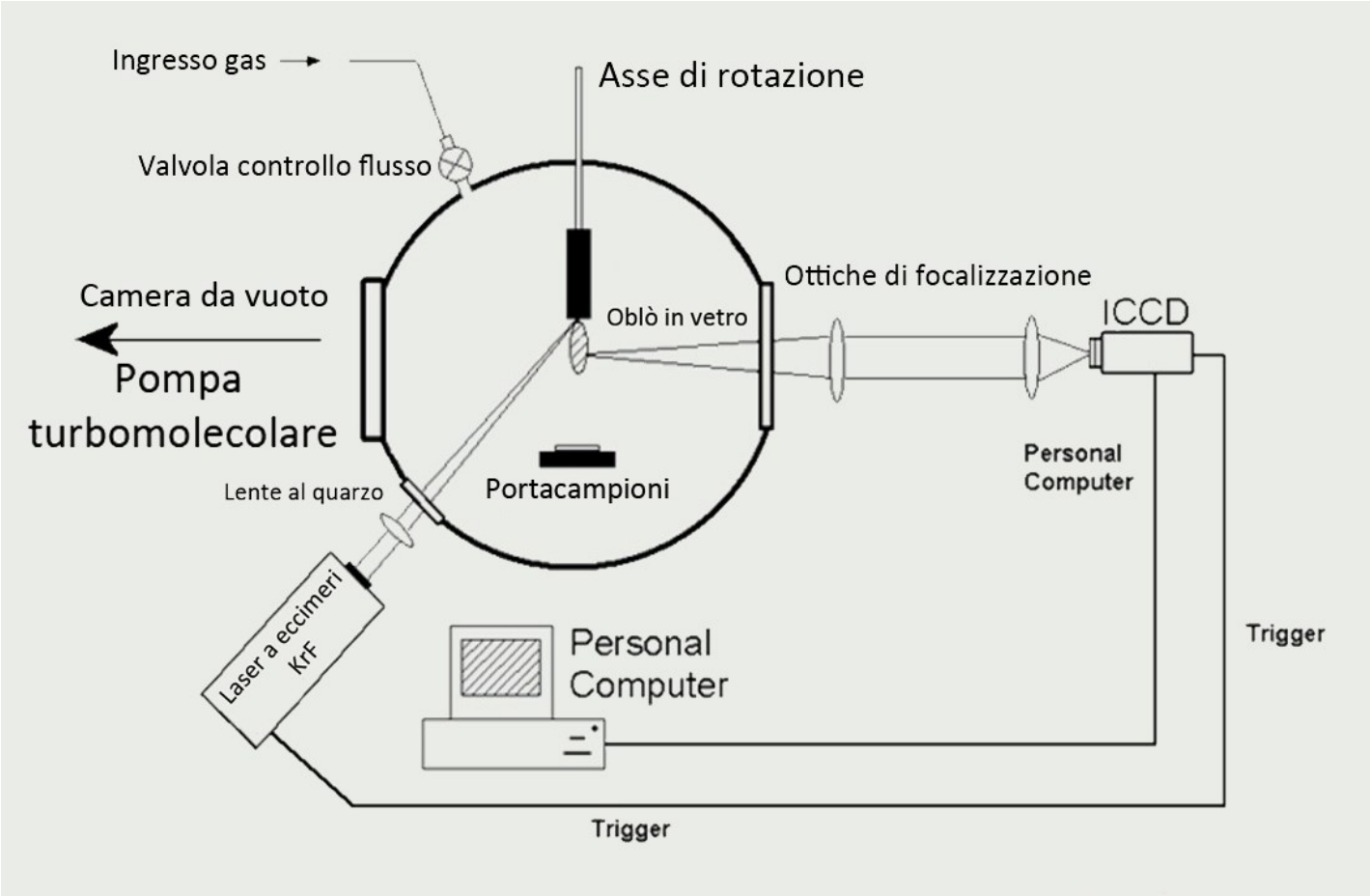
1) Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

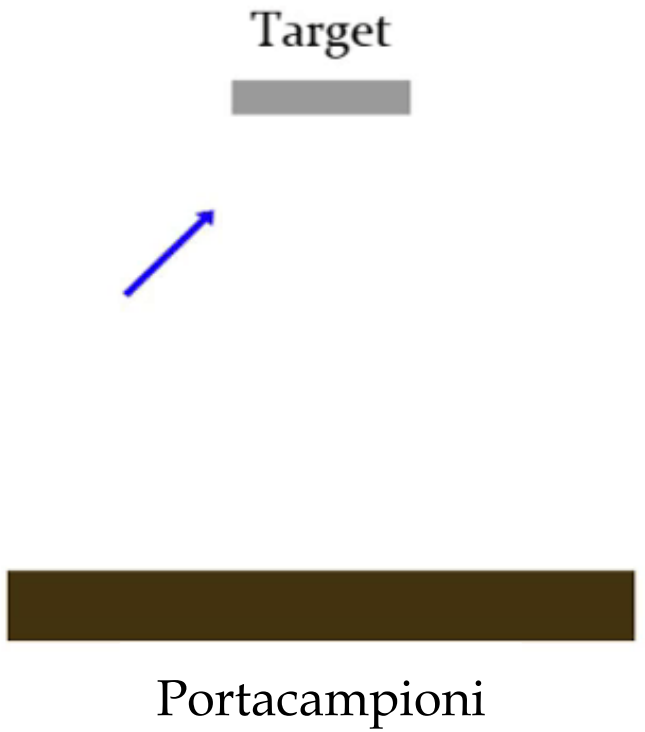
2) Profilometria laser

ATTIVITÀ 1

Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

Deposizione con laser pulsato (PLD)



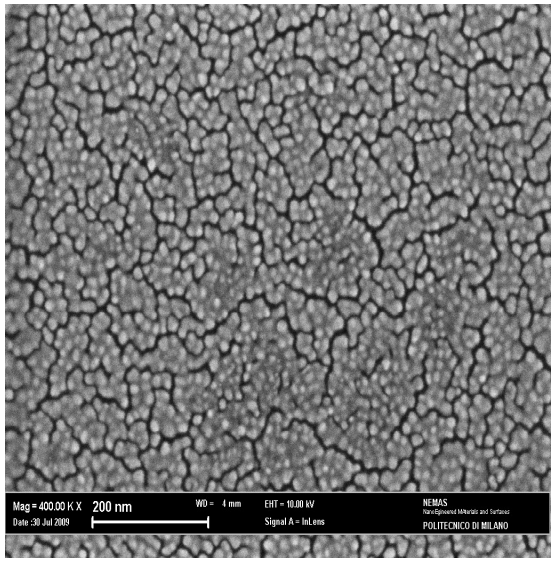


Modello a propagazione mista

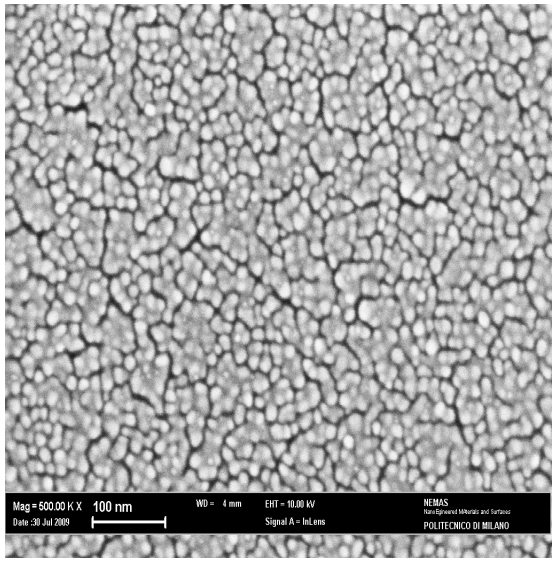
Effetto della pressione del gas inerte

Film AgNP

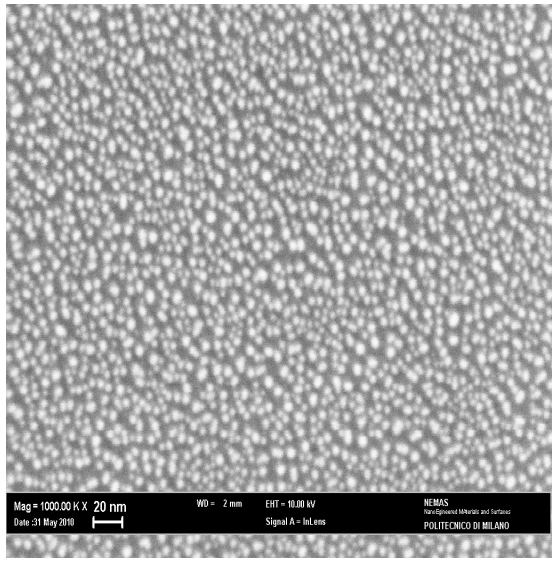
40 Pa



70 Pa



100 Pa



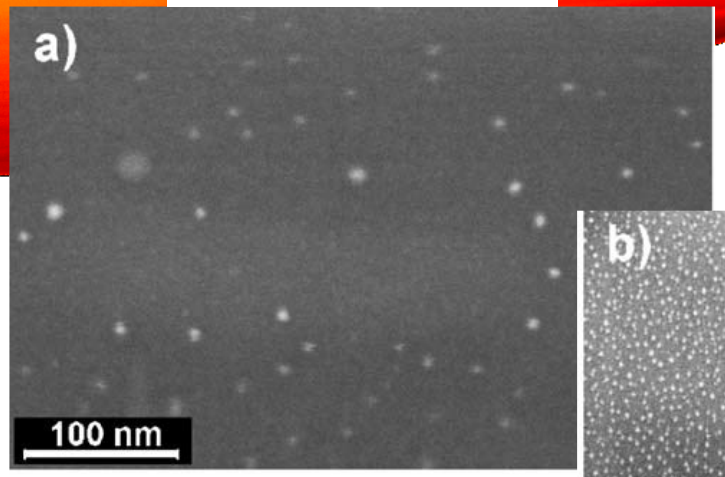
Le nanoparticelle tendono a formare aggregati aventi diversa morfologia

Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

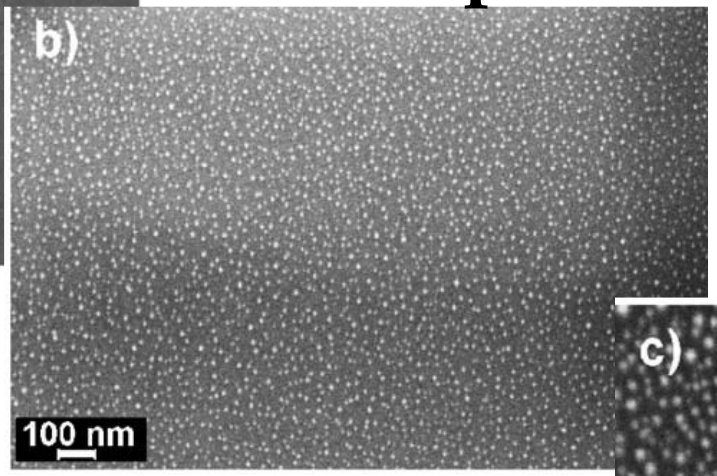
Effetto del numero di colpi

Film AgNP

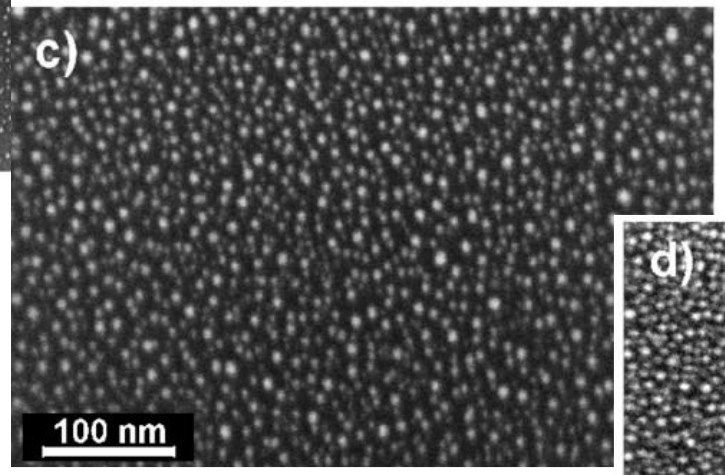
500 colpi



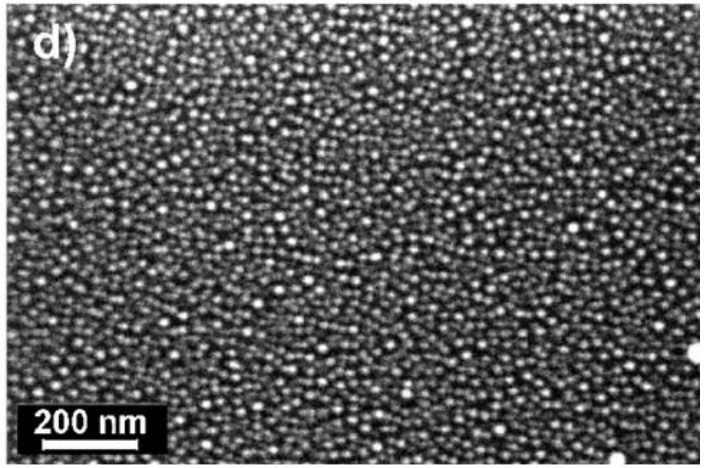
1000 colpi



5000 colpi



10000 colpi

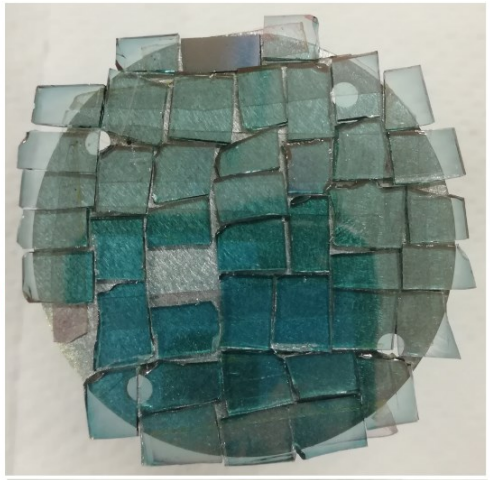


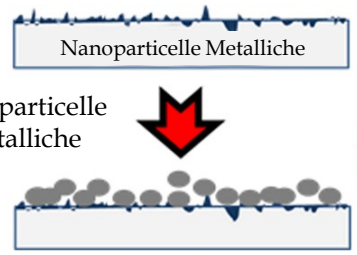
DN Densità Numerica

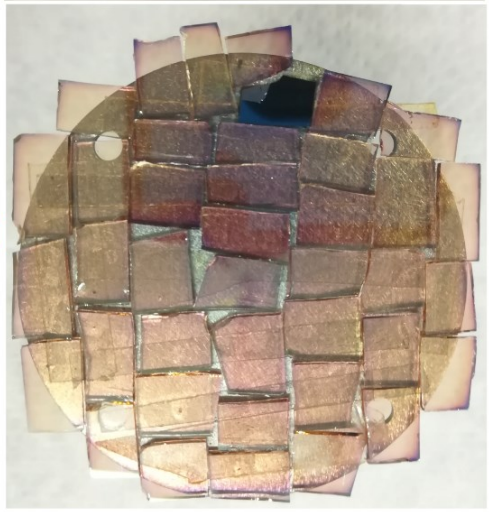
Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

Caratterizzazione UV-Vis

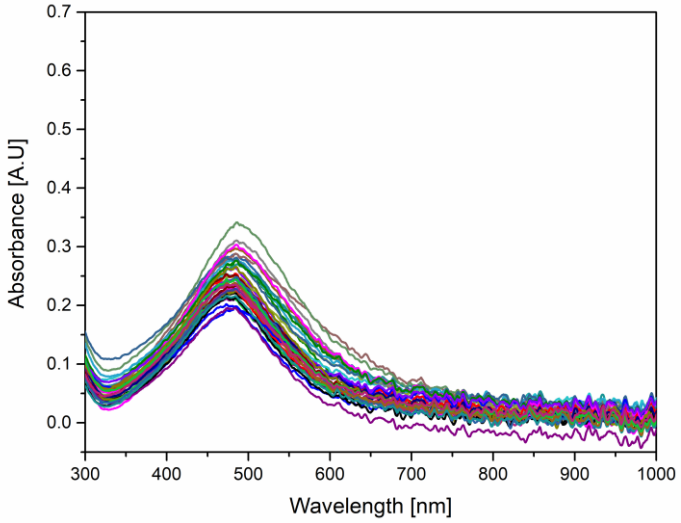
AgNP





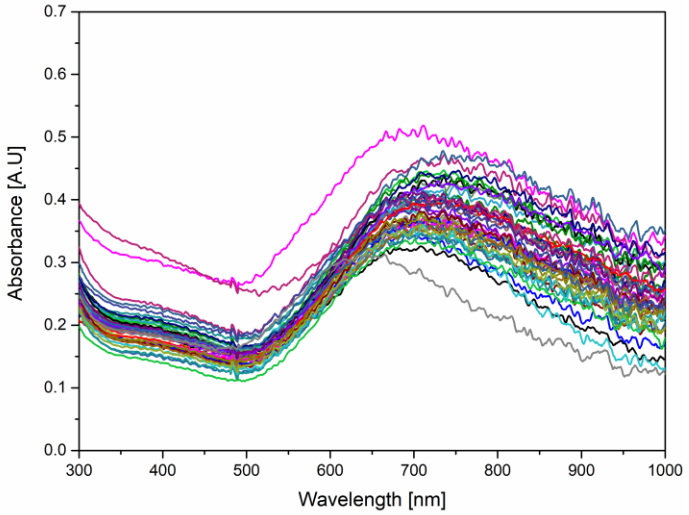


AuNP



Risonanza Plasmonica AgNP

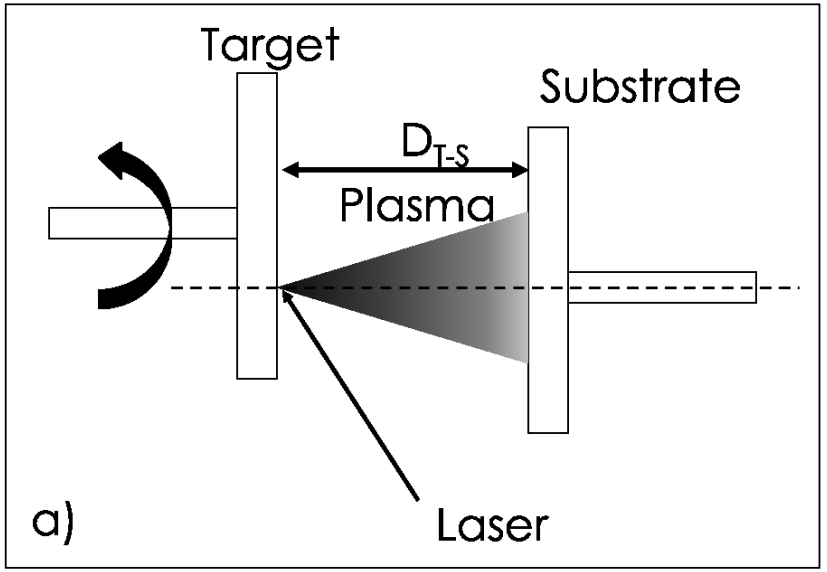
Risonanza Plasmonica AuNP

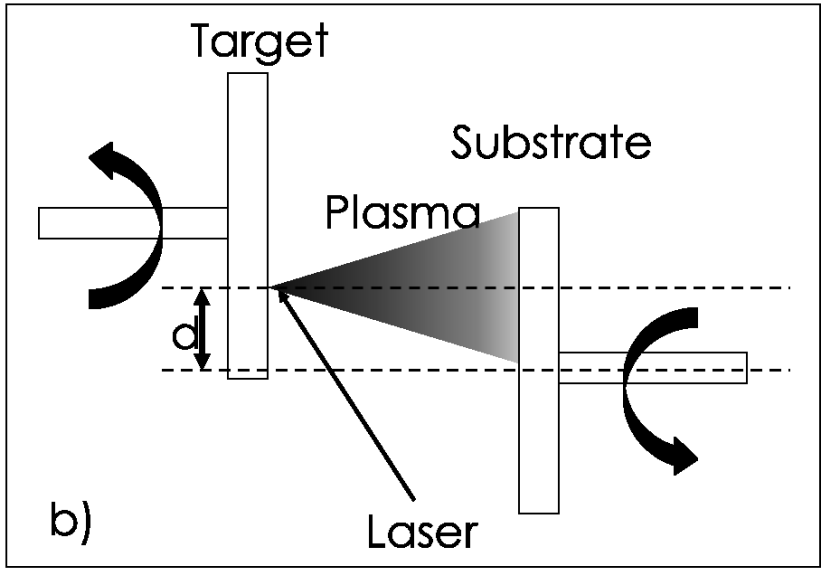


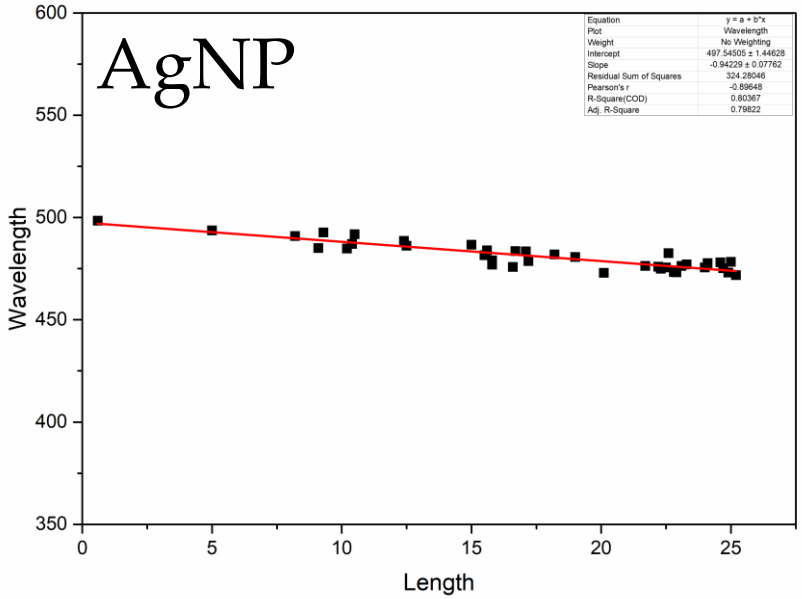
Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

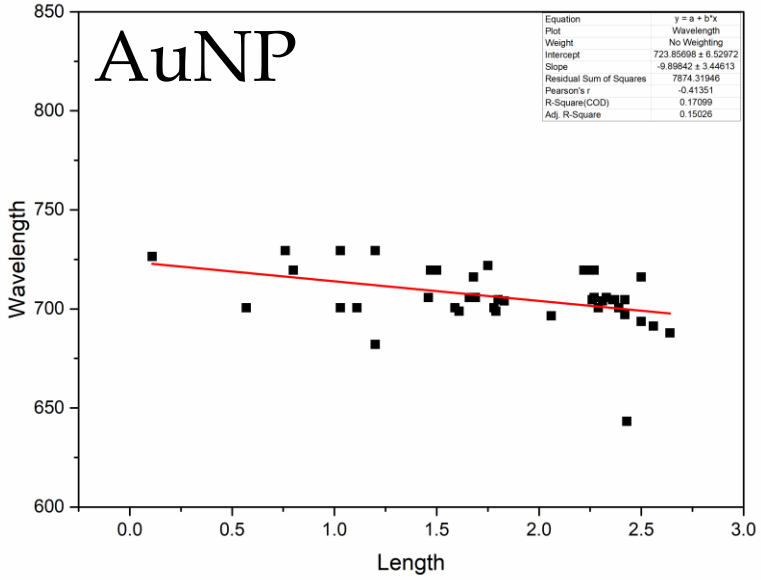
Schema strumentale

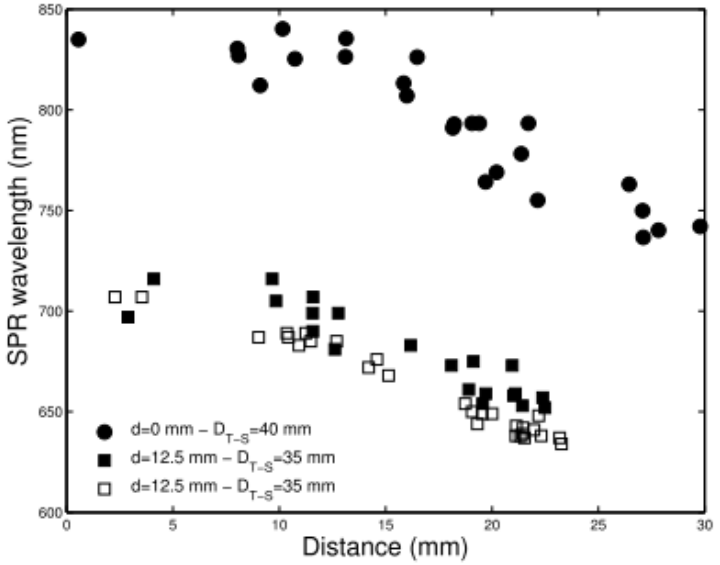
Effetto della rotazione











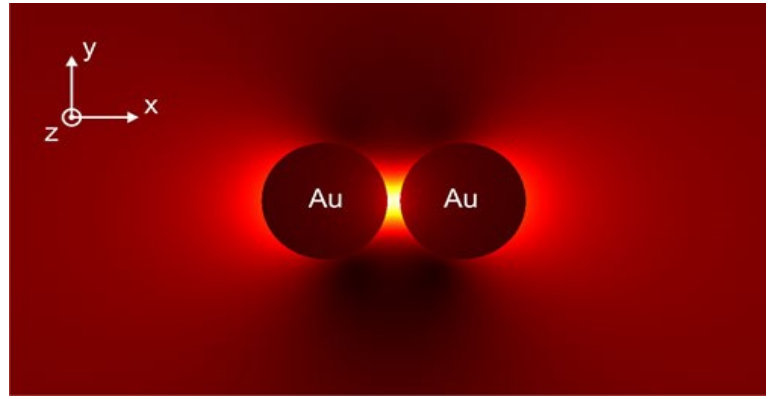
Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

Spettroscopia Raman amplificata da superfici

Principio fisica: ***amplificazione dei campi elettromagnetici generate dall'eccitazione dei plasmoni localizzati di superficie.***

- ✓Detezione strutturale ad **alta sensibilità**
- ✓**Basse concentrazioni di analita**

NP Metalliche → Amplificazione alla nanoscale, « *Nanoantenne* »

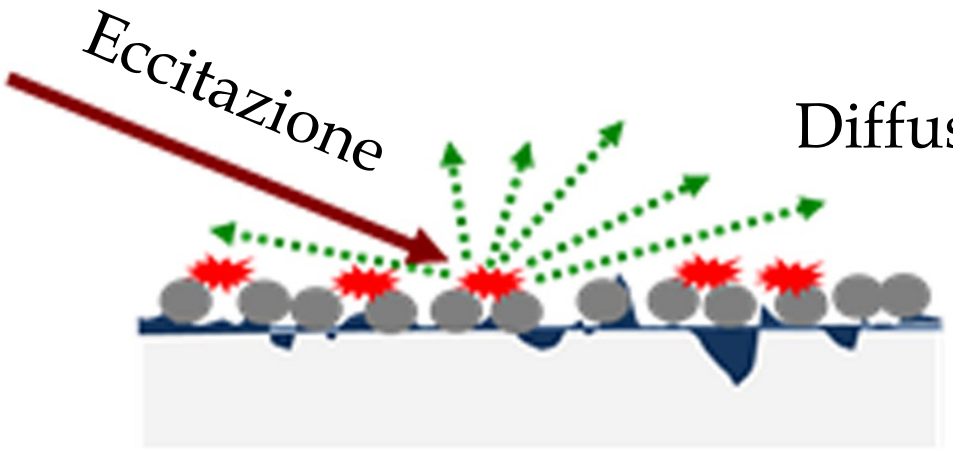


Punto "caldo"

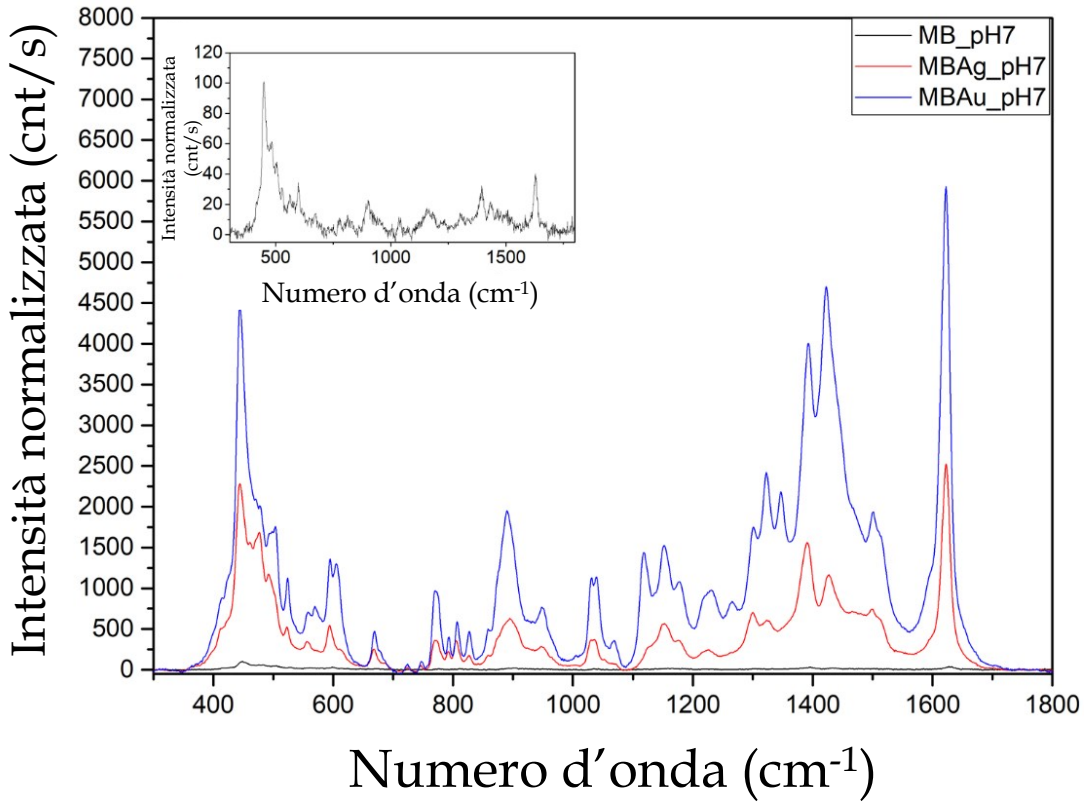
Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

SERS

Amplificazione dell'intensità della luce diffusa

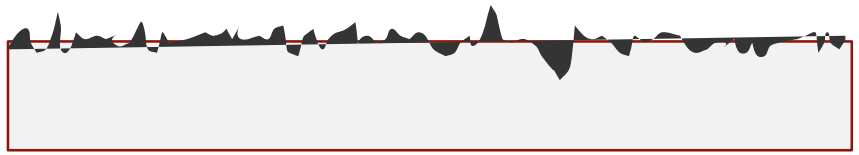


Diffusione Raman amplificata

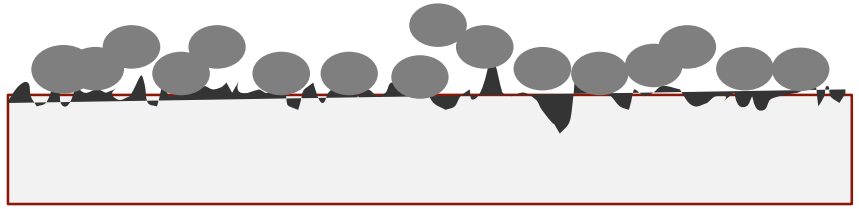


Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

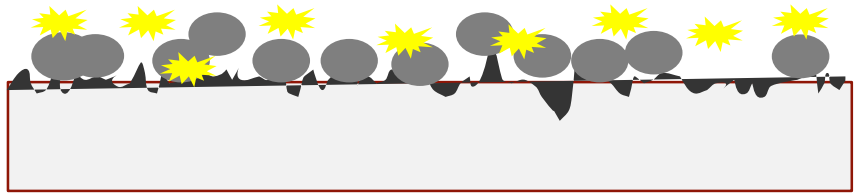
Substrati SERS-attivi



Film lucidante



Film lucidante + NP metalliche



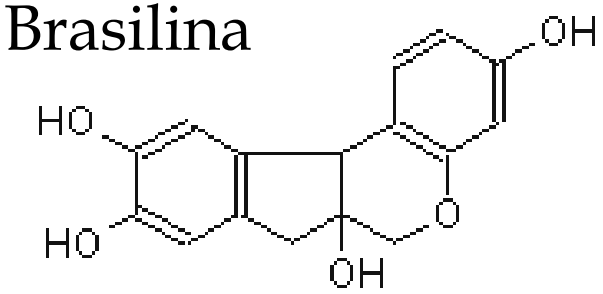
Film lucidante + NP metalliche + colorante

Metal Nanoparticles deposition by Pulsed Laser Deposition

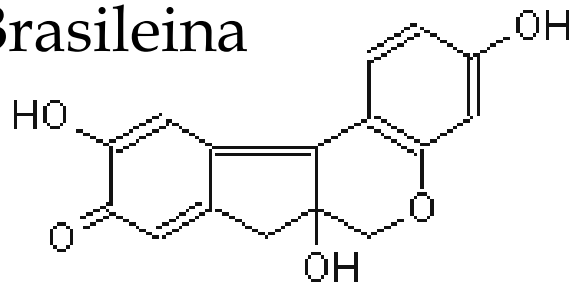
Substrati SERS-attivi

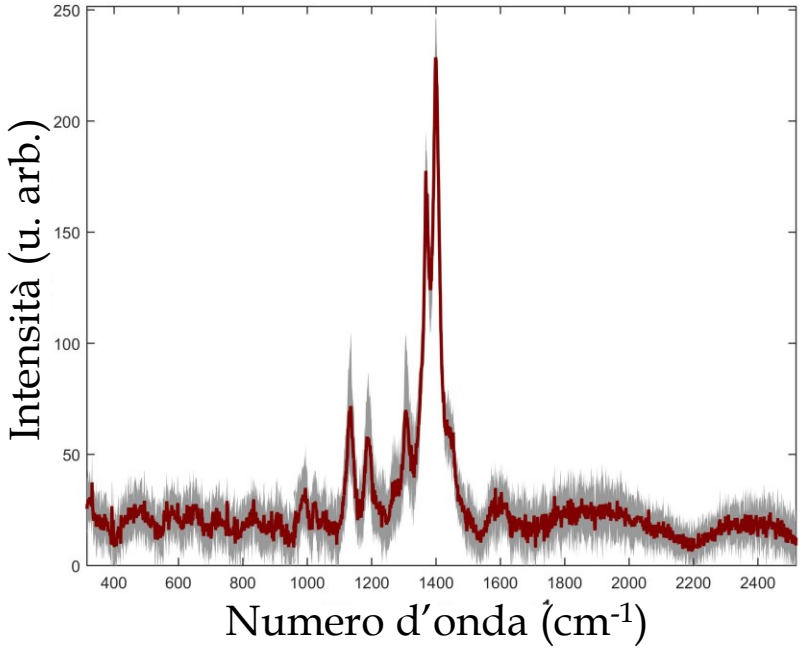
VERZINO

Brasilina



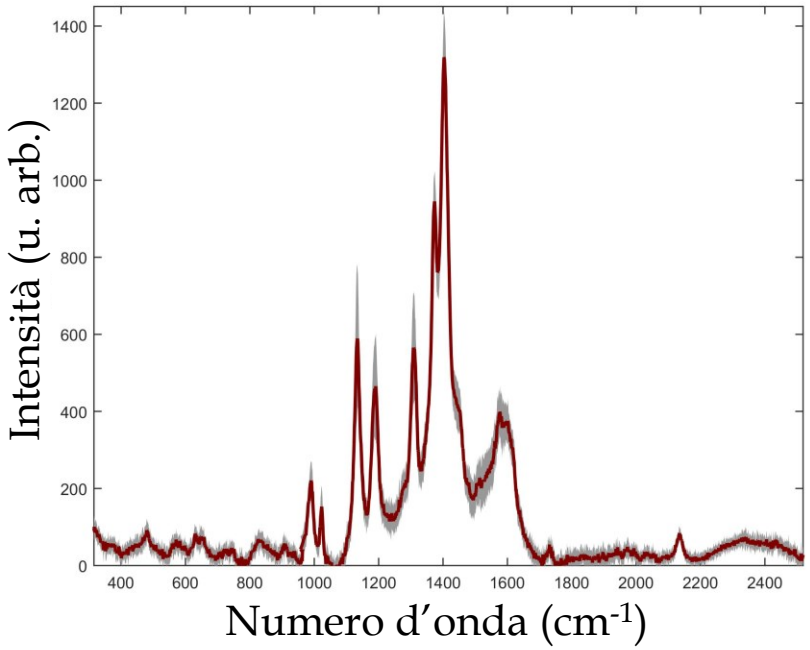
Brasileina





Ag NPs

(25k 70Pa 35mm 2.6 J/cm²)



Au NPs

(25k 100Pa 35mm 3 J/cm²)

Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

Effetto del pH nel SERS

Domande di ricerca:

1) Le performance dei substrati SERS-attivi vengono alterate dalle variazioni di pH?

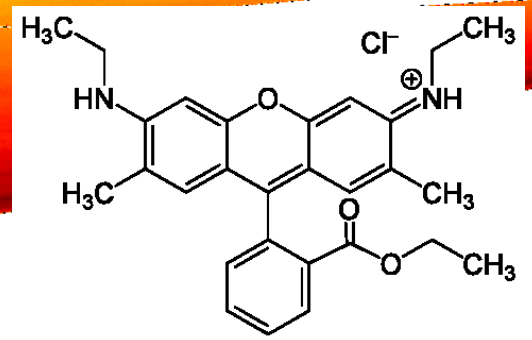
2) Il parametro pH ha influenza sul fenomeno SERS in generale?

Le NP di Ag and Au sono state depositate tramite tecnica PLD

I test sono stati effettuati sui coloranti Rodamina-6-G e Blu di Metilene

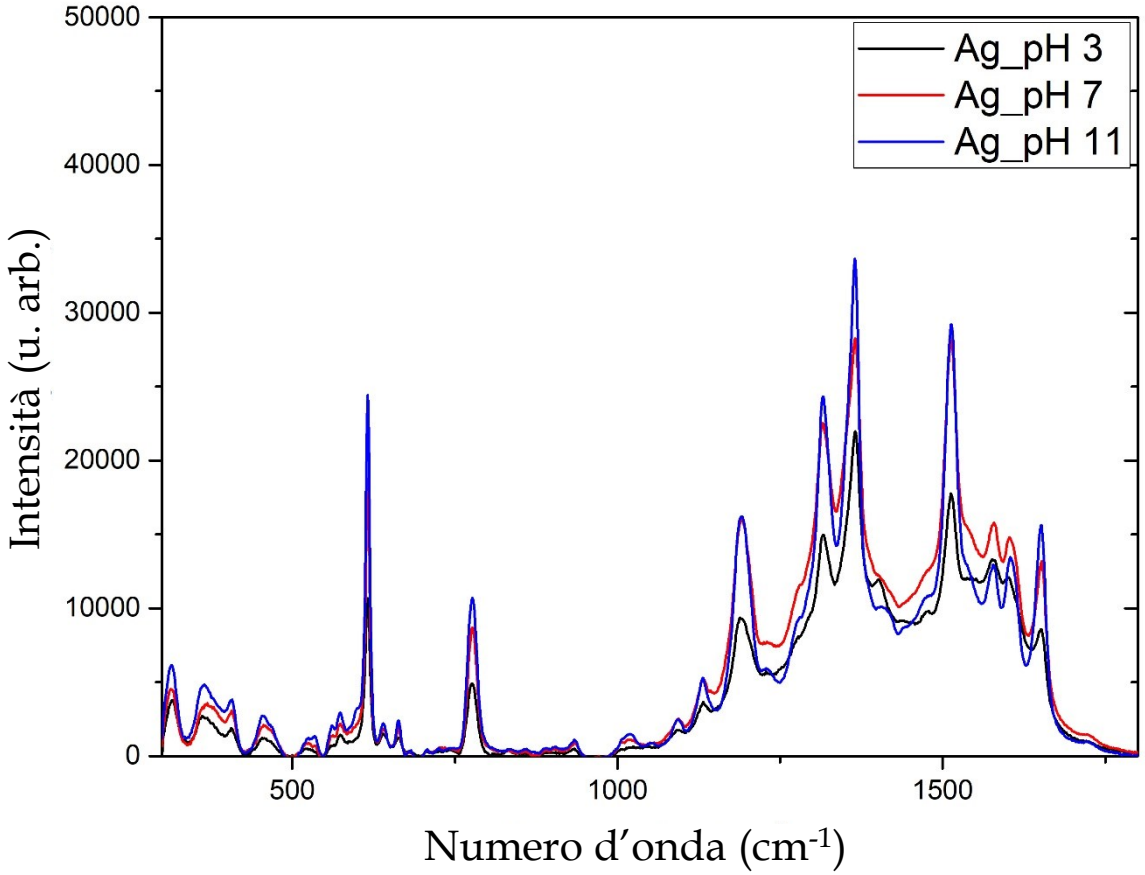
Come substrati per la deposizione sono stati usati sia dei vetrini che i film lucidanti

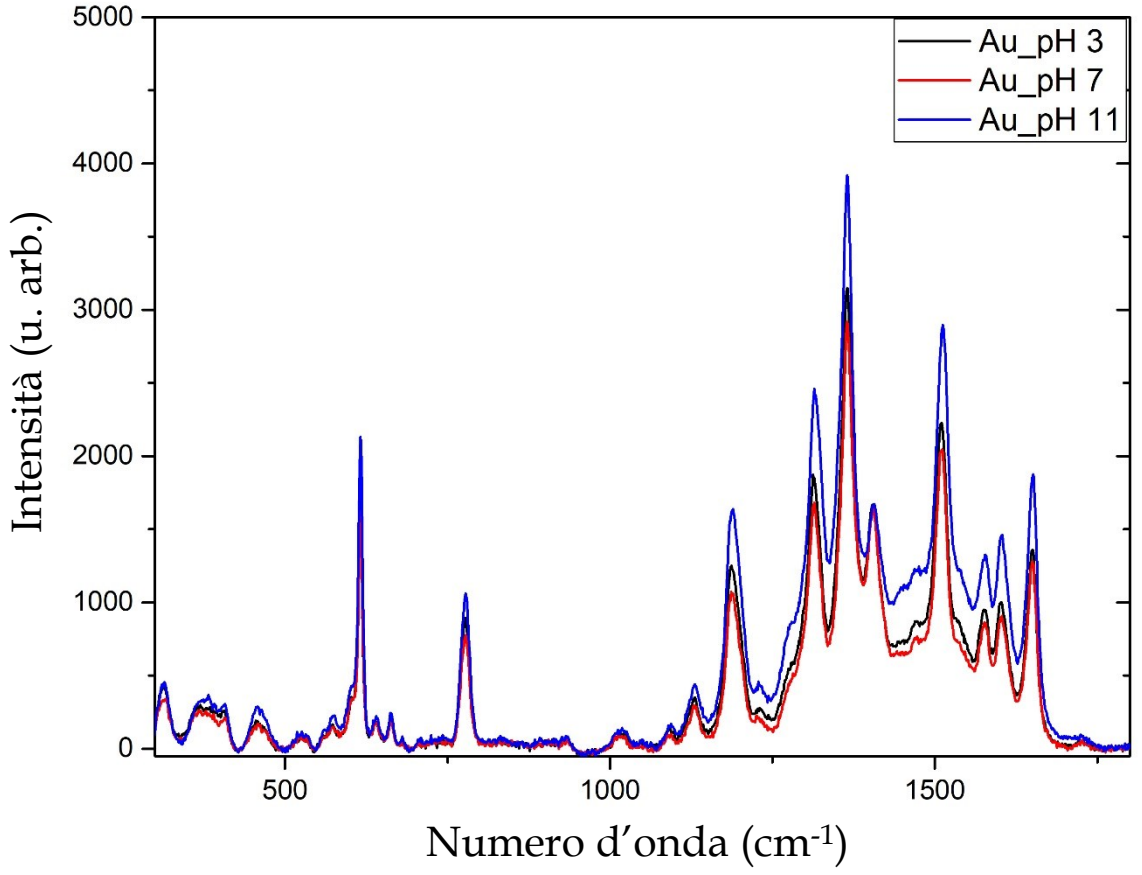
Range di pH investigato: 3-11



Effetto del pH: Rodamina-6-G

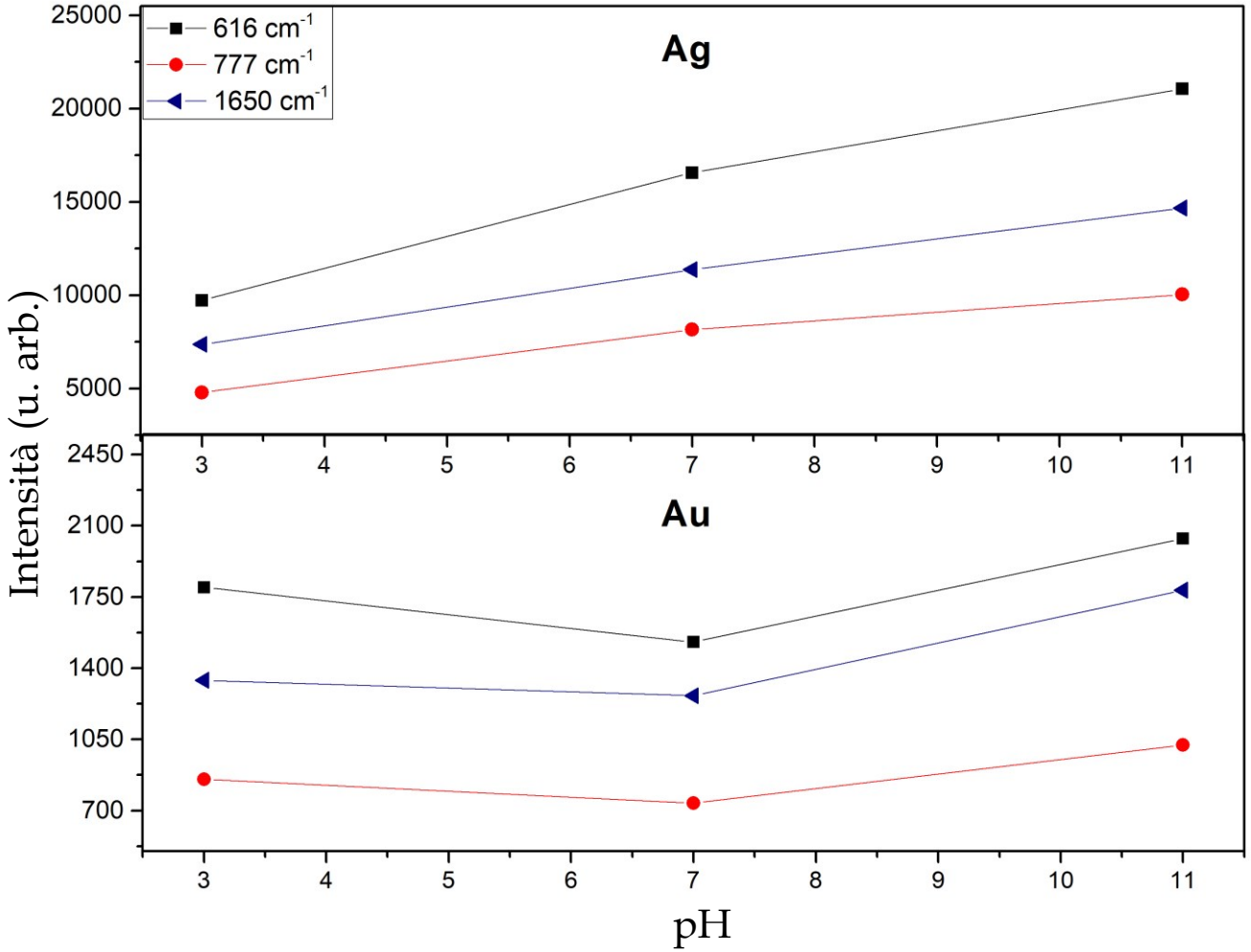
Focus sulle performance dei film SERS attivi

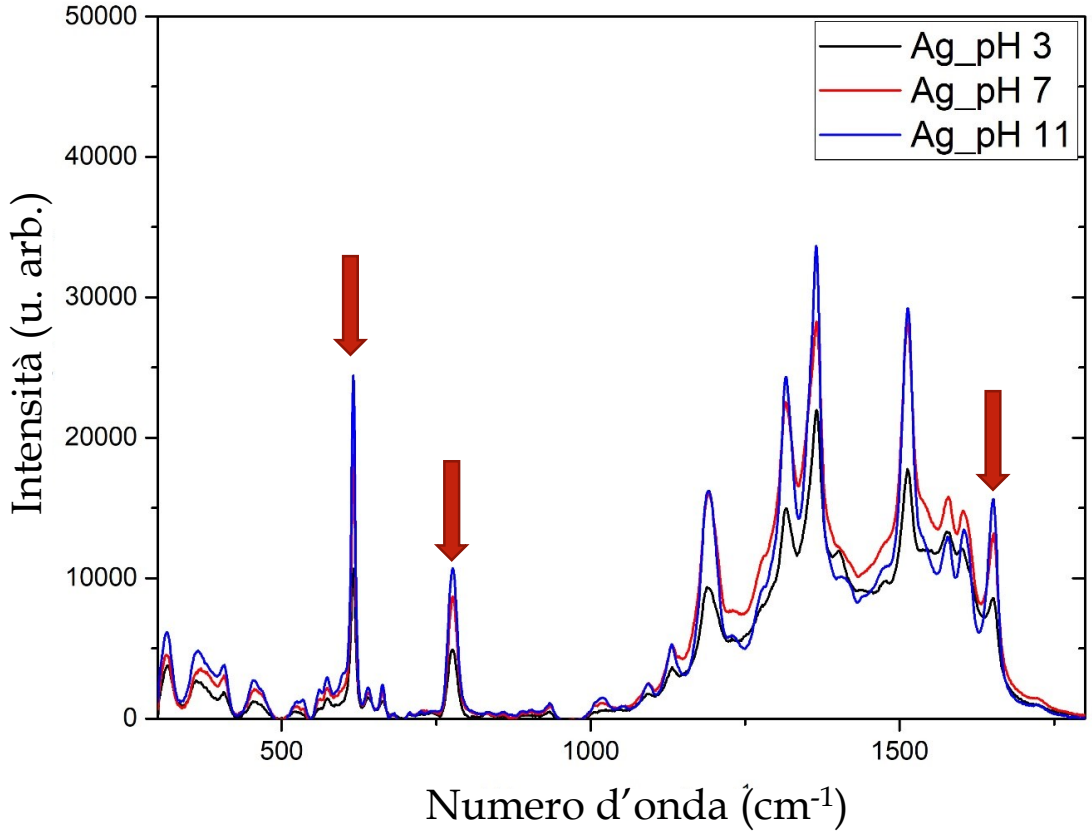




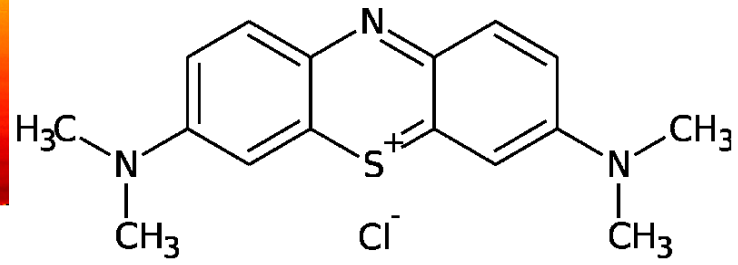
Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

Effetto del pH: Rodamina-6-G



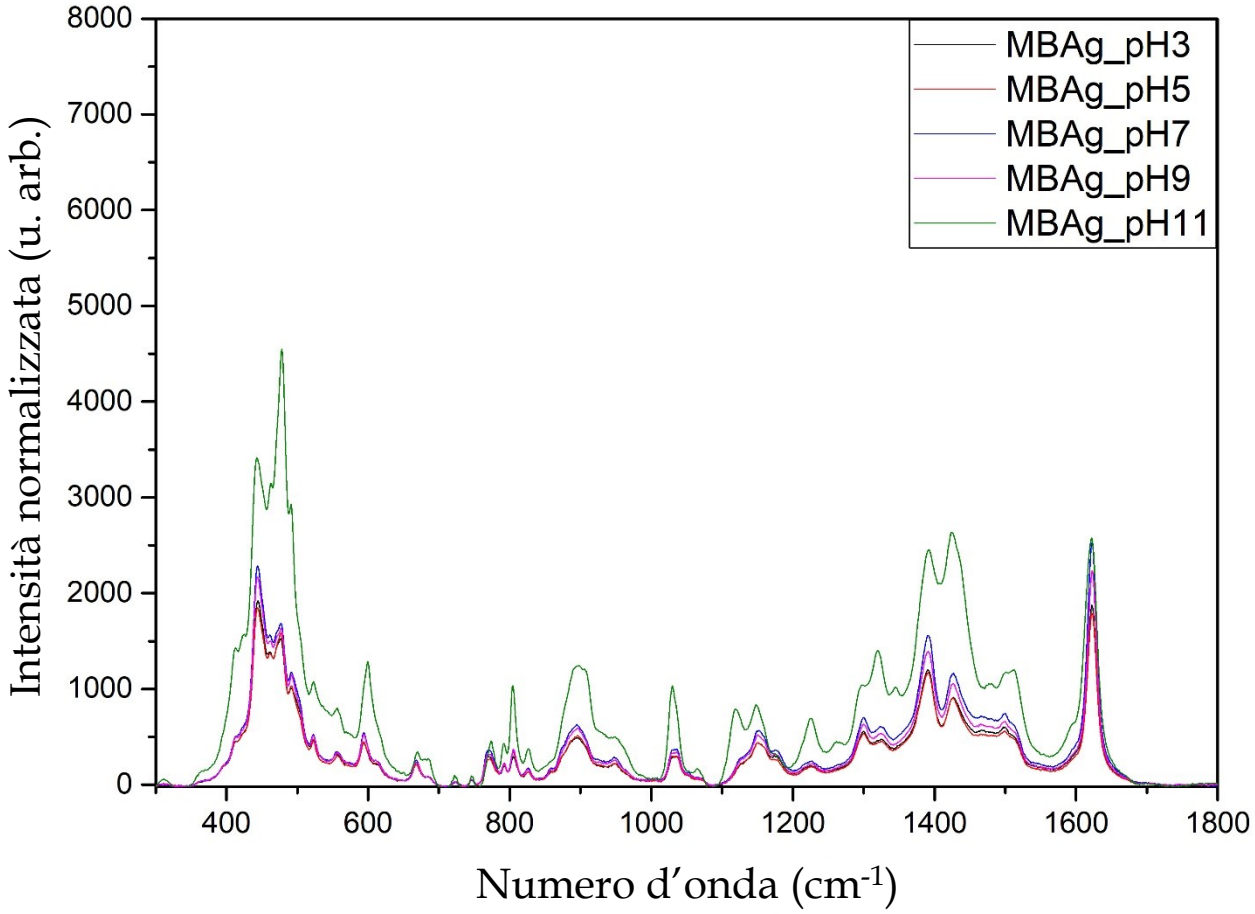


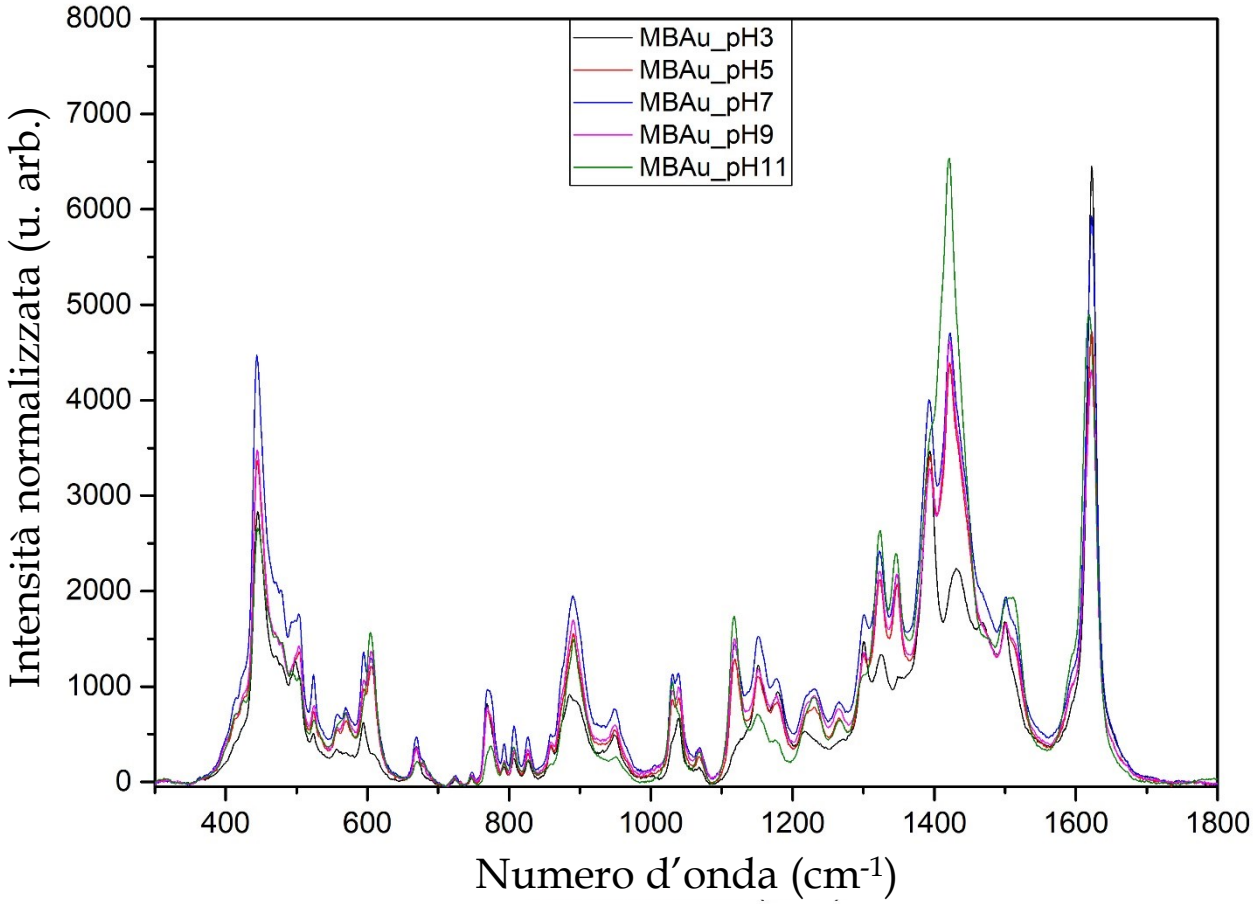
Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)



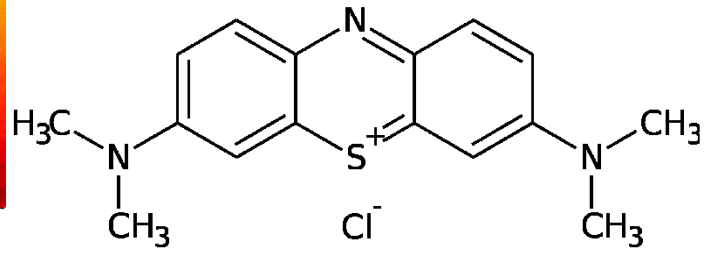
Effetto del pH: Blu di Metilene

Focus sugli effetti del pH sui vetrini SERS attivi

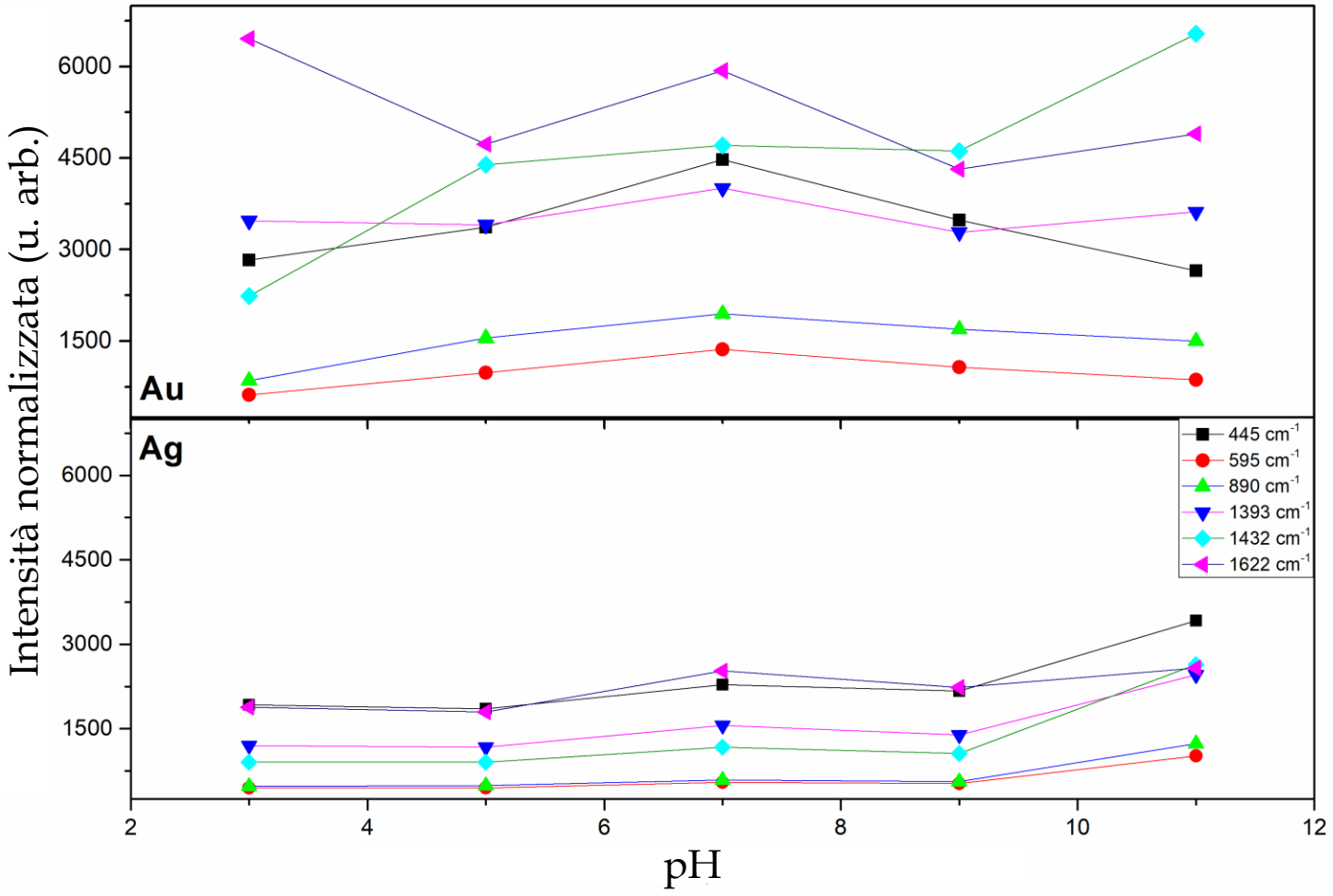


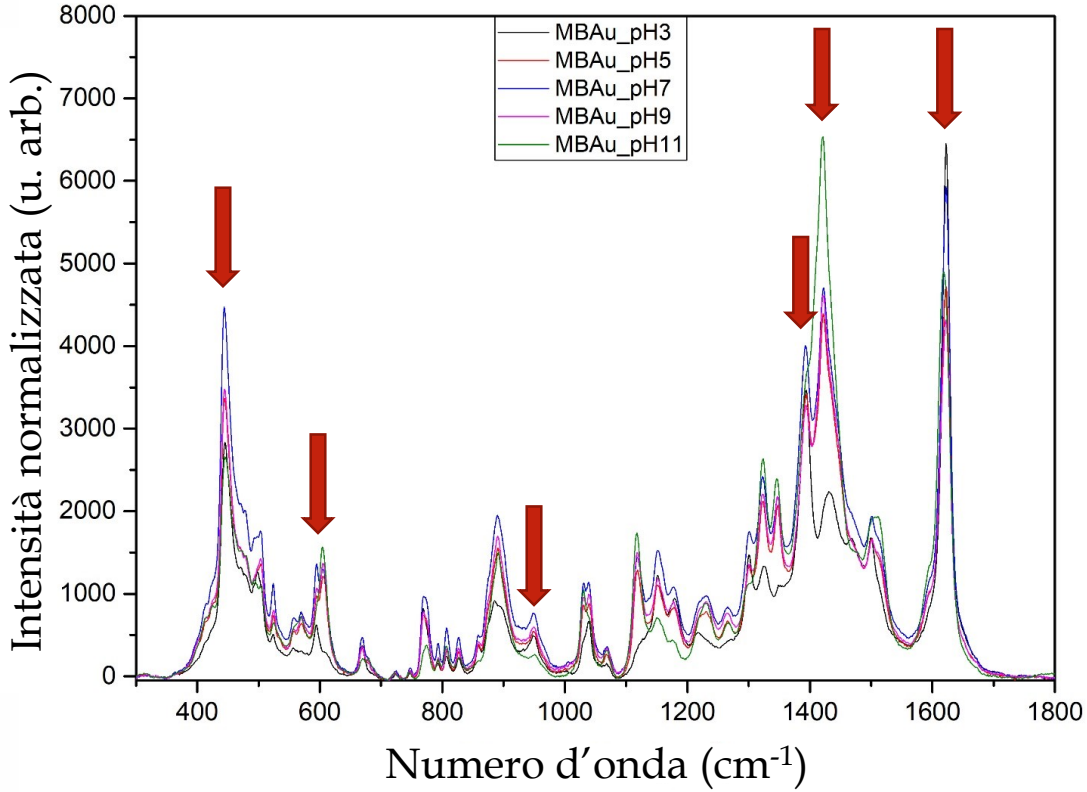


Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)



Effetto del pH: Blu di Metilene



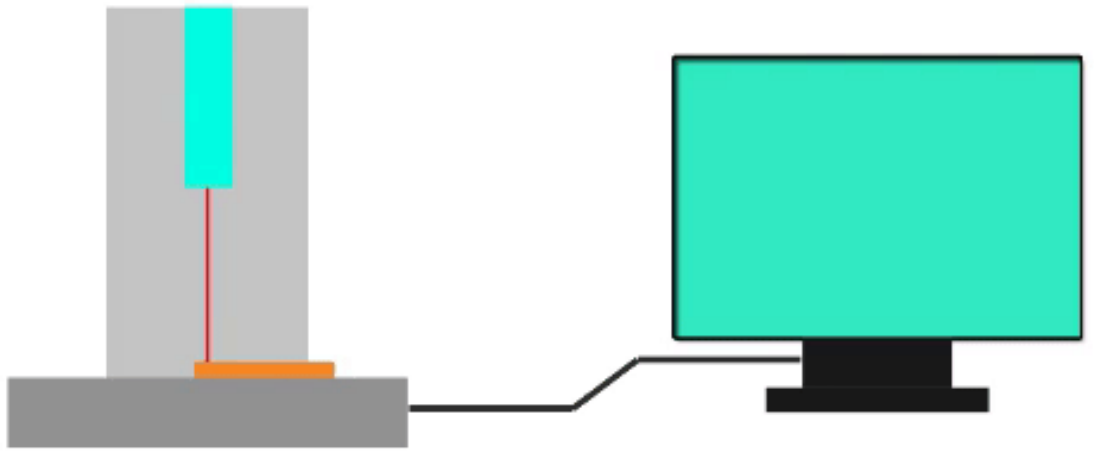


Deposizione di nanoparticelle metalliche attraverso laser pulsato (PLD)

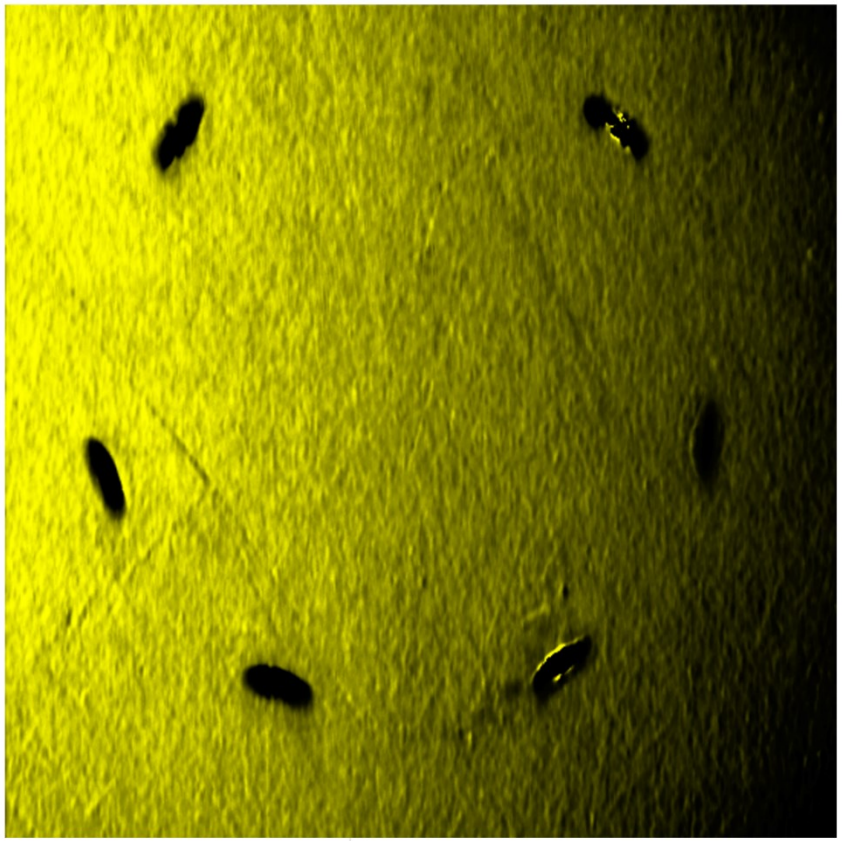
ATTIVITA’ 2

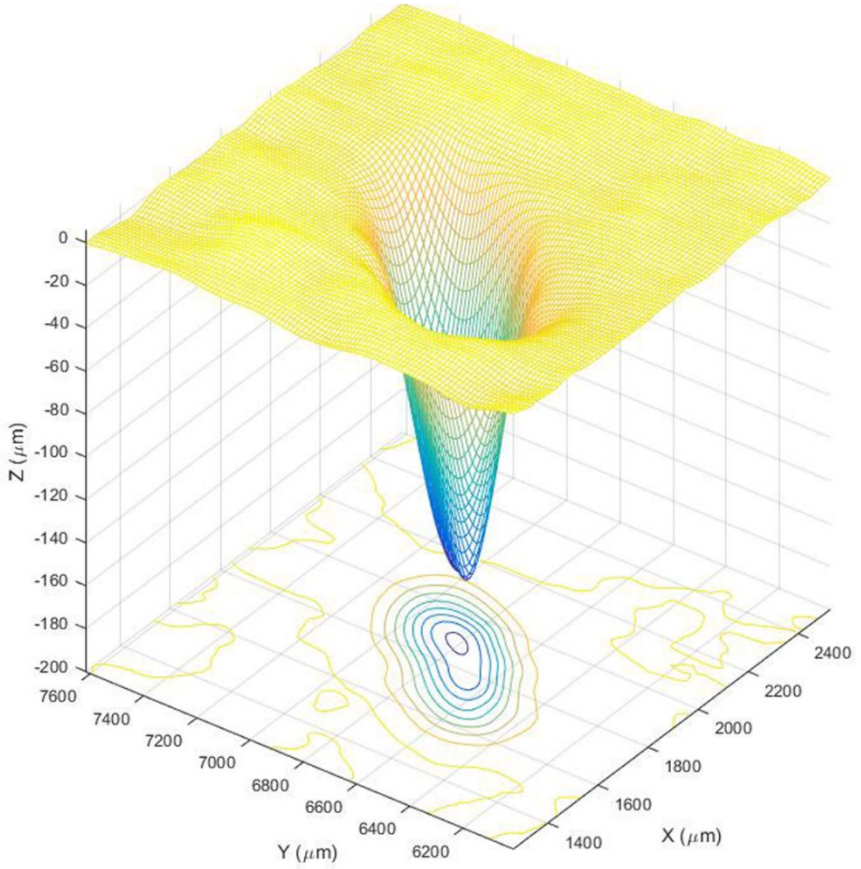
Profilometria Laser

Profilometro Ottico



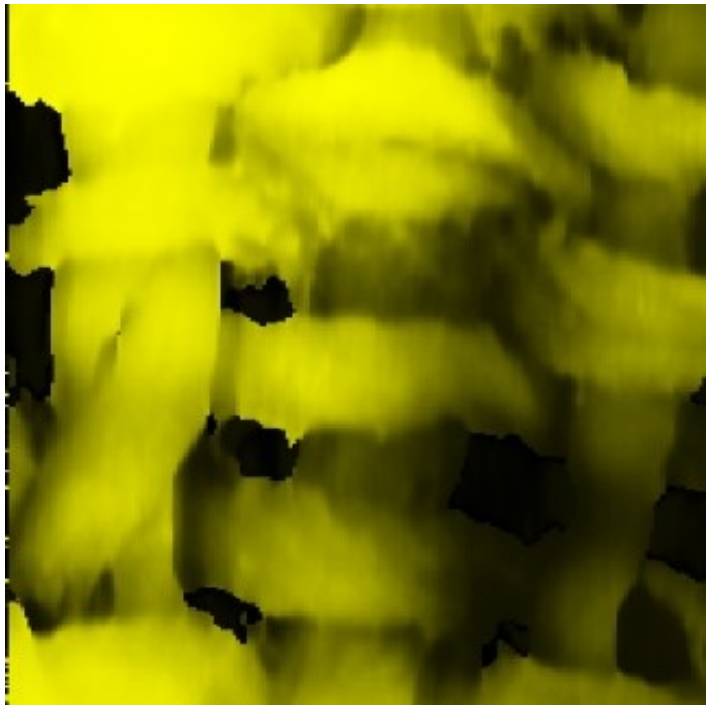
Determinazione della massa ablata

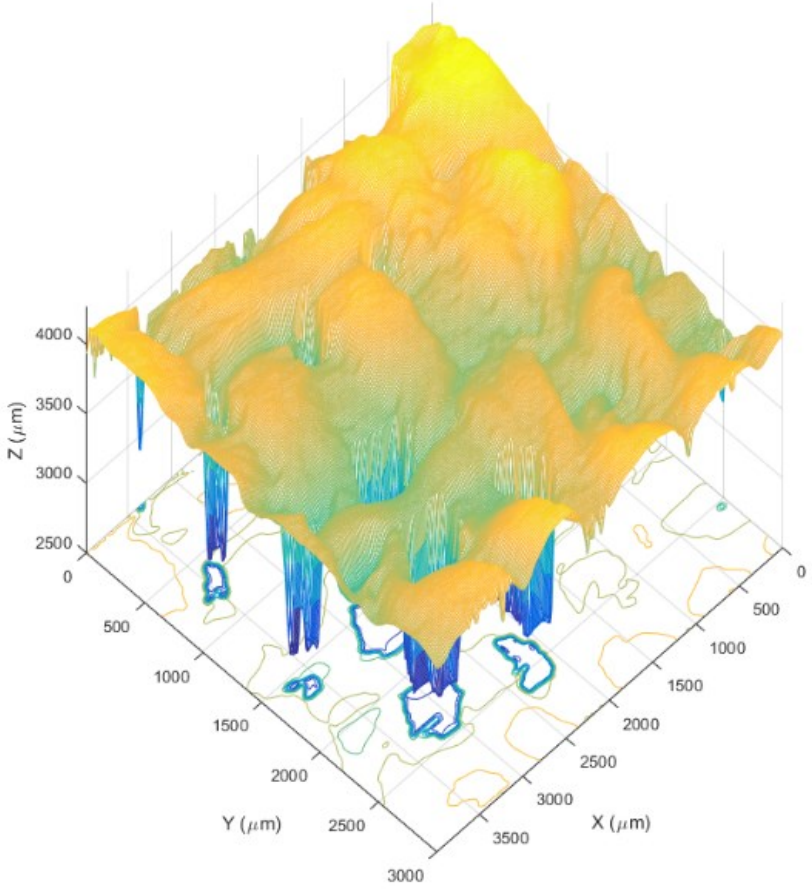




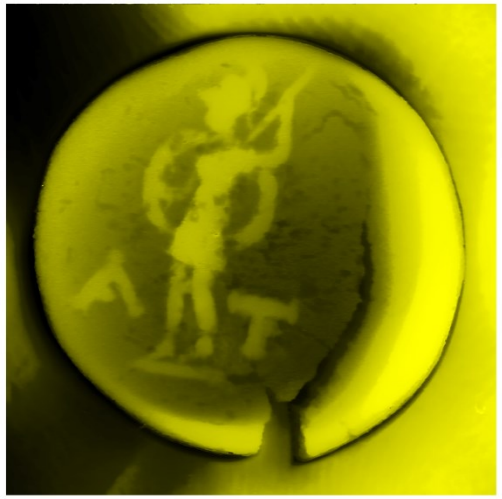
Profilometria Laser

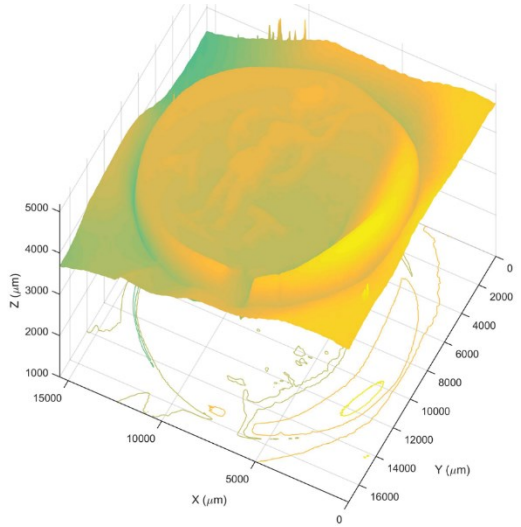
Campioni di interesse culturale: tessuti





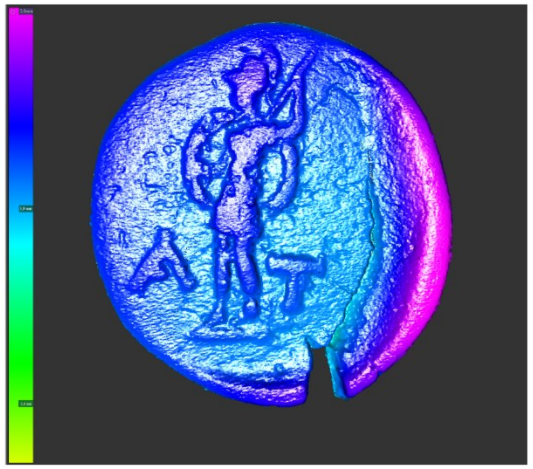
Campioni di interesse culturale: monete

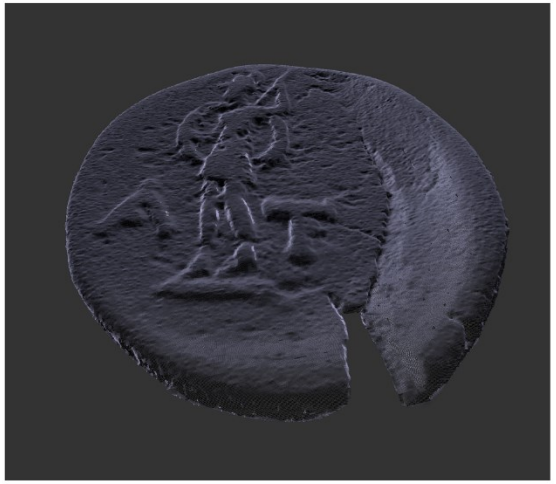




Elaborazione MATLAB

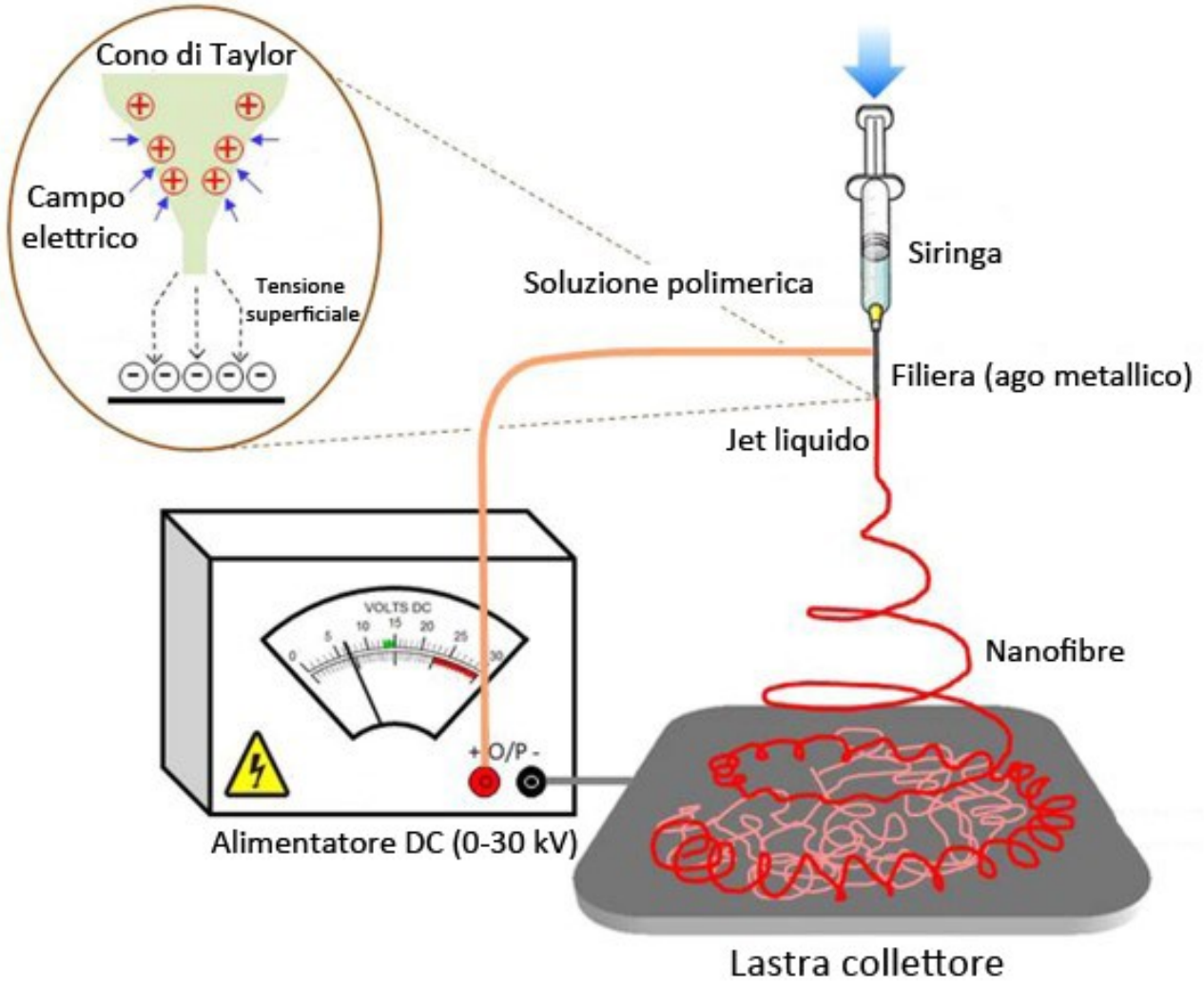
Modellazione 3D



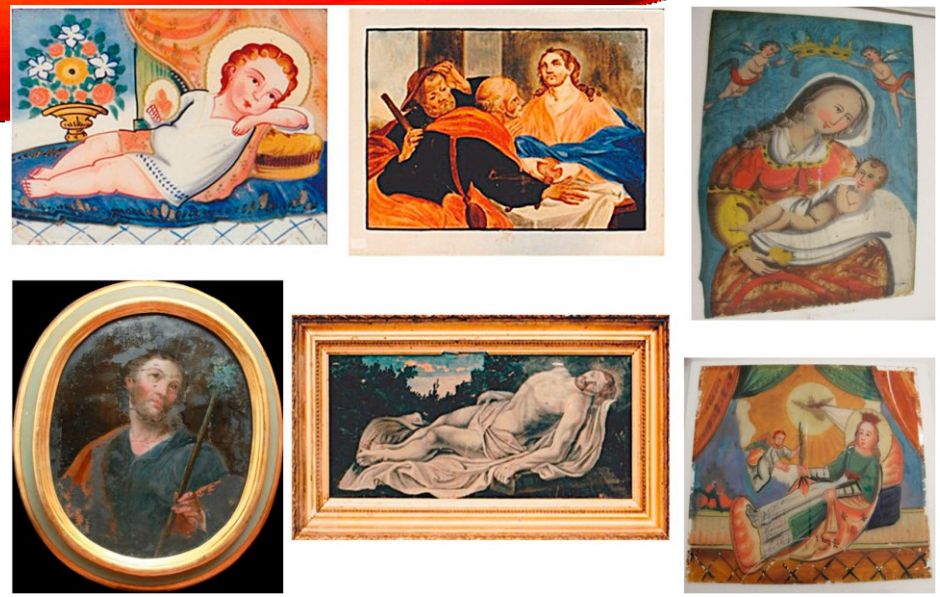


PROGETTI IN SVILUPPO

Elettrofilatura di polimeri



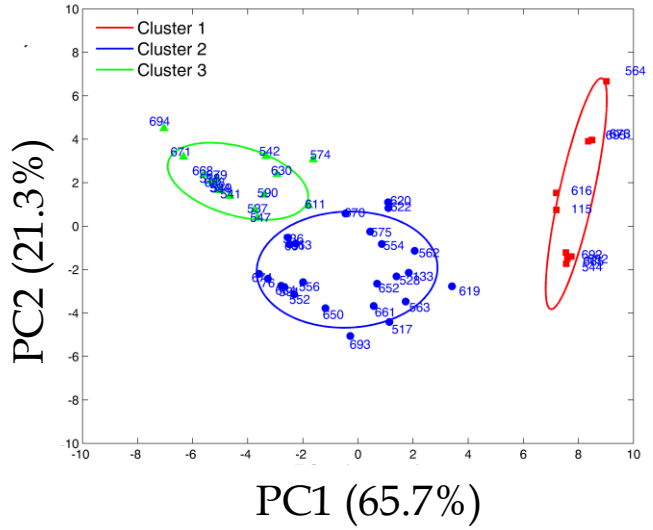
Indagini sulle attribuzioni



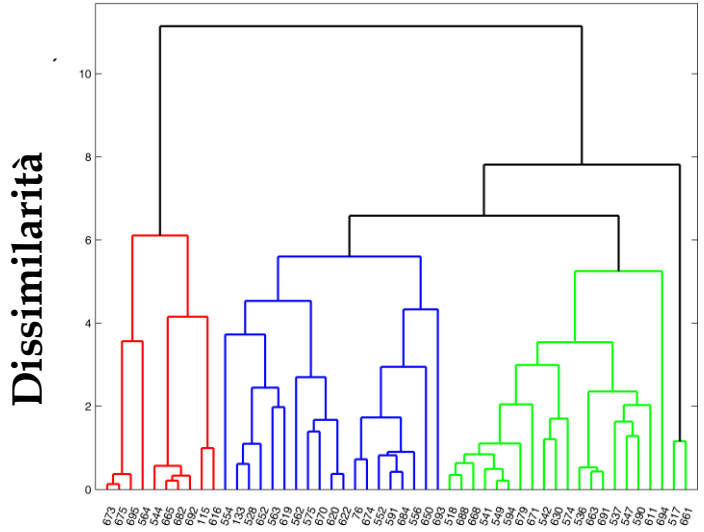
Analisi multivariata

Dati XRF
acquisiti sui vetri

Analisi delle componenti principali

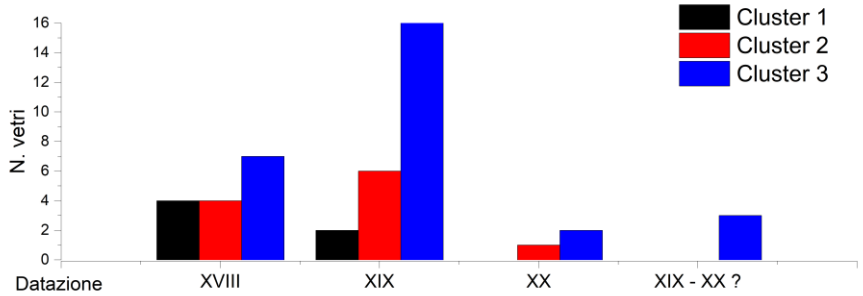


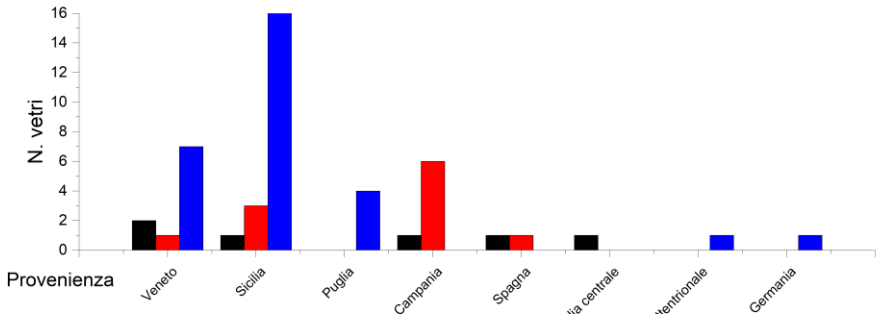
Analisi dei cluster



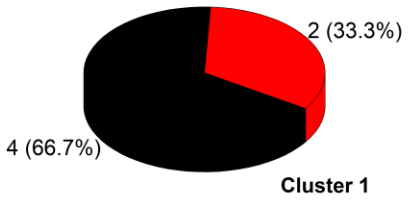
Analisi statistica

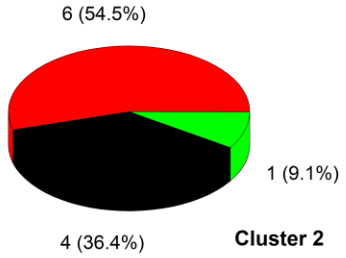
Istogrammi

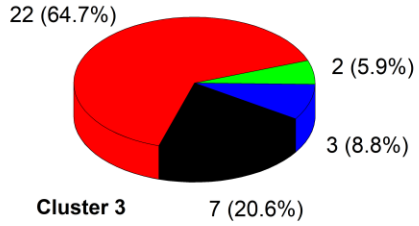


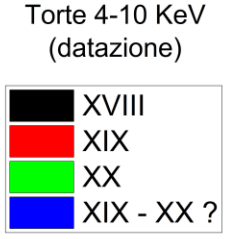


Grafici a torta



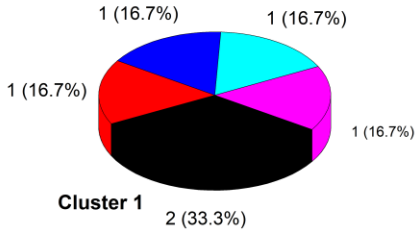


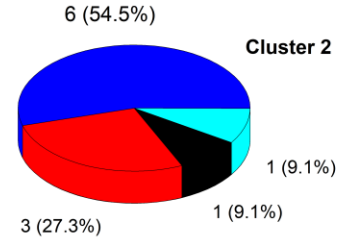


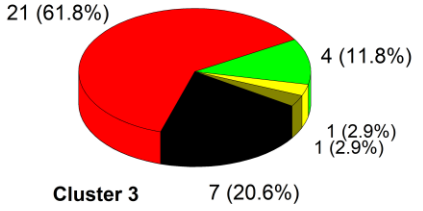


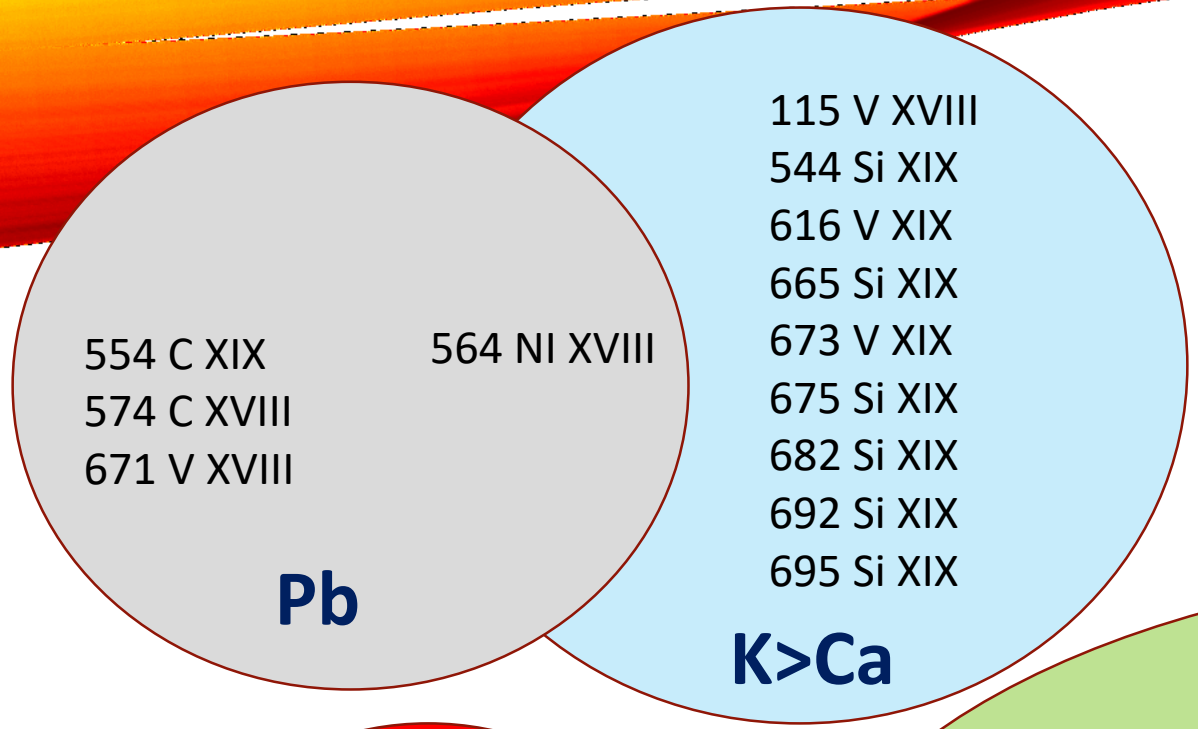
Provenienza

Datazione



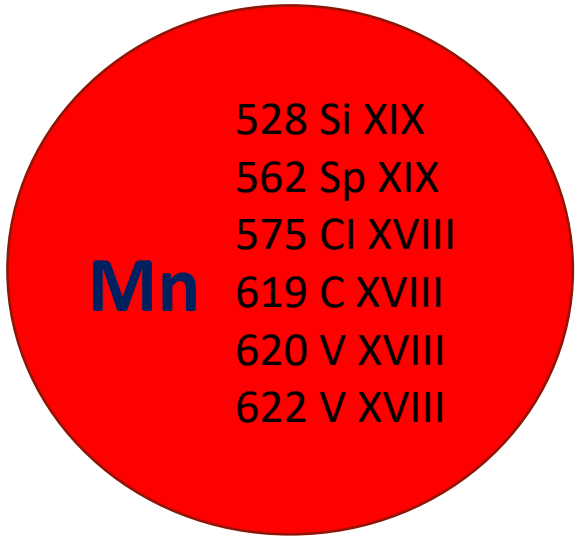


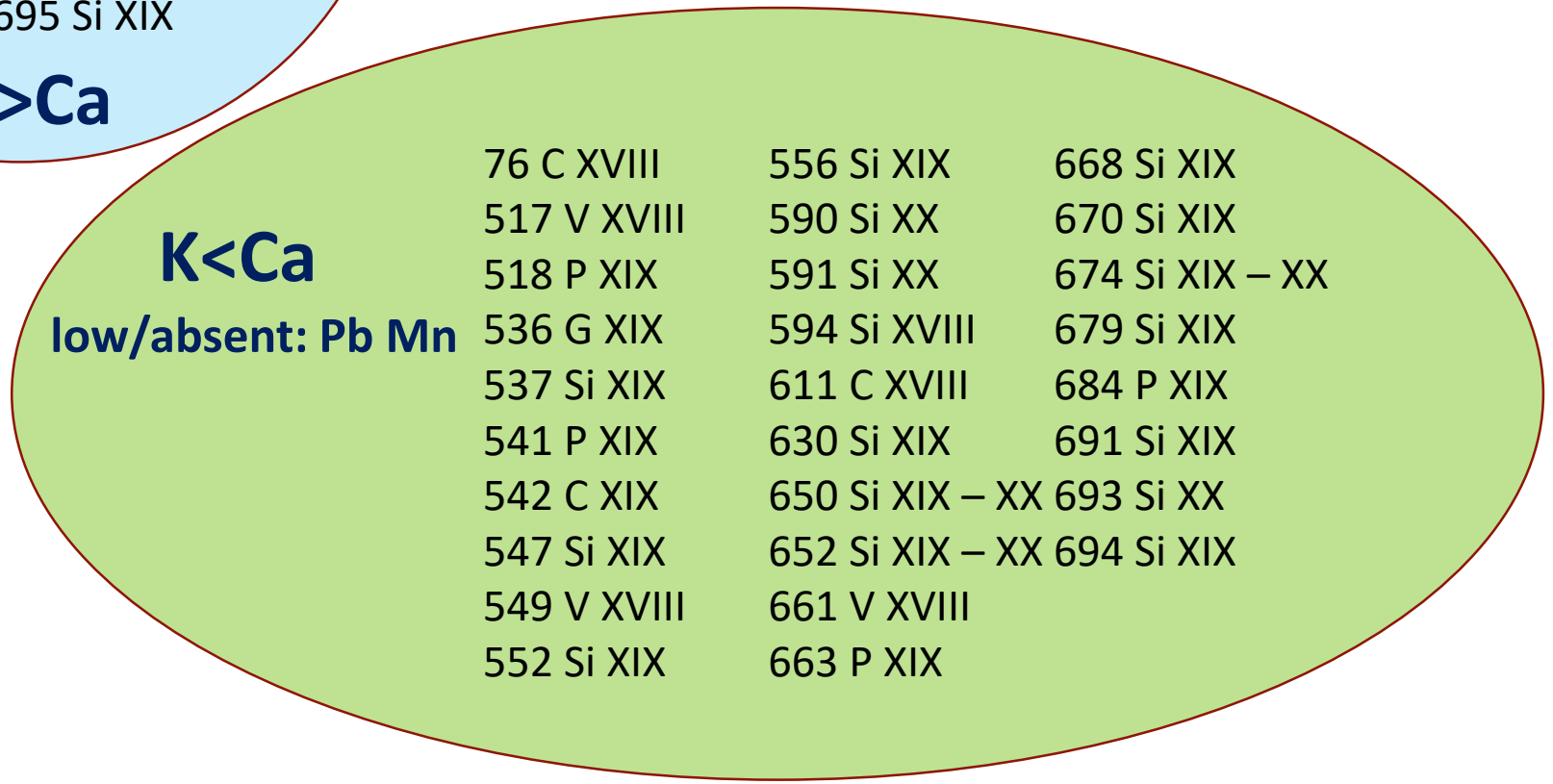




Legenda:

C - Campania
Si - Sicily
V - Veneto
NI – Italia settentrionale
Sp – Spagna
CI – Italia centrale





ALTRE ATTIVITÀ

- NanoInnovation 2018
- YOCOCU 2018
- Arte e Scienza 2018

GRAZIE PER L'ATTENZIONE