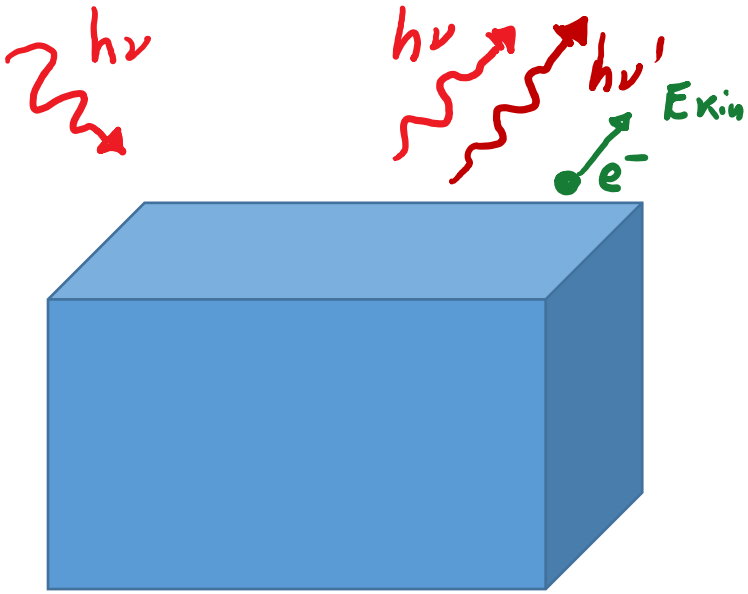
UNIVERSITÀ DEGLI STUDI DITRIESTE
Dipartimento di Scienze Chimiche e Farmaceutiche

Spettroscopie avanzate dei materiali

Albano Cossaro acossaro@units.it

Interazione radiazione materia

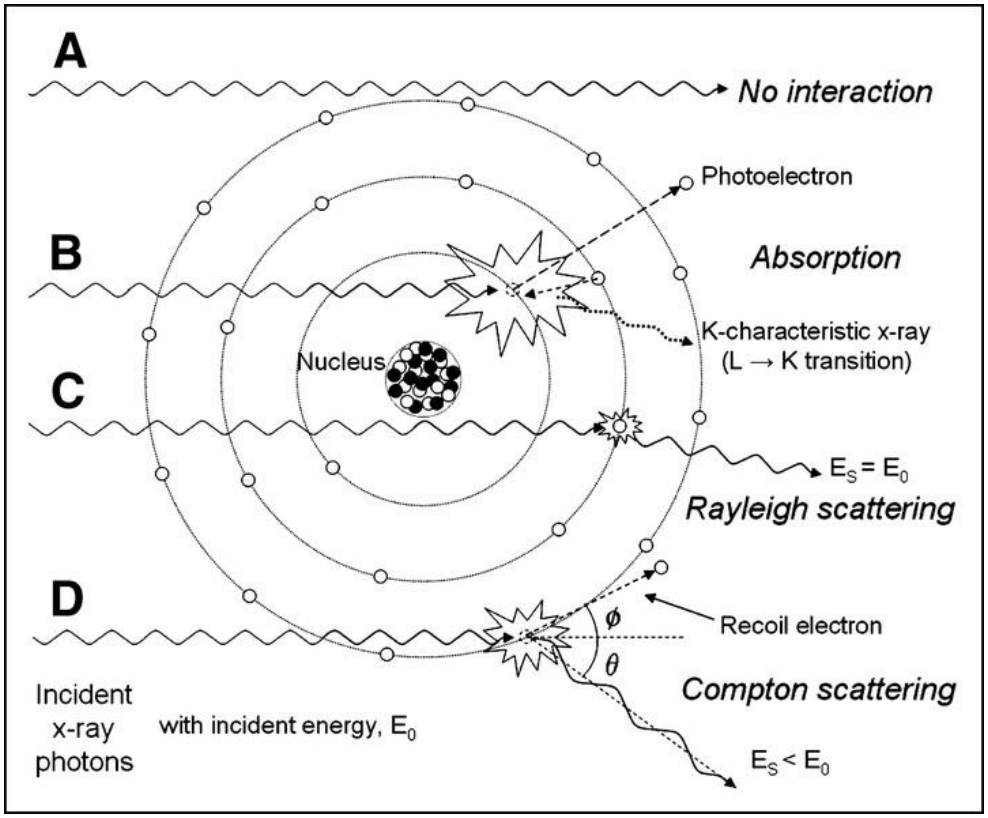


photon in – photon out

Diffrazione di raggi X
Riflettività
Fluorescenza

photon in – electron out

XPS (X-ray Photoelectron Spectroscopy
Assorbimento a soglia

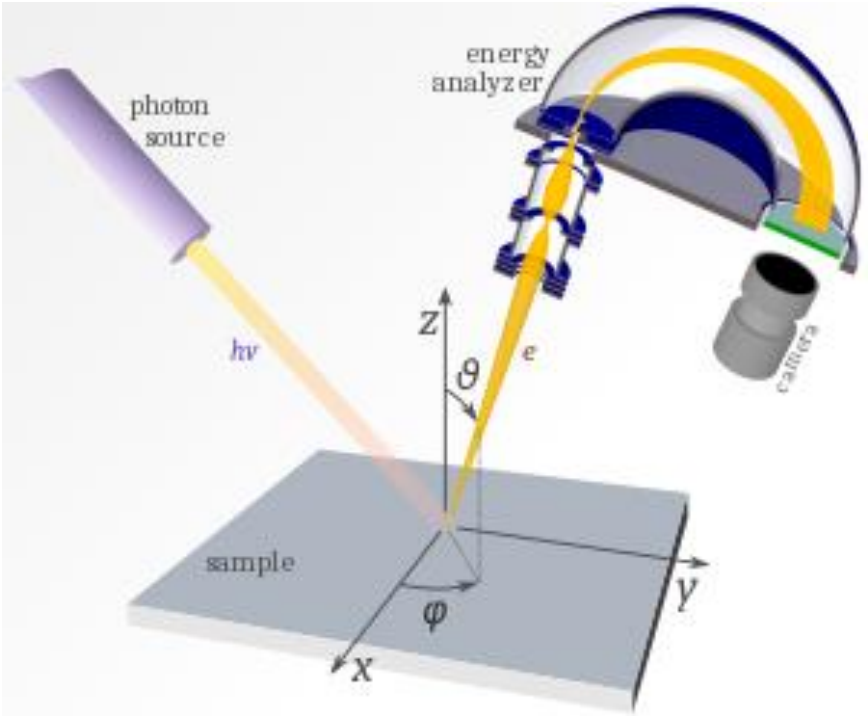

A
No interaction
Photoelectron
B
Absorption
K-characteristic x-ray
(L → K transition)
Nucleus
C
$E_S = E_0$
Rayleigh scattering
D
Recoil electron
ϕ
θ
Compton scattering
Incident
x-ray
photons
with incident energy, E_0
$E_S < E_0$

Fotoemissione (XPS)

Chimica del sistema

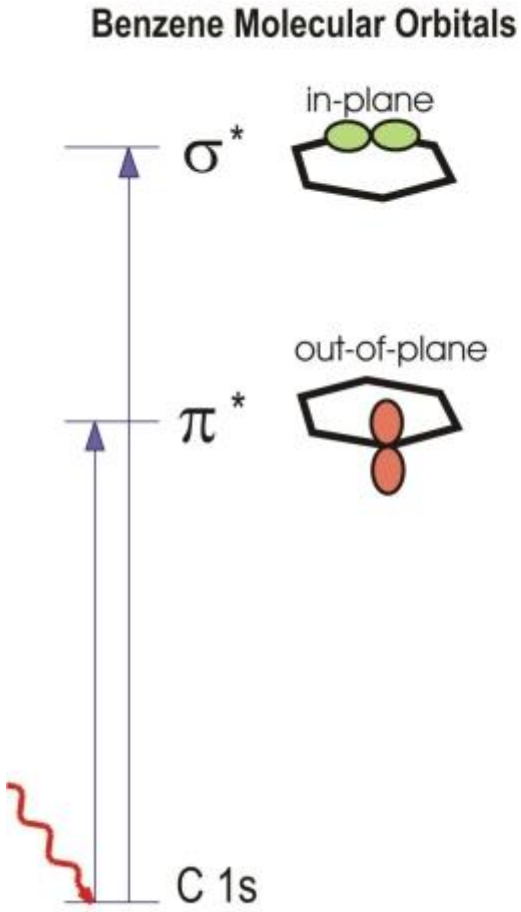
(che tipo di interazione sta avendo una molecola con la superficie?)

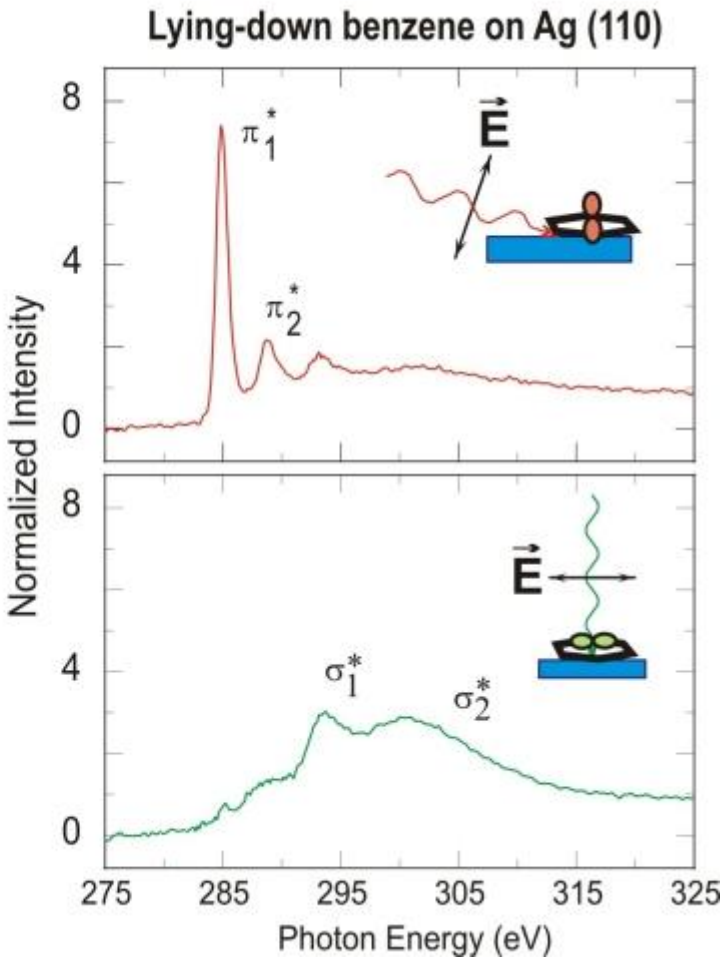
Stechiometria



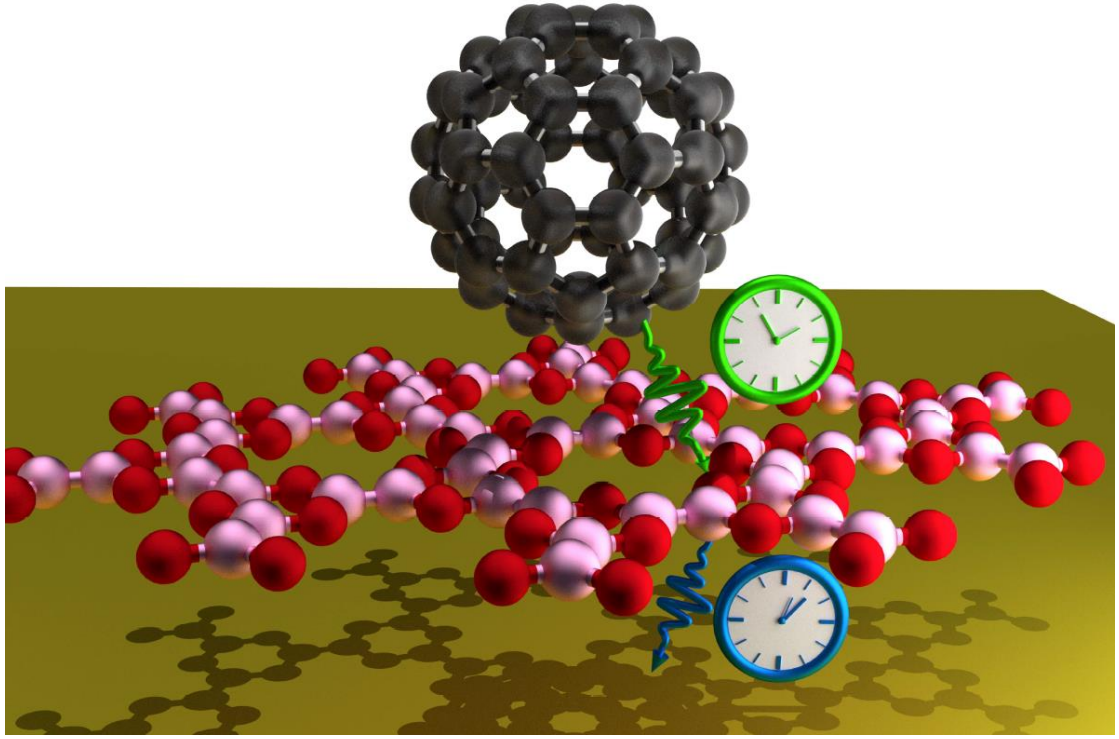
Assorbimento a soglia (NEXAFS)

(Near Edge Absorption Spectroscopy)





Spettroscopie risolte in tempo



- Pump&Probe
- Transient Absorption Spectroscopy
- Fotoemissione risonante

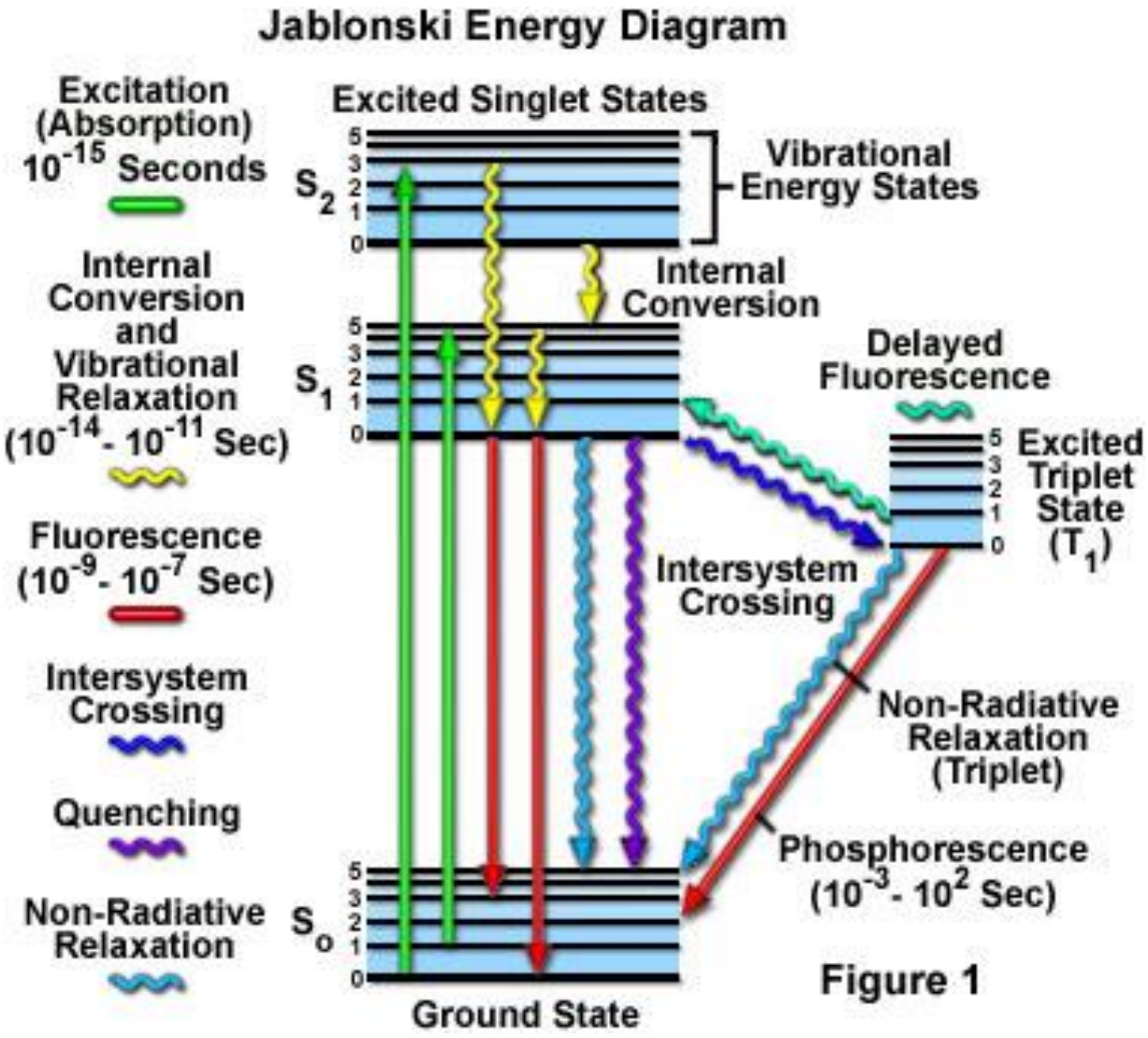
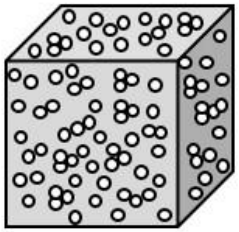

Jablonski Energy Diagram
Excitation (Absorption) 10^{-15} Seconds
Internal Conversion and Vibrational Relaxation (10^{-14} - 10^{-11} Sec)
Fluorescence (10^{-9} - 10^{-7} Sec)
Intersystem Crossing
Quenching
Non-Radiative Relaxation
Excited Singlet States
S_2
S_1
S_o
5
3
2
1
0
Vibrational Energy States
Internal Conversion
Delayed Fluorescence
Excited Triplet State (T_1)
Intersystem Crossing
Non-Radiative Relaxation (Triplet)
Phosphorescence (10^{-3} - 10^{2} Sec)
Ground State

Figure 1

Rough Vacuum

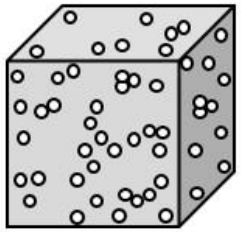
1 atm – 10^{-3} Torr



1.10^{-3} Torr
4.10^{13} atom/cm^3

High Vacuum

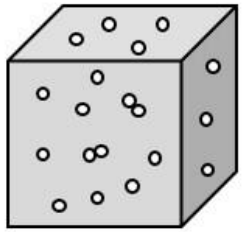
10^{-3} Torr - 10^{-8} Torr



1.10^{-6} Torr
4.10^{10} atom/cm^3

Ultra High Vacuum

10^{-8} Torr - 10^{-12} Torr



1.10^{-11} Torr
4.10^{5} atom/cm^3

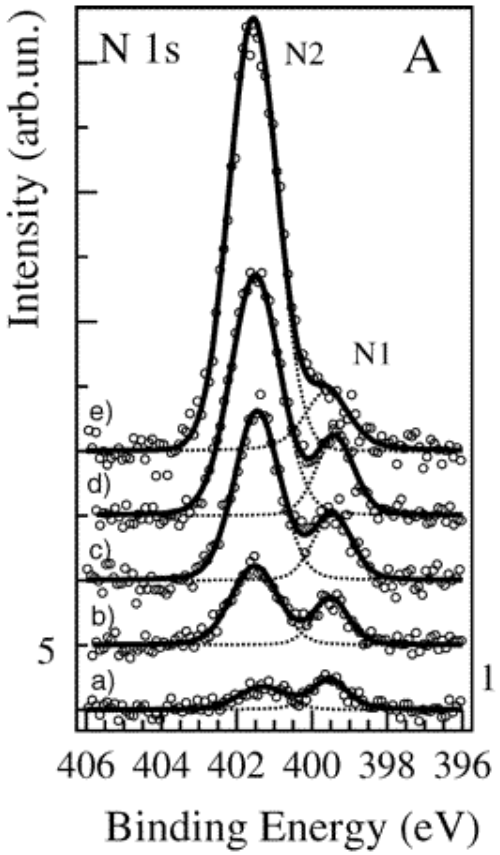
Tecnologia del vuoto







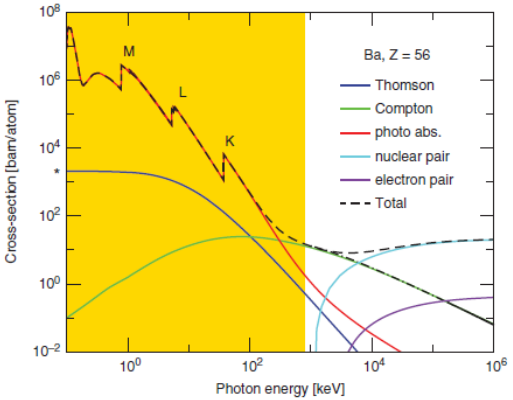
Analisi Dati

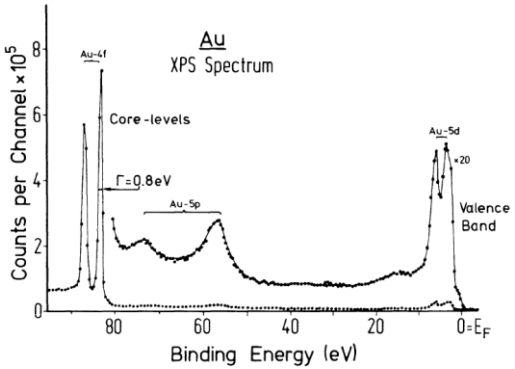


- Fit di dati
- Teoria degli errori

Interazione radiazione materia

Richiami elettromagnetismo
Scattering di fotoni
Diffrazione e struttura cristallina



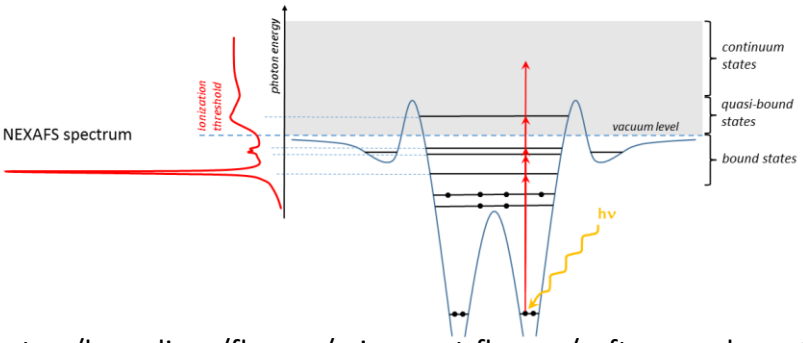


Fotoemissione

Richiami di CF2….
Tecnica XPS
Interpretazione degli spettri

NEXAFS

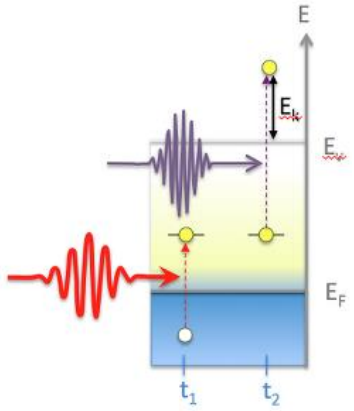
Tecnica NEXAFS
Interpretazione degli spettri



https://www.maxiv.lu.se/beamlines-accelerators/beamlines/flexpes/science-at-flexpes/soft-x-ray-absorption/

Spettroscopia risolta in tempo

Fotoemissione risonante
Spettroscopia Pump-Probe
2PP
TAS



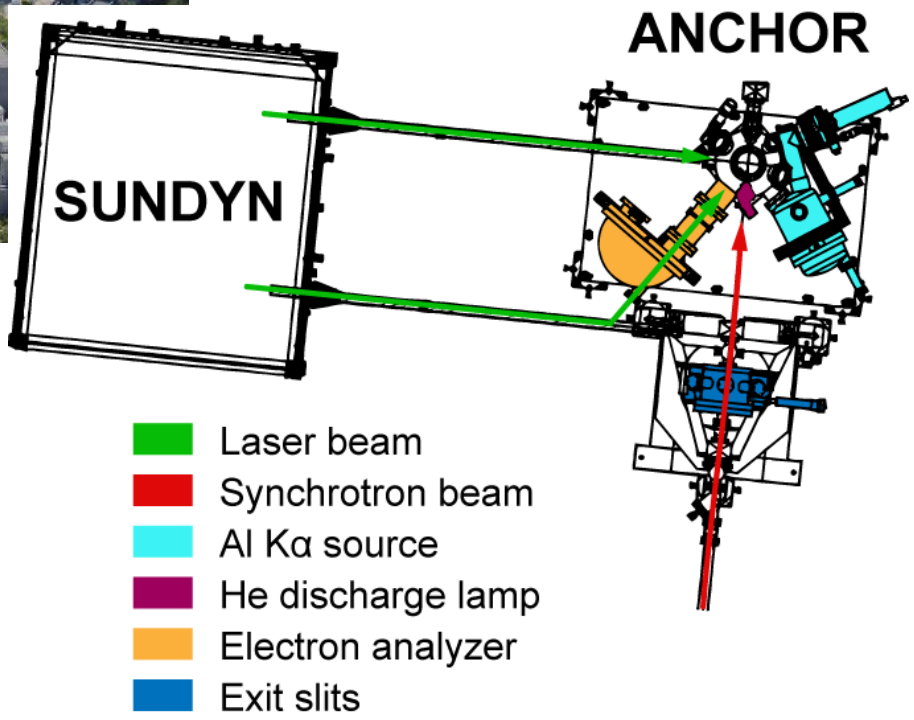


Tecnologia del vuoto e strumentazione

Teoria degli errori e analisi dati

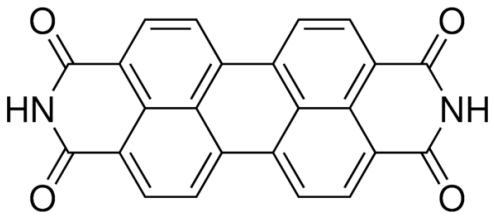
Laboratorio ANCHOR-SUNDYN





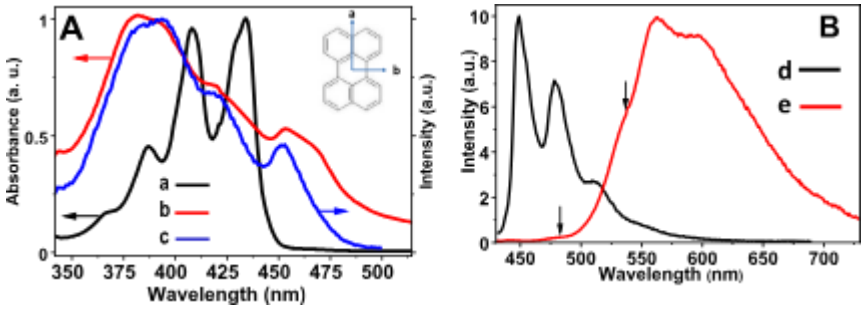


Esperienza di laboratorio

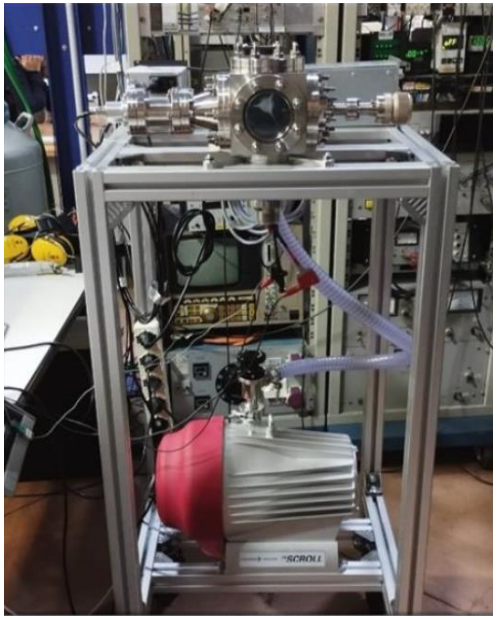


PTCDI

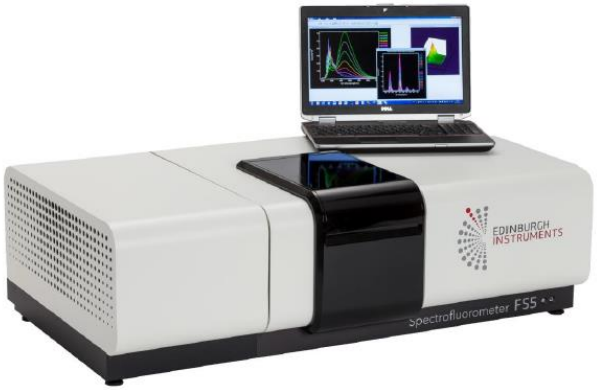
- Tempo di vita degli stati eccitati



- Crescita di film in UHV

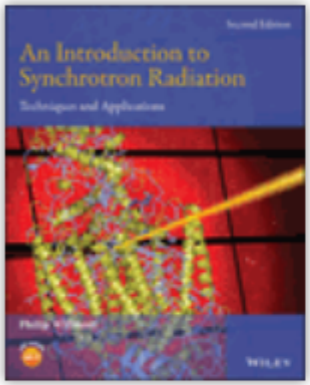


- Tempo di vita degli stati eccitati



- Assorbimento transiente





An Introduction to Synchrotron Radiation: Techniques and Applications, Second Edition

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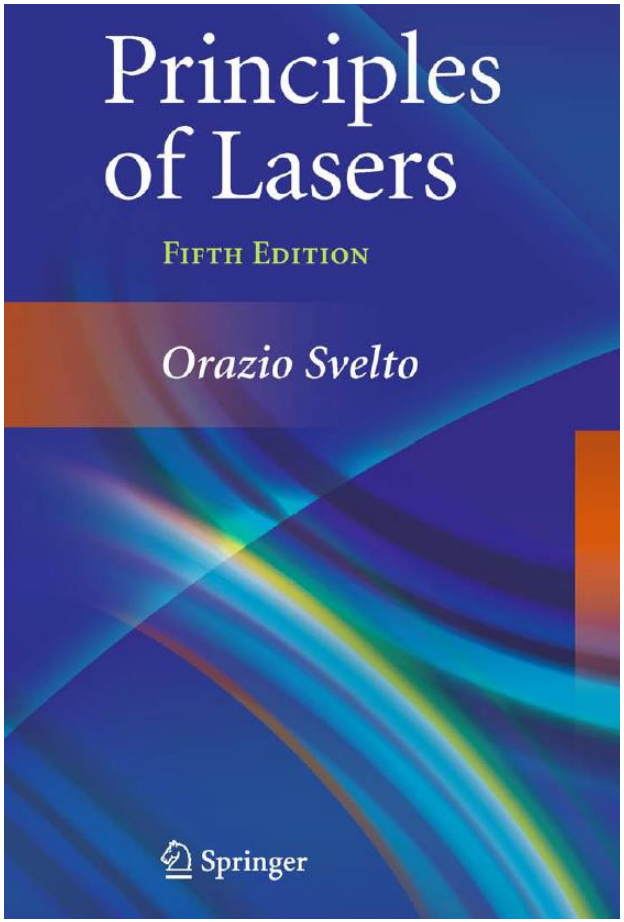
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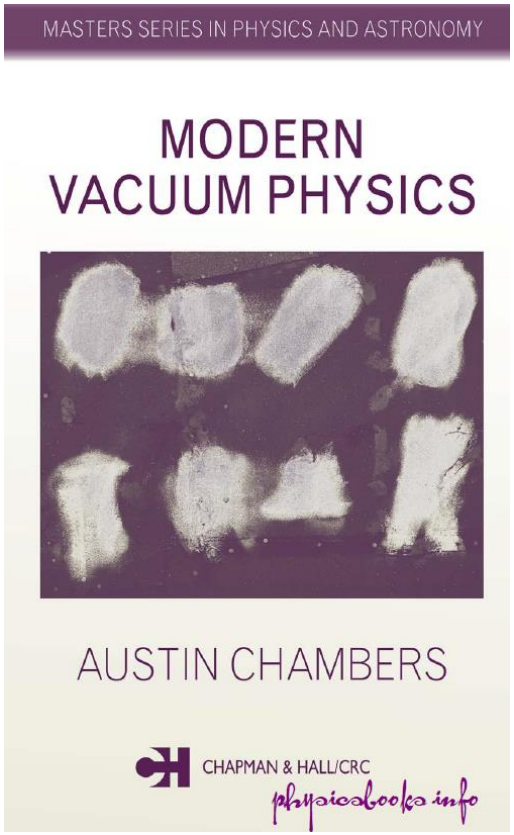
Print ISBN: 9783527404889 | Online ISBN: 9783527680535 | DOI: 10.1002/9783527680535

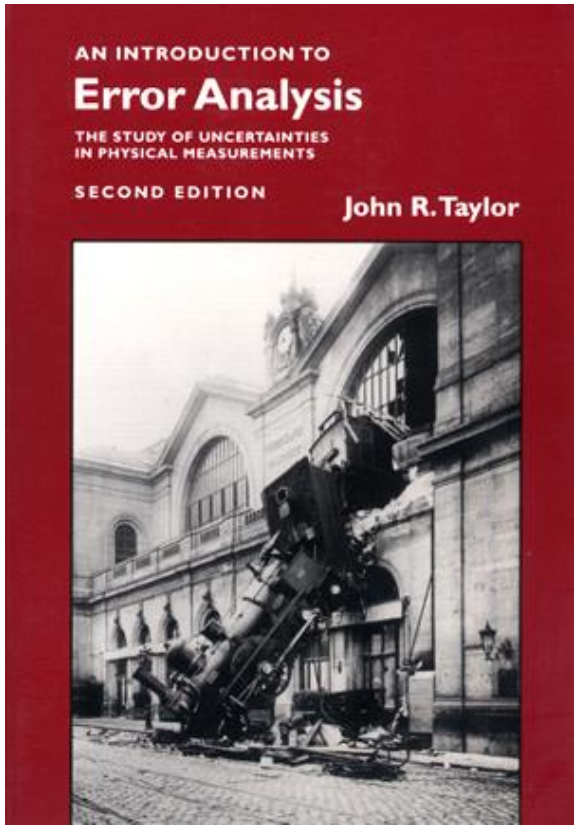
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