



Nicoleta Nicoara

PhD student

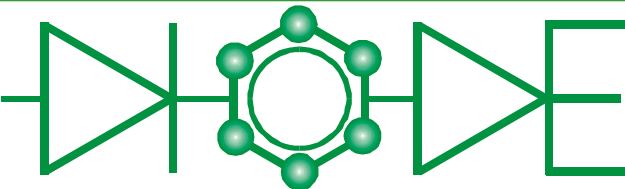
Universidad Autónoma Madrid, Spain
(experimental group)

Laboratorio de Nuevas Microscopías

Prof. Arturo M. Baró



IHP Research Training Network



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Scientific Background

1999 Faculty of Physics, “Babes-Bolyai University”, Bachelor Degree .

Diploma work “ NMR and ESR studies of Polymers ”

2000 Master of Science “Babes-Bolyai University” & “Zaragoza University”.

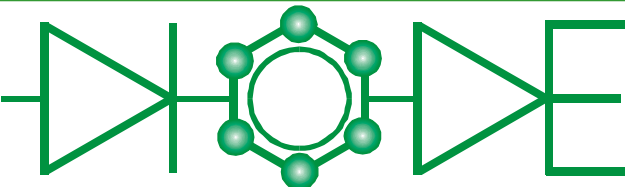
April 2001 Join the DIODE Network as young researcher.

Oct. 2001 Start PhD studies at Department of Condensed Matter.

Universidad Autónoma Madrid (supervisor: Dr. Javier Méndez)



IHP Research Training Network

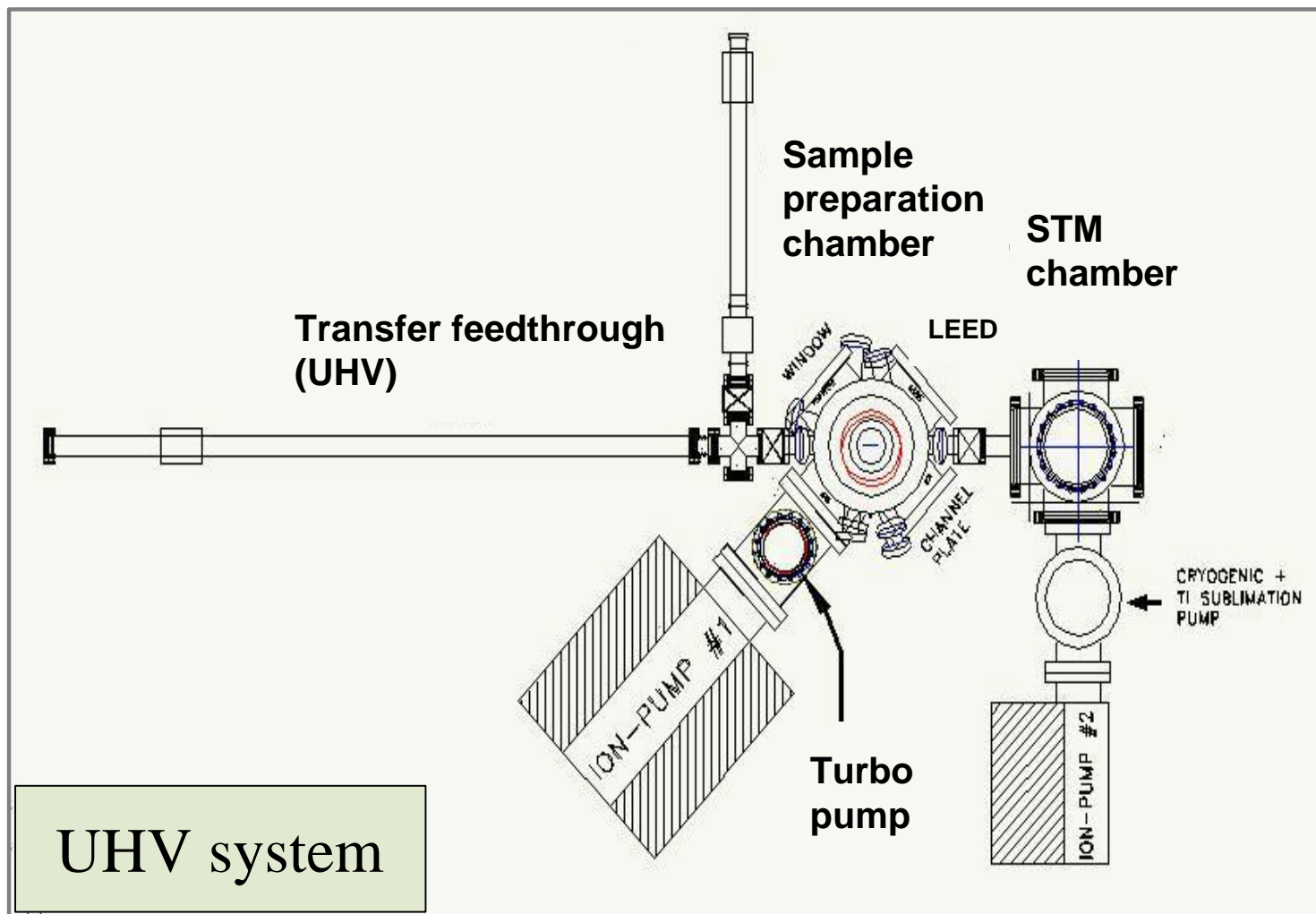


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Scanning Tunneling Microscopy and Spectroscopy study of organic/inorganic interfaces



Experimental setup



STM-beetle type

Contents

- ***Measurement techniques and materials***

UHV experimental set-up

PTCDA organic molecules

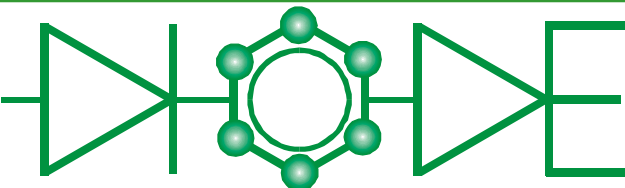
GaAs(100) surfaces – Chalcogen passivated GaAs(100)-2 × 1

– MBE ex-situ GaAs(100)-2 × 4

Au(111) and **Si(111)** surfaces

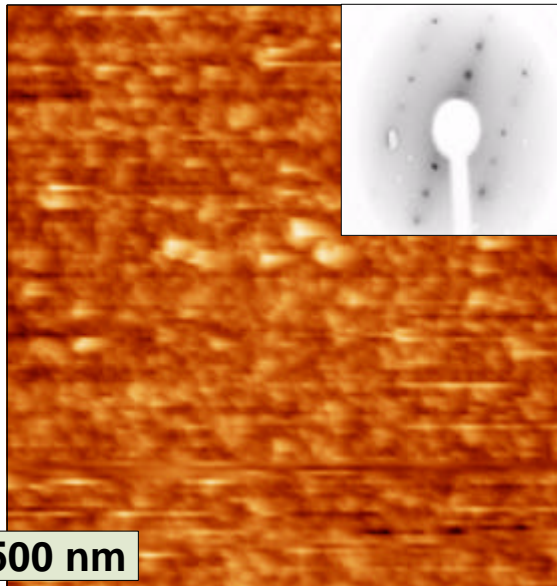
- ***STM results : organic /inorganic interfaces***

- ***Summary***



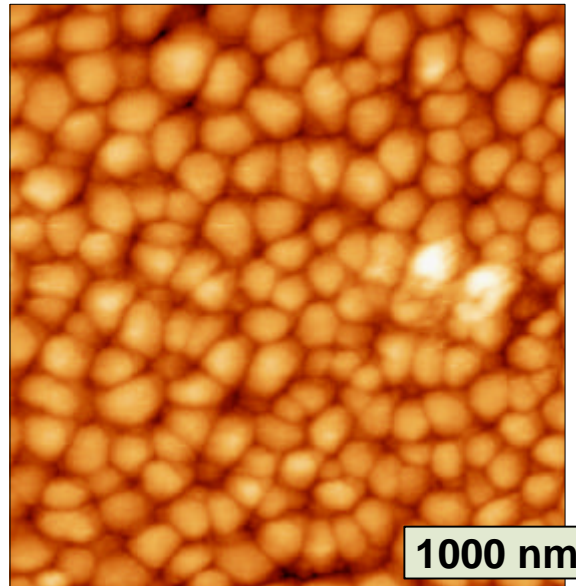
Morphology of the chemically prepared samples

S-GaAs(100)



- rough surfaces
- LEED pattern 2x1 reconstruction

PTCDA /S-GaAs(100)



- organic molecules grown at RT form unordered grains

Chemical passivation

Epi-ready **GaAs(100)**
 $n=1 \times 10^{18} \text{ cm}^{-3}$



Degreasing
Acetone, Ethanol, DI-water



Wet chemical S treatment
 $\text{S}_2\text{Cl}_2 + \text{CCl}_4 = 1:3$, 15 sec
 $\text{S}_2\text{Cl}_2 + \text{CH}_2\text{Cl}_2 = 1:11$, 2 min



Rinsing in CCl_4 ,
Acetone, Ethanol, DI-water

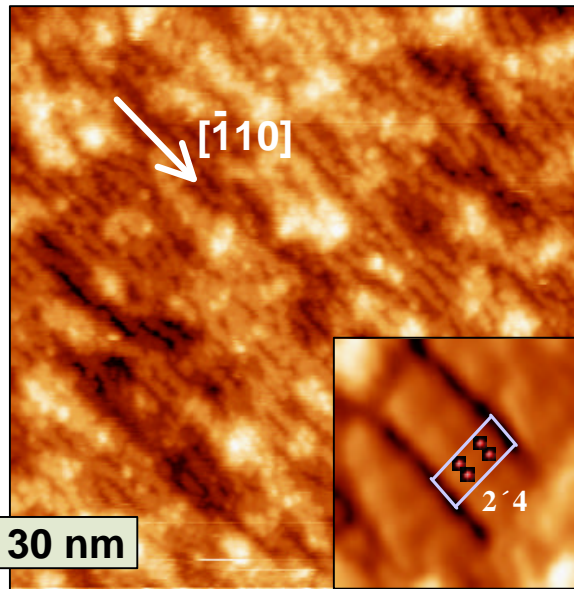


Annealing 450°C , 20 min
2 × 1 LEED pattern

S-passivated GaAs(100)

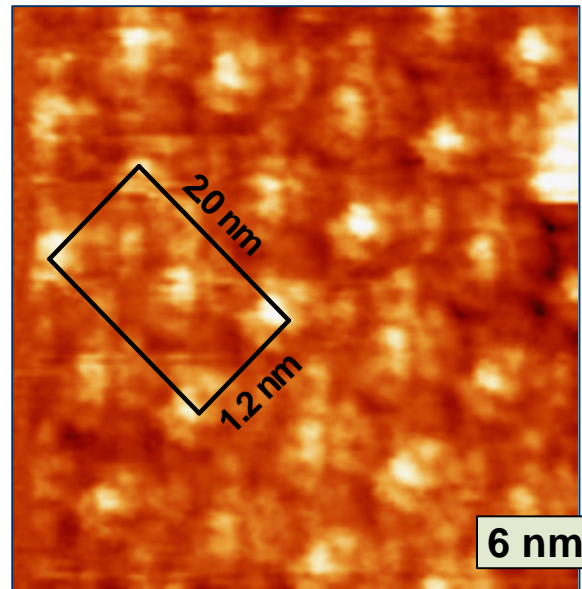
Morphology and structural properties

GaAs(100)



- dimers rows corresponding to the reconstruction of the As-rich GaAs(100).

PTCDA/S-GaAs(100)



- ordered molecules
- the marked unit cell consisting of two molecules corresponds to the bulk PTCDA distances (1.19nm×1.99nm).

MBE As-passivated
GaAs(100)

Epi-ready **GaAs(100)**
 $n=1 \times 10^{18} \text{ cm}^{-3}$



As capped **GaAs(100)**
Insitu As_2 passivation



As desorption
annealing 450°C , 45min
2 × 4 LEED pattern

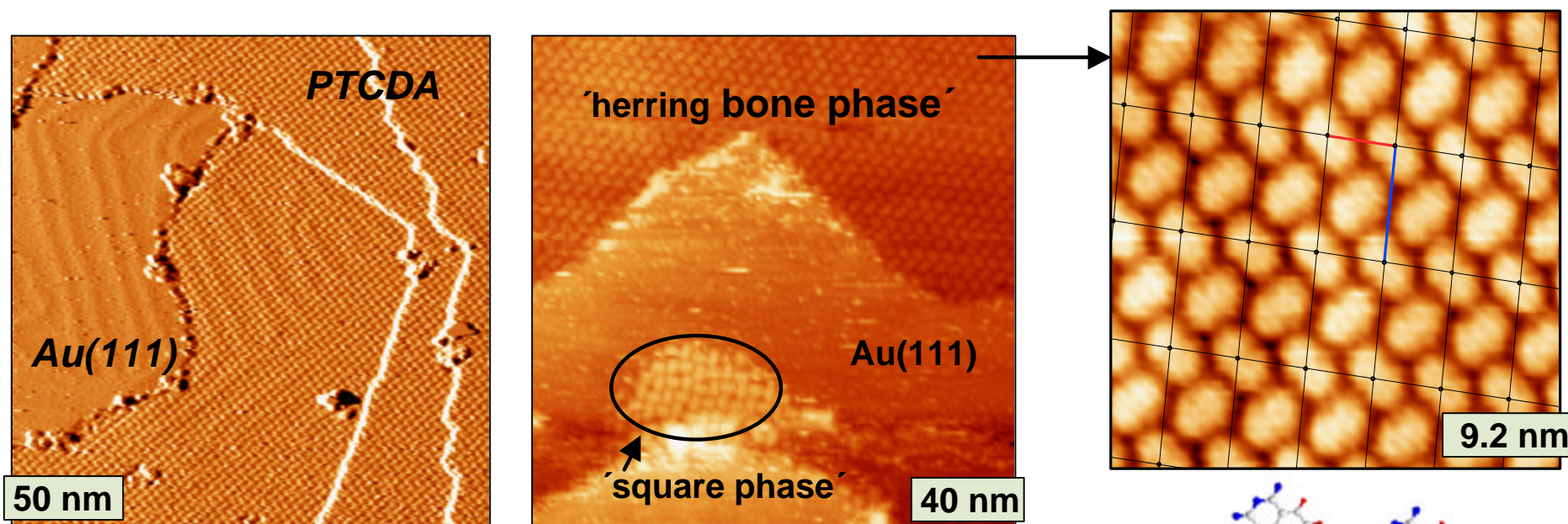


S evaporation ,
decomposition of SnS_2

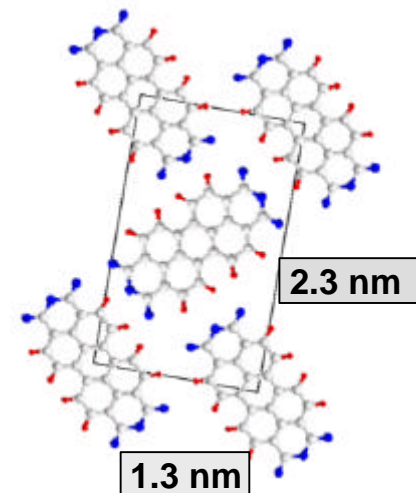


S-GaAs(100) 2 × 1

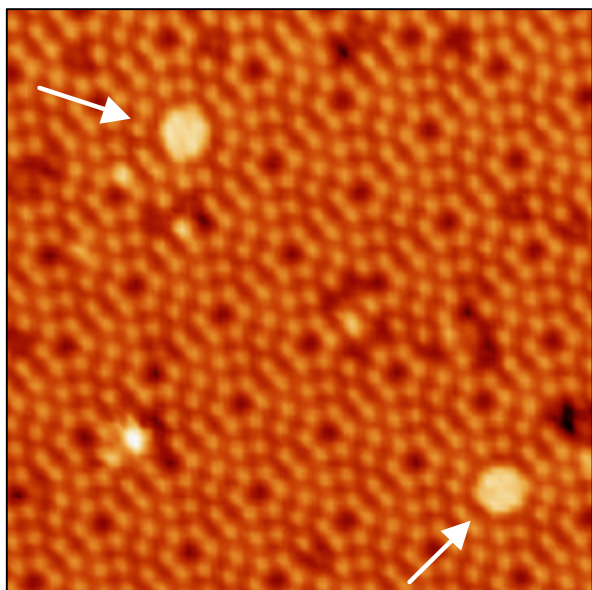
PTCDA / Au(111) ($2\sqrt{3} \times \sqrt{3}$) reconstruction



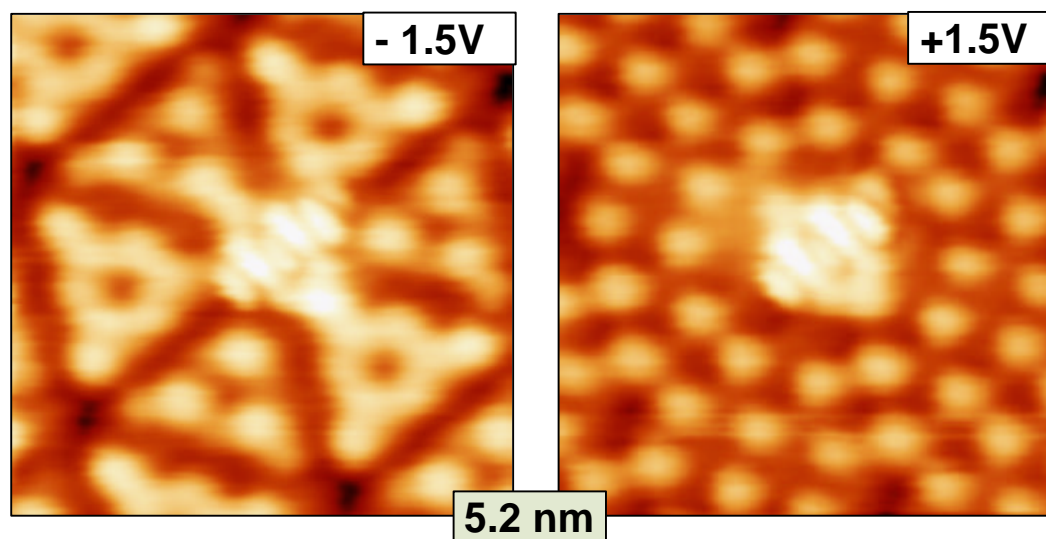
- The Au(111)- ($2\sqrt{3} \times \sqrt{3}$) reconstruction is still visible through the PTCDA monolayer.
- Domains of two different structural phases **HB** and **S** are observed.
- Ordered structure on top of reconstructed Au(111) surface.



PTCDA /Si(111)- (7×7) reconstruction



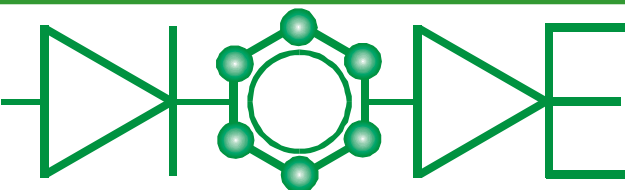
- Isolated molecules at “corner holes”.



- Observation of intramolecular features of single molecules of PTCDA .

Summary

- The growth of **PTCDA** has been investigated depending on the substrate, its treatment and its temperature.
- An important influence of substrate roughness on the ordering of deposited PTCDA is determined.
- Deposition of PTCDA on Au(111) substrate leads to ordered molecules for submonolayer coverage .
- Intramolecular features of individual molecules are resolved for PTCDA deposition on silicon substrate.
- **Future aims**
 - Optimise the growth of PTCDA on GaAs substrate.
 - Investigation extended to other organic molecules.



Diode Network

■ ***Experience***

■ ***Collaborations***

- Gregory Cabailh (**TCD**)
- Joachim Steiner, Ivan Cerrillo (**UWA**)
- Collaborating in STM and AFM Training (UAM)
DIODE-Training Workshop
STM, AFM and Theoretical Simulations
Madrid, 22th - 26th April 2002

