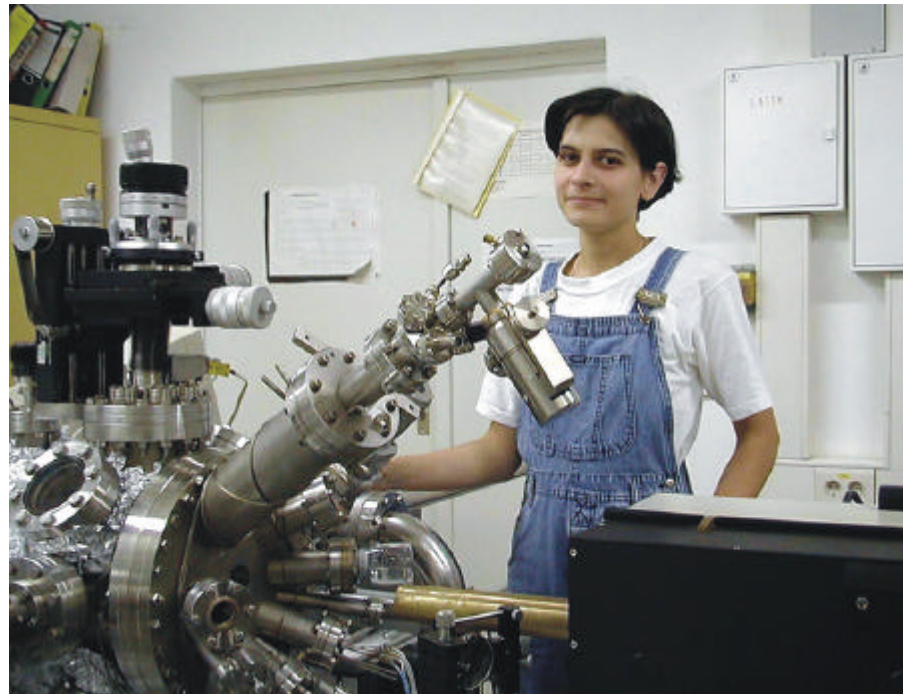
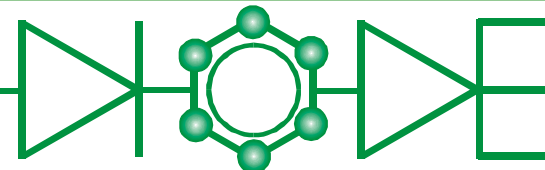


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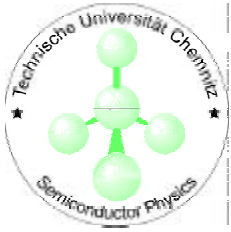
Technische Universität Chemnitz (TUC)



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TU Chemnitz

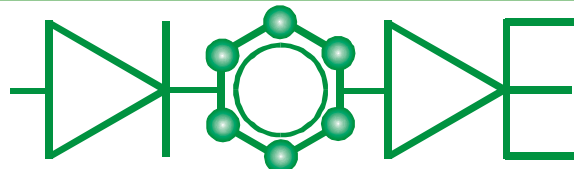


Scientific Background

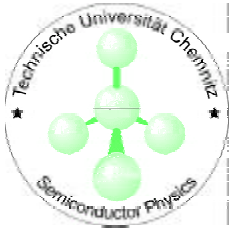
- Nationality: Romanian
- 1994-1998: Faculty of Physics, Babes-Bolyai University, Cluj-Napoca;
 - ❖ Diploma work : Electron paramagnetic resonance, Optical spectroscopies (in infrared and UV-VIS spectral ranges) and magnetic measurements studies of glass systems.
- 1998-1999: Master of Science Studies Infrared and Raman spectroscopies studies on **PTCDA** molecular system.
- Sept. 1999: start PhD studies at TU Chemnitz:
 - ❖ Raman spectroscopy investigations on thin **organic** films deposited via OMBD on semiconductor substrates.
- April 2000: join the DIODE network as Young Researcher.



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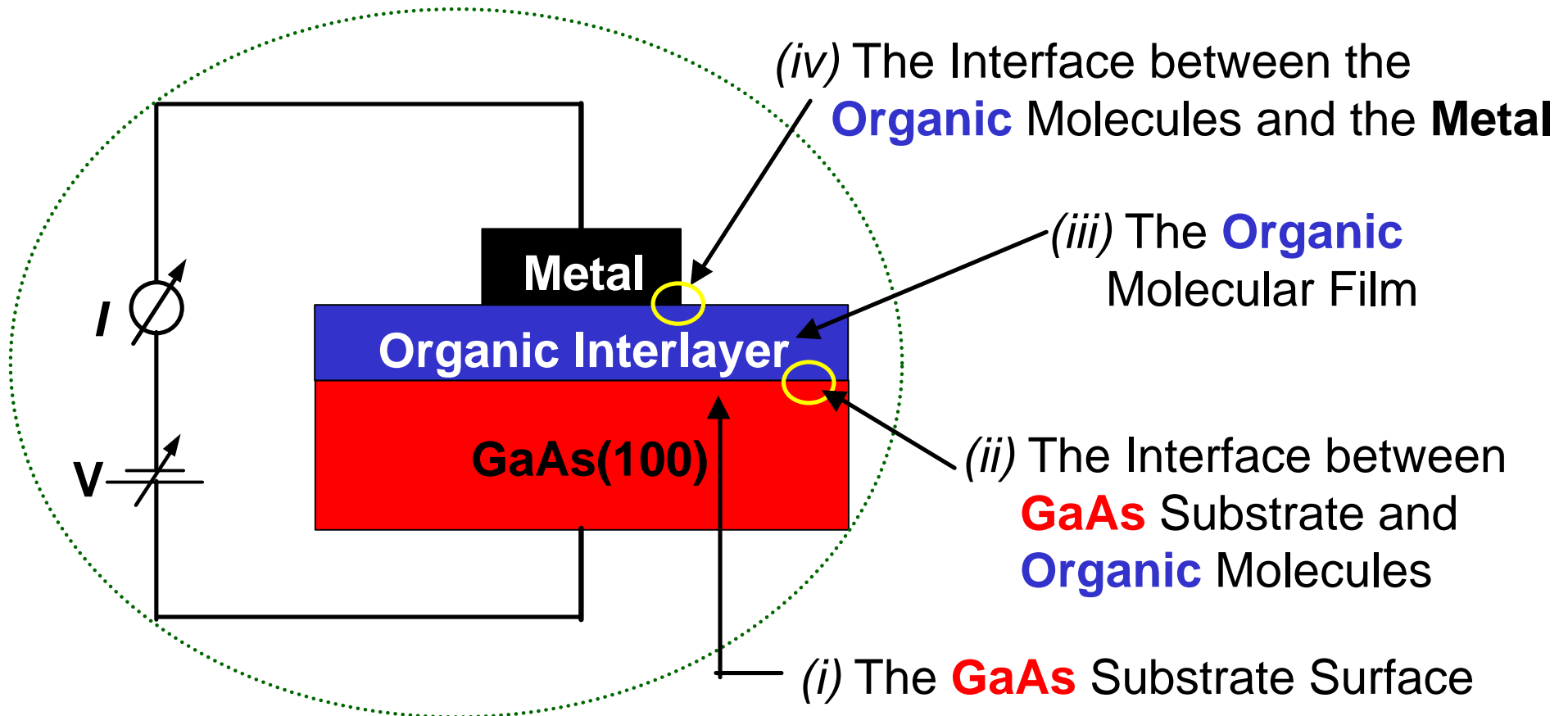


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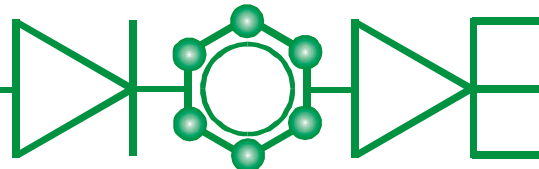


The Project

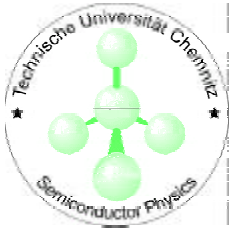
(v) The Overall Device Performance



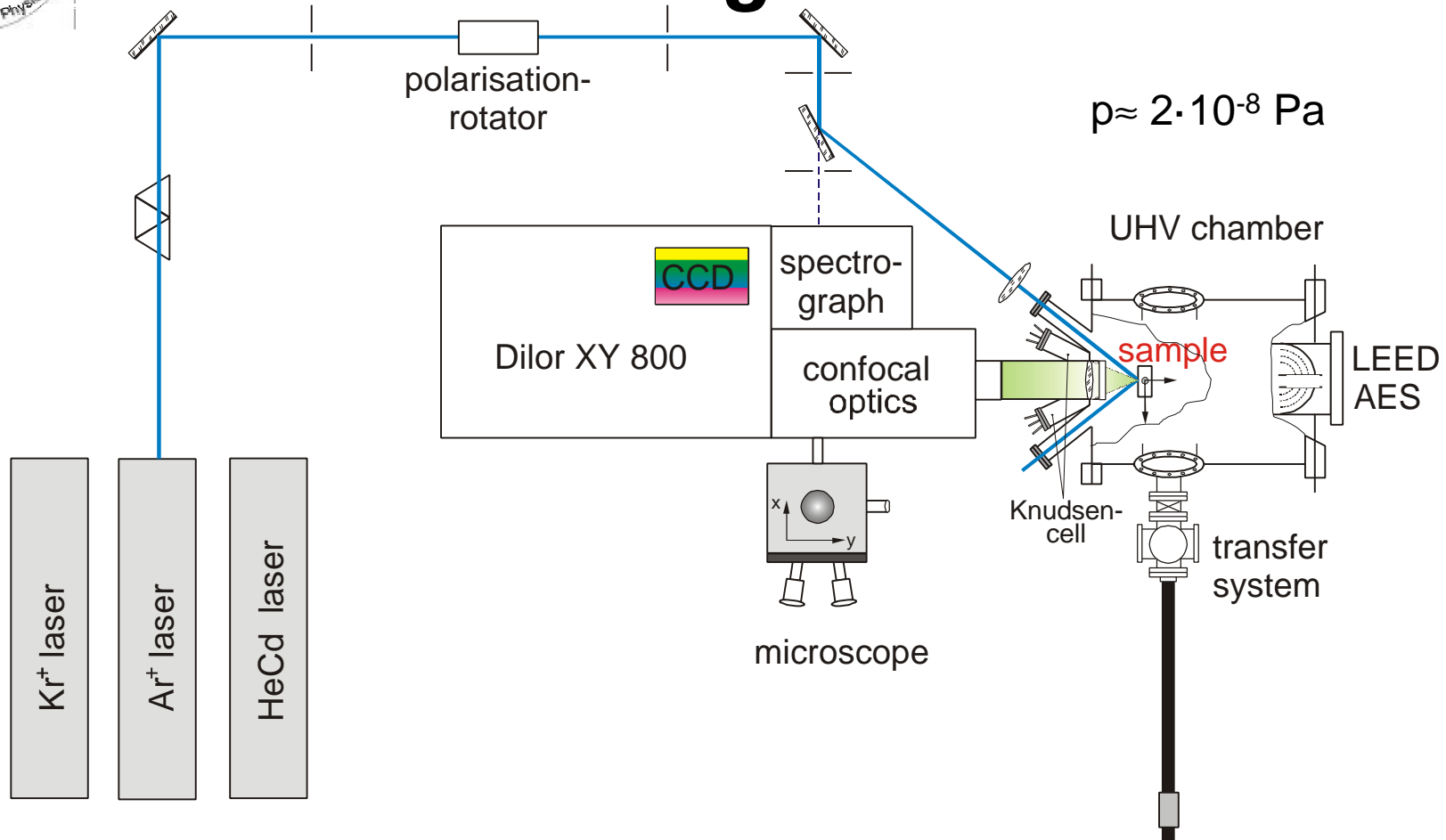
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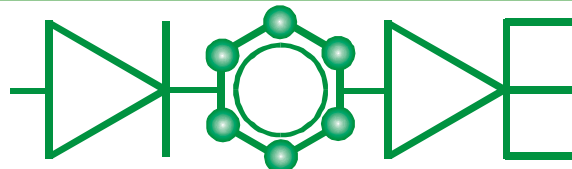
OMBD System and Raman Configuration



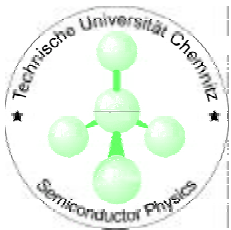
Ar⁺ laser: 2.54eV (488nm) lies in the absorption band of perylene derivatives



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Vibrational Properties of *PTCDA*: Raman Spectra of Molecular Crystal

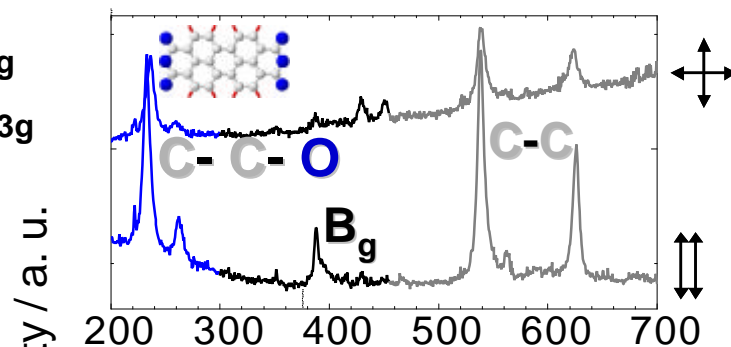
internal molecular modes:

external molecular modes (phonons):

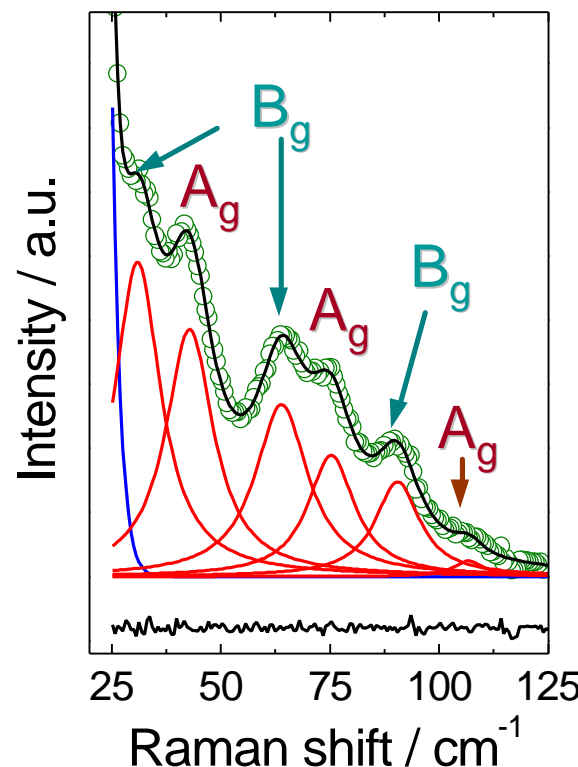
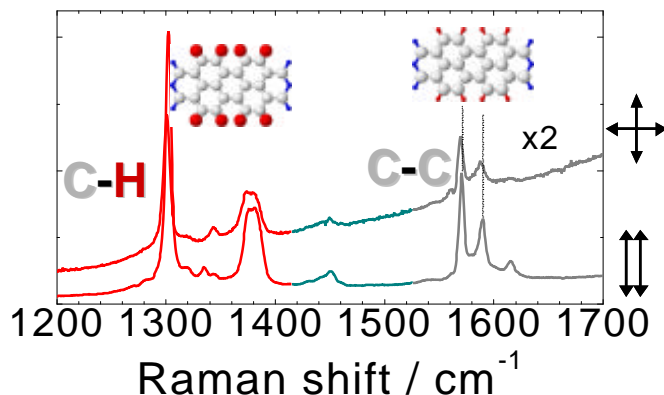
Symmetry: D_{2h}

C_{2h} (monoclinic)

$19A_g + 18B_{1g}$
 $+ 10B_{2g} + 7B_{3g}$



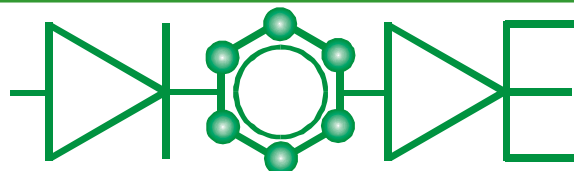
**2-fold
Davydov
Splitting**



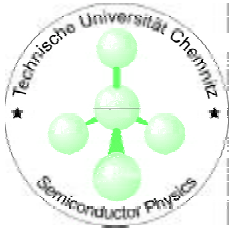
**6 rotational
vibrations:
 $3A_g + 3B_g$**



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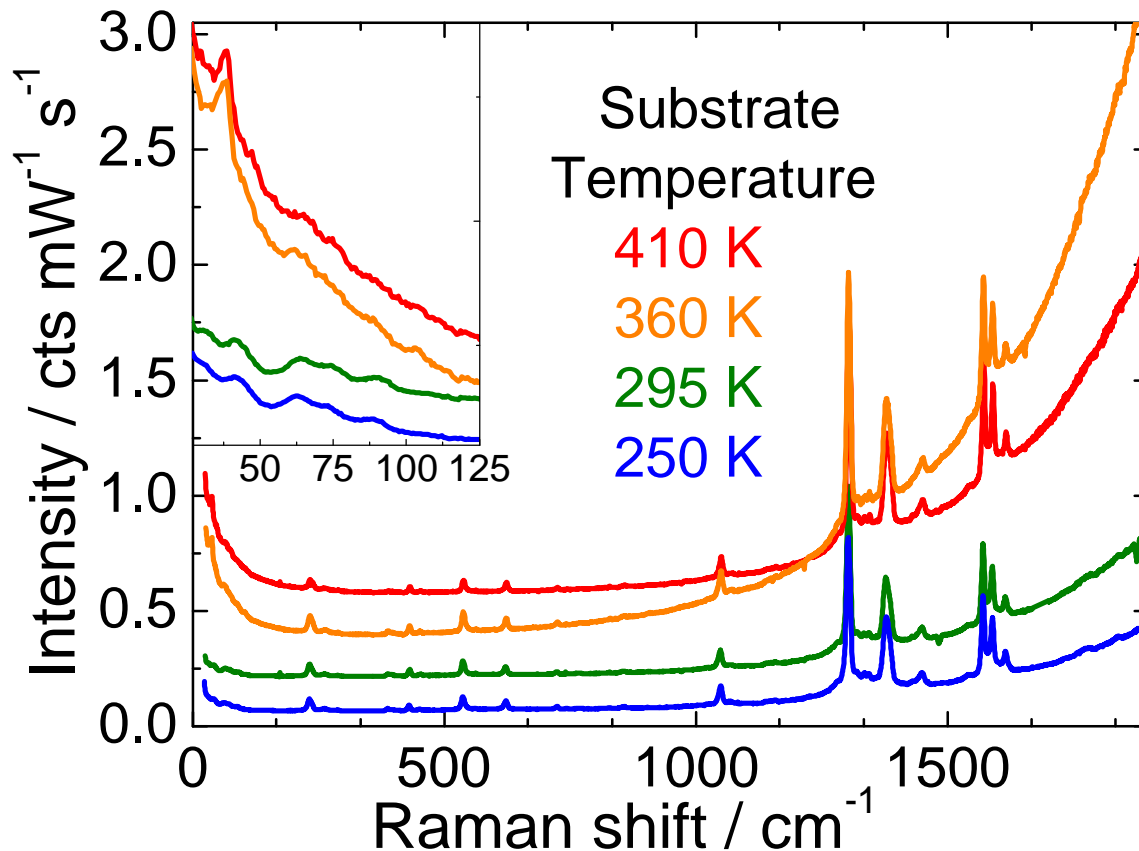


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Influence of Growth Temperature on Raman Spectra of *PTCDA* Films

PTCDA / *GaAs(100):S*



• With increasing substrate temperature :

➤ Increase of the background in the frequency range

low



film

roughness

high

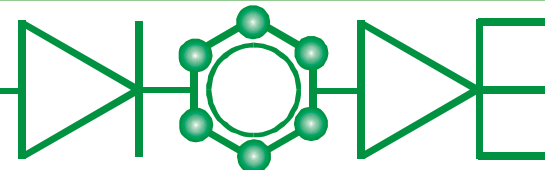


PL

efficiency



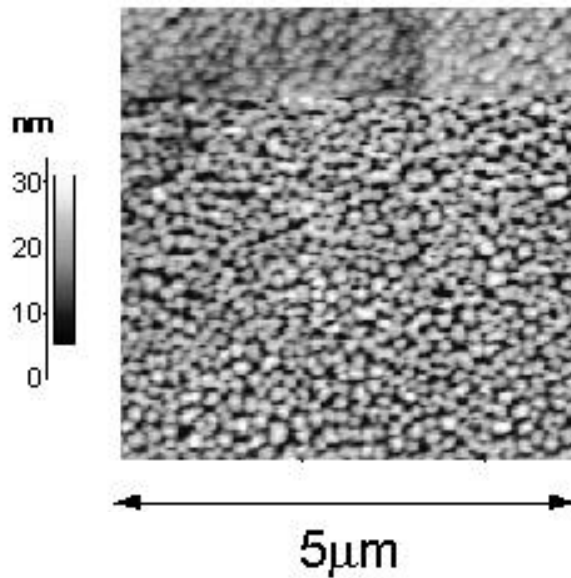
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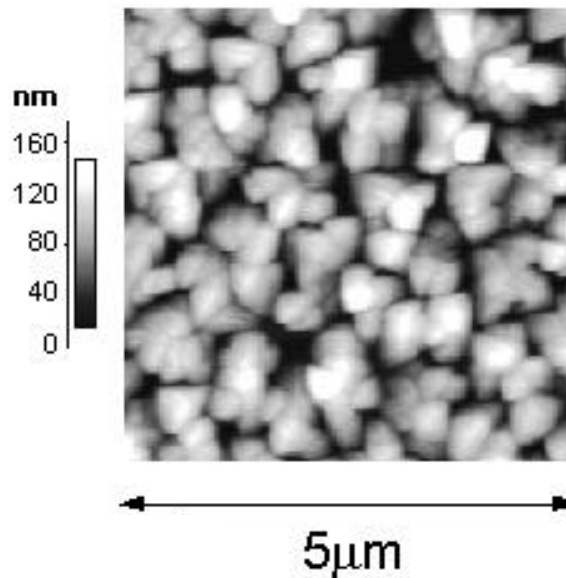
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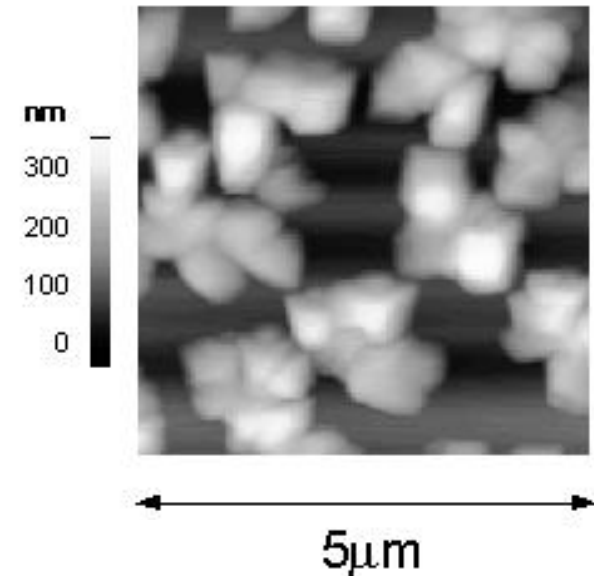
AFM Topography of *PTCDA* Films Grown on *S-GaAs(100)*



$T_{\text{substrate}} = 295 \text{ K}$



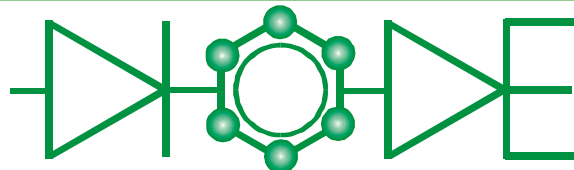
$T_{\text{substrate}} = 360 \text{ K}$



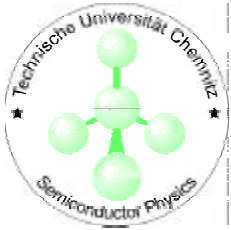
$T_{\text{substrate}} = 410 \text{ K}$



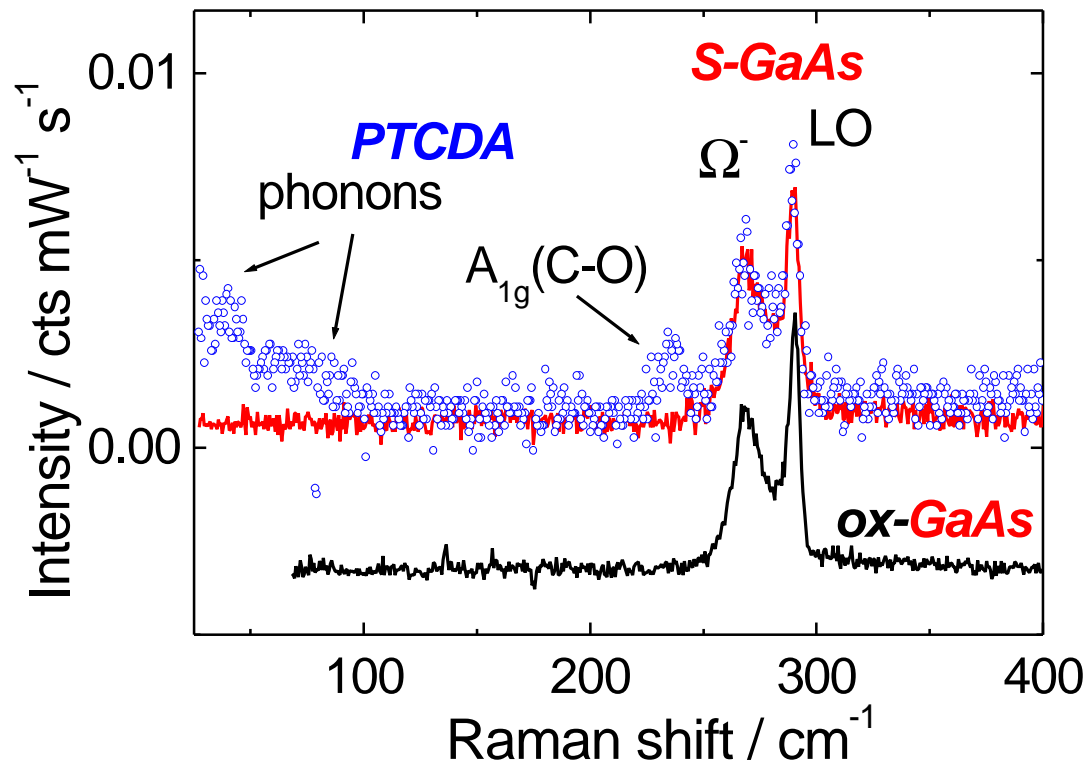
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Probing the Electronic Properties at *PTCDA* / *GaAs* Interface



$$\frac{I_{LO}}{I_{\Omega^-}} \propto e^{2d_n d_{GaAs}^{488nm}}$$

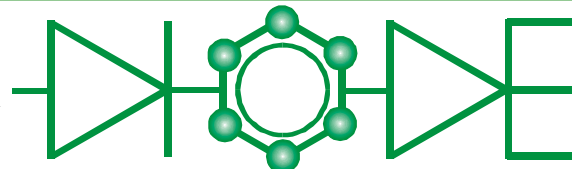
$$d_n \propto \sqrt{V_s(z=0)}$$

Values for the band
bending potential at the
interface

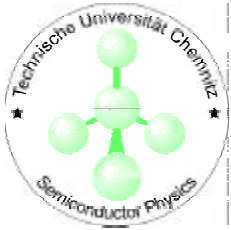
J. Geurts, Surf. Sci. Rep. 18 (1993), 1



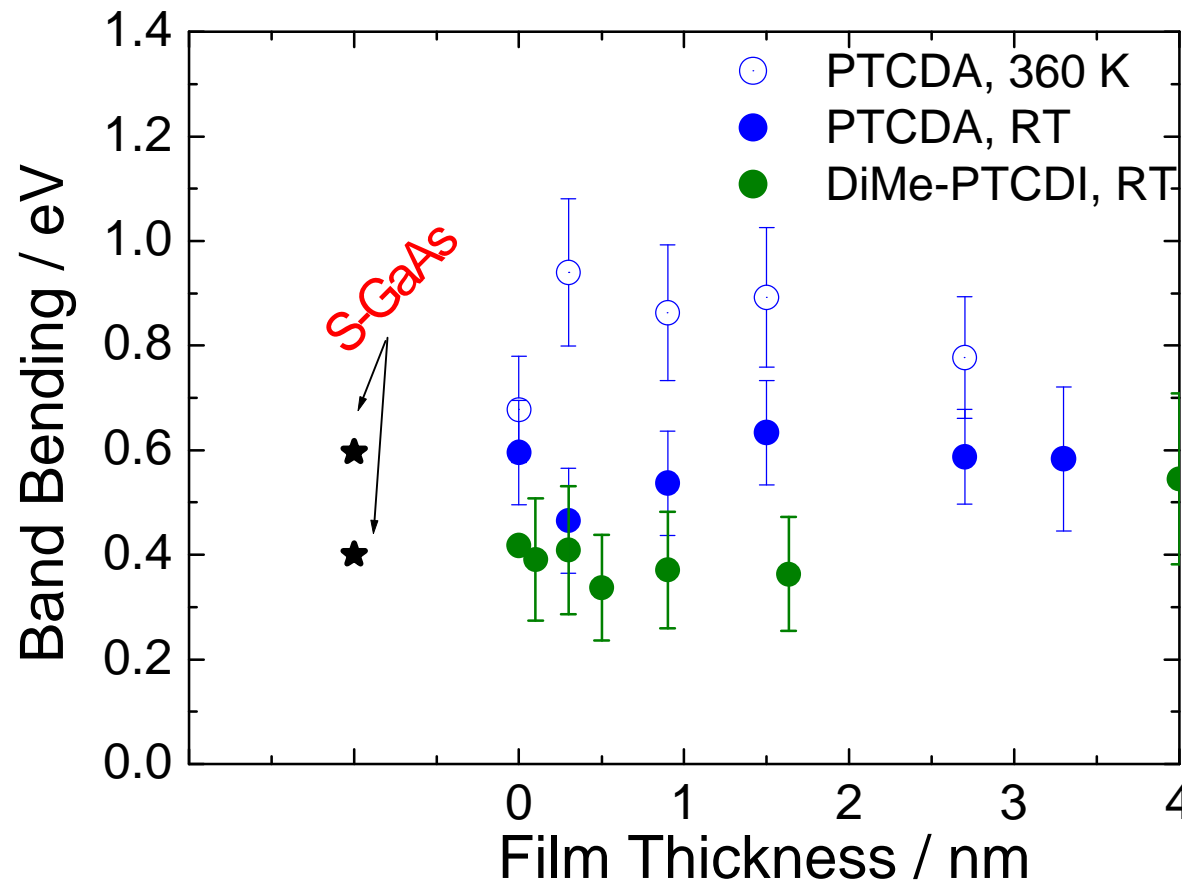
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Band Bending in **GaAs** Upon **Organics** Deposition



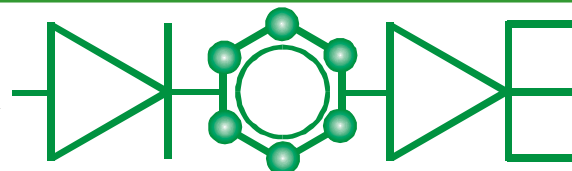
• deposition of **PTCDA** or **DiMe-PTCDI** at RT does not change the band bending of **the GaAs** resulted after the chemical treatment and annealing.

⇒ neither one of the considered organics induce an additional interface charge.

✓ good agreement with photoemission results.

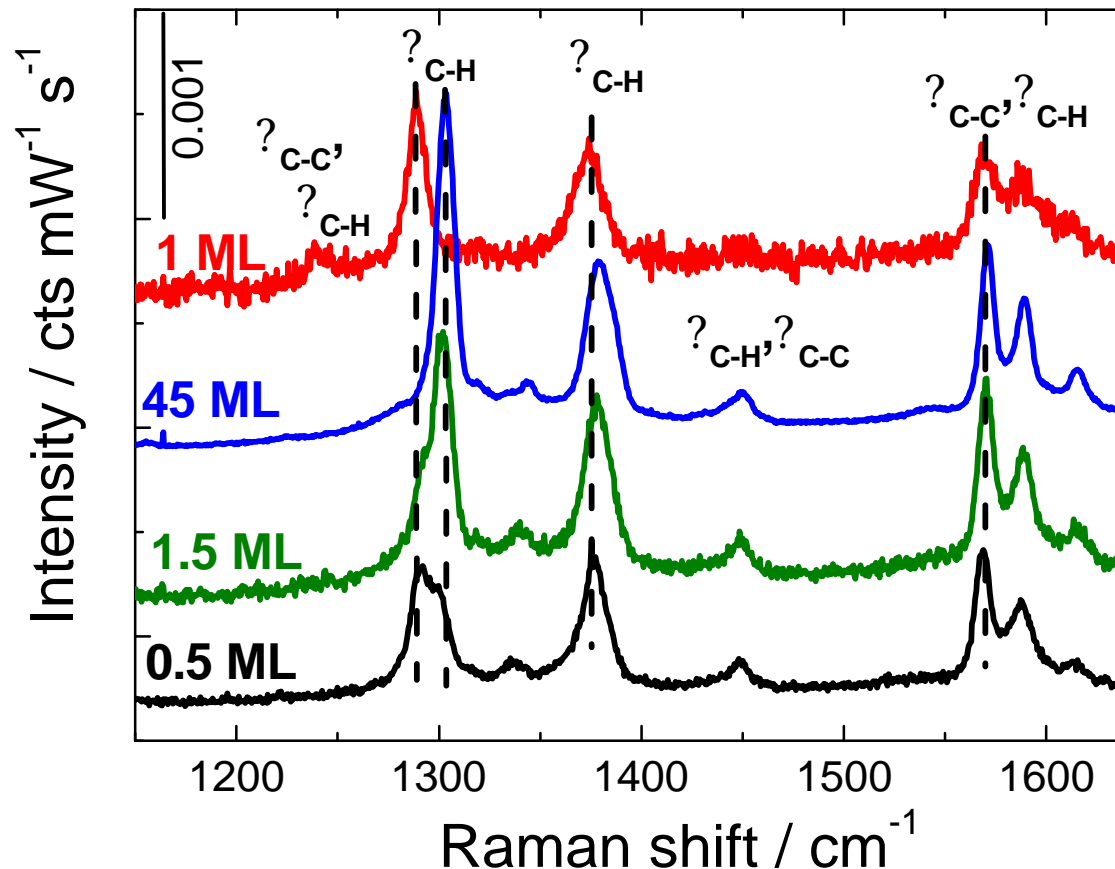


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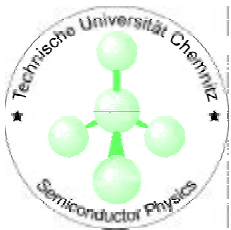
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PTCDA/S-GaAs Interface

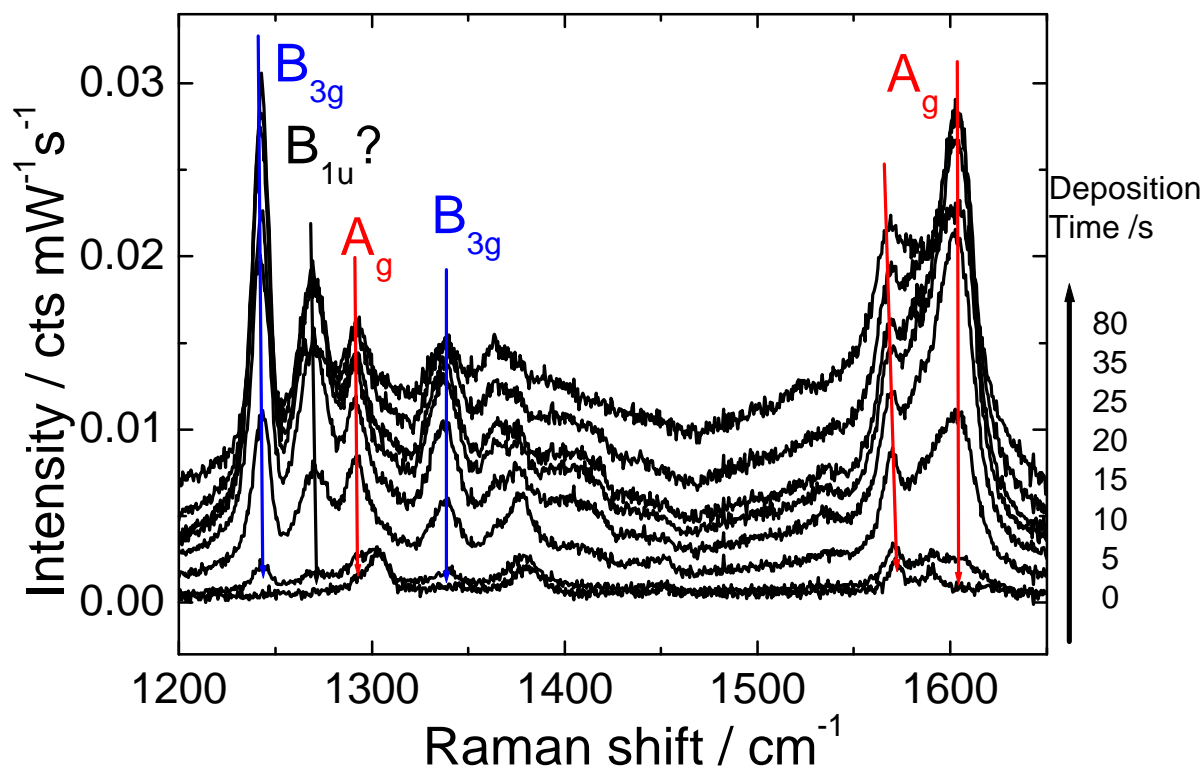


After annealing of a 15 nm (45 ML) film at 620 K for 30 min:

- ~ 0.32 nm (1 ML) remains on the surface.
 - shifts appear in the modes with C-H contribution.
- ⇒ geometrical distortion or small amount of charge transfer (CT) between PTCDA molecules and GaAs.



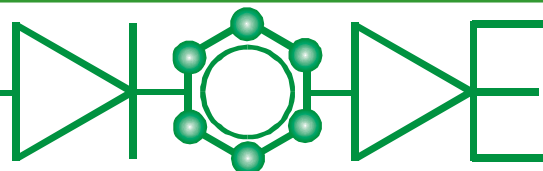
PTCDA MLs upon Ag Deposition



- increase in intensity for the lower symmetry modes (B_{3g}).
- shifts towards lower frequencies of the C-C modes, less than predicted for charged molecules.
 \Rightarrow electromagnetic SERS that may be accompanied by a small amount of CT between **PTCDA** molecules and Ag.
 \Rightarrow similar results for **DiMe-PTCDI**



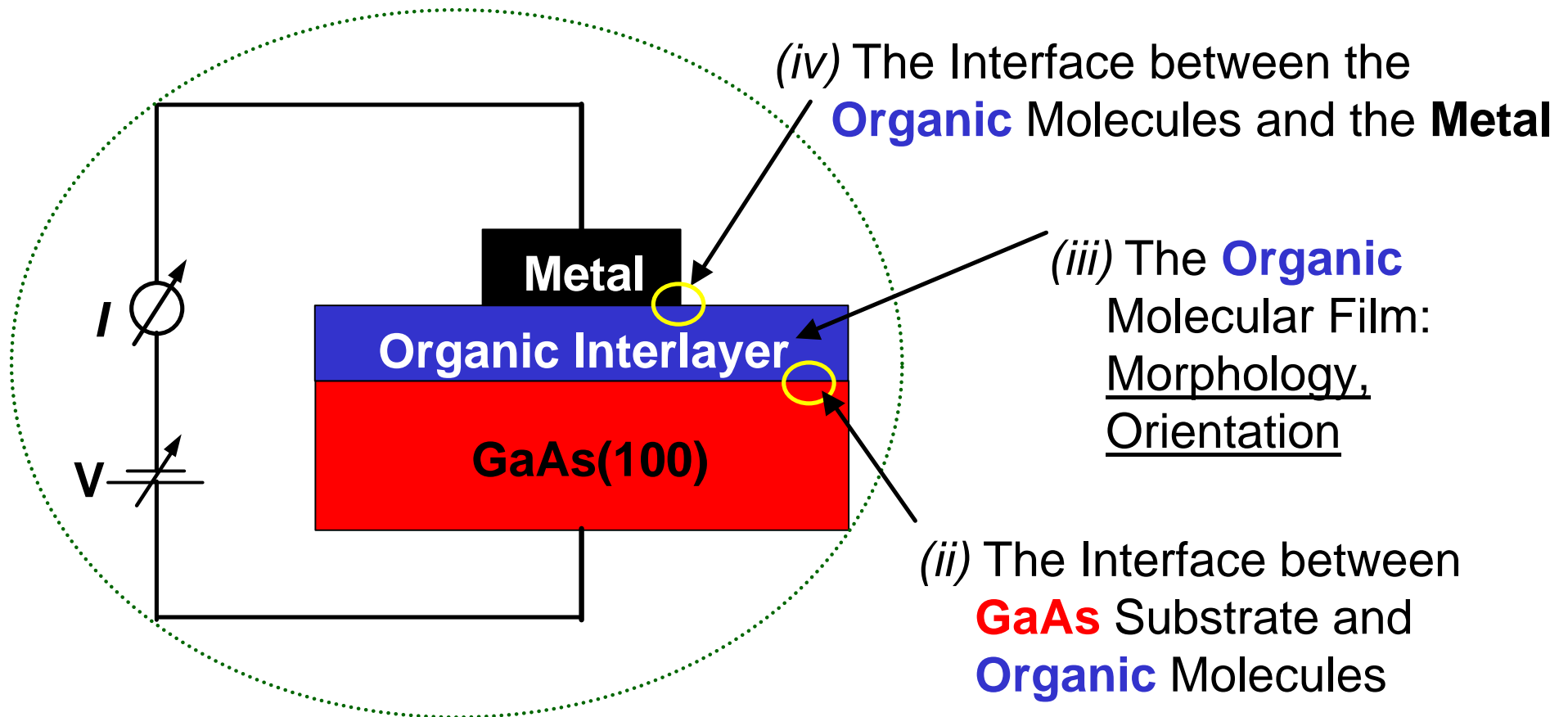
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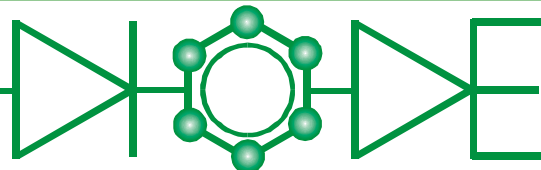
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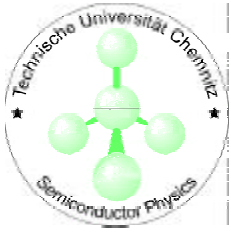
The Application of Raman Spectroscopy in DIODE Project



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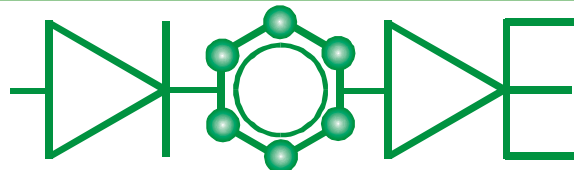
Personal Experience in The Network

Training experience in the group:

- oral presentations practised weekly in the group stimulate:
 - interactive learning of the technique of presentation.
 - scientific discussions.
 - knowledge transfer.
- writing of scientific publications.
- participation in international conferences with oral presentations.



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Personal Experience in The Network

Training experience in the network:

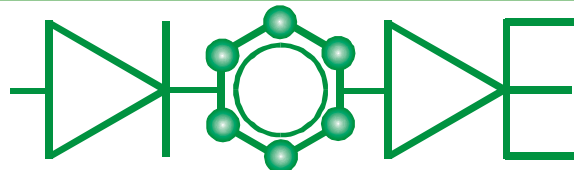
- participation in the workshops organized by the network with oral presentations.
- research stays in Madrid and Dublin with introductions into STM and XPS techniques.
 - meet other young researchers and ease the communication.

Remarks:

- the communication between the young researchers of different nodes can still be improved by organizing weekly net meetings, phone calls.



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