



The Faculty Graduate Center Chemistry offers this lecture series:

Vibrational Spectroscopic Study of Surfaces

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Date: November 8- November 14, 2023

Location: 21019

Time: Usually between 9.15-12.30 or upon negotiation

First course: Wednesday, November 8 – 9.15 h (also to discuss further course appointments) – approximately we will have 7 days with lectures

Everybody (doctorate and graduate student) is asked to participate free of charge. We are looking forward to meet you on November 8 at 9 am.

Dr. Markus Drees

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1. INTRODUCTION

1.1. SPECIAL PROPERTIES OF SURFACES AND INTERFACES

Bulk material

Surface:

surface reactions
adsorption
internal diffusion

Surface modifications:

temperature treatment
diffusion
implantation
cleaning
grafting
coating
deposition, etc.

Importance:

catalysis
corrosion
thin layers, LB films
conducting materials
adsorbents ,
etc.

1.2. Classification of investigation methods used in surface studies.

A - chemical composition

B - structure of molecules in surfaces

A. COMPOSITION OF SOLID SURFACES

METHOD	PHYSICAL BASIS	TYPE OF INFORMATION	SURFACE
LEED	Elastic back scattering of electrons	Atoms of surface and adsorbates	SC
Auger ES	El. emission from surface atoms (e-, X-ray, ion)	Atoms	SC
XPS, UPS (ESCA)	El. emission from atoms (X-ray, UV)	El. structure oxidation state	SC, DIS
ISS	Elastic reflection of inert gas ions	Atoms	SC
SIMS	Ion beam ejection of surface atoms	Atoms	SC, DIS
EXAFS	Interference of photoemitted el.	Atoms of surface and adsorbates	DIS
TDS	Thermally induced desorption	Adsorption energies	SC, DIS

B. STRUCTURE OF MOLECULES ON SOLID SURFACES

METHOD	PHYSICAL BASIS	TYPE OF INFORMATION	SURFACE
HREELS	Inelastic reflections of low-energy electrons	Atoms and molecules	SC
IR	Vibrational excitation (A, E and R)	Molecules	SC, DIS
Raman (RR, SERS)	Inelastic light scattering (VIS, NIR)	Molecules	DIS
INS	Inelastic neutron scattering	Molecules (no selection rules!)	DIS
SFG	$\omega_s = \omega_{IR} + \omega_{vis}$ Second order non linear optical process	Vibration spectra of surface molecules	Any interfaces accessible by light