

# **ATOMIC FORCE MICROSCOPY (AFM)**

## **Basics of Instrumentation & Applications**

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# Contents/Outlines

- ❖ Background
- ❖ How does AFM Work?
- ❖ Modes of Operation
- ❖ Advantages and disadvantages
- ❖ General Applications



# Background

- *Is a non-invasive* technic for *surface* characterization of conductive and non-conductive materials

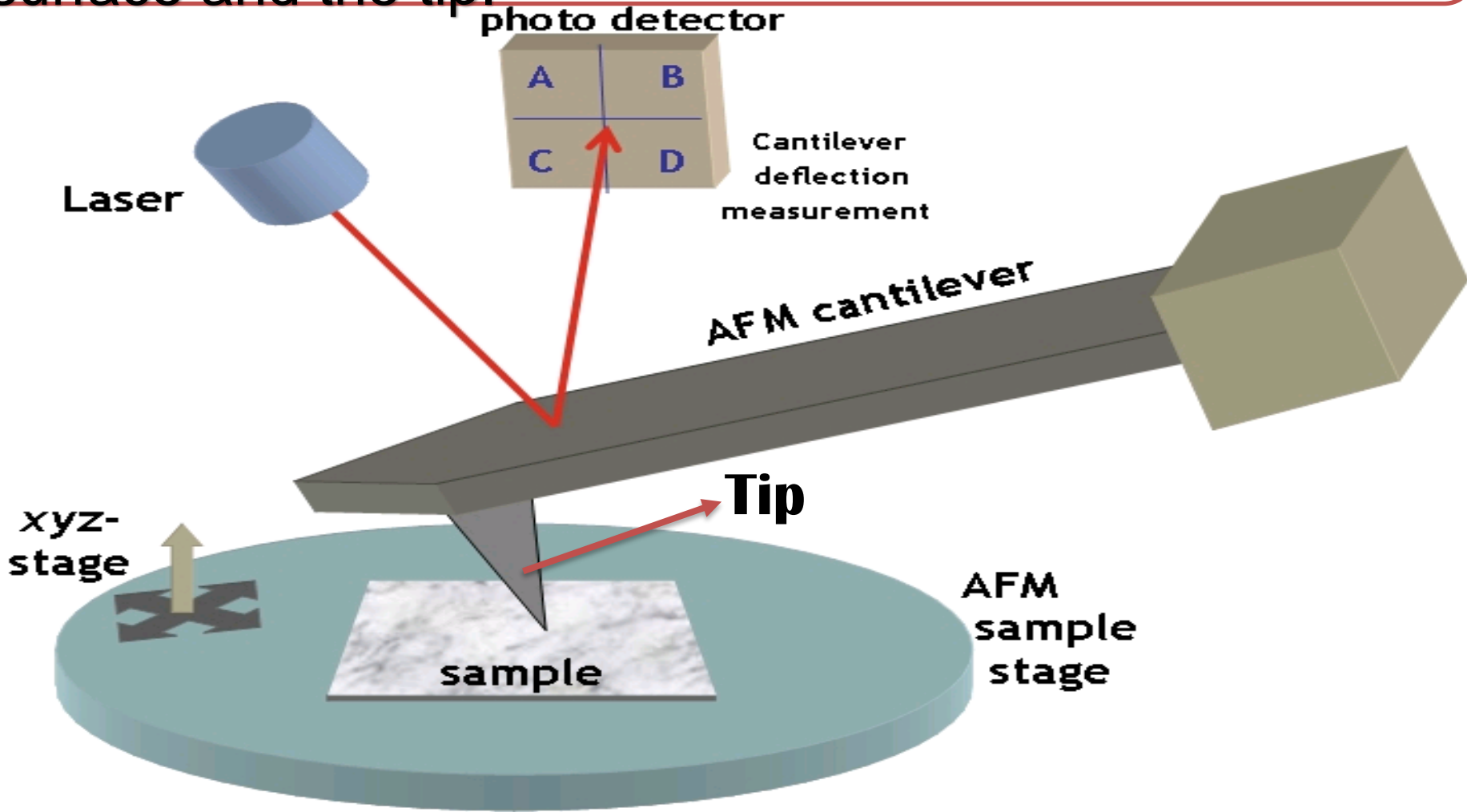
## *History*

- 1986 – Binnig and co-workers
- 1989 – the first commercially available AFM

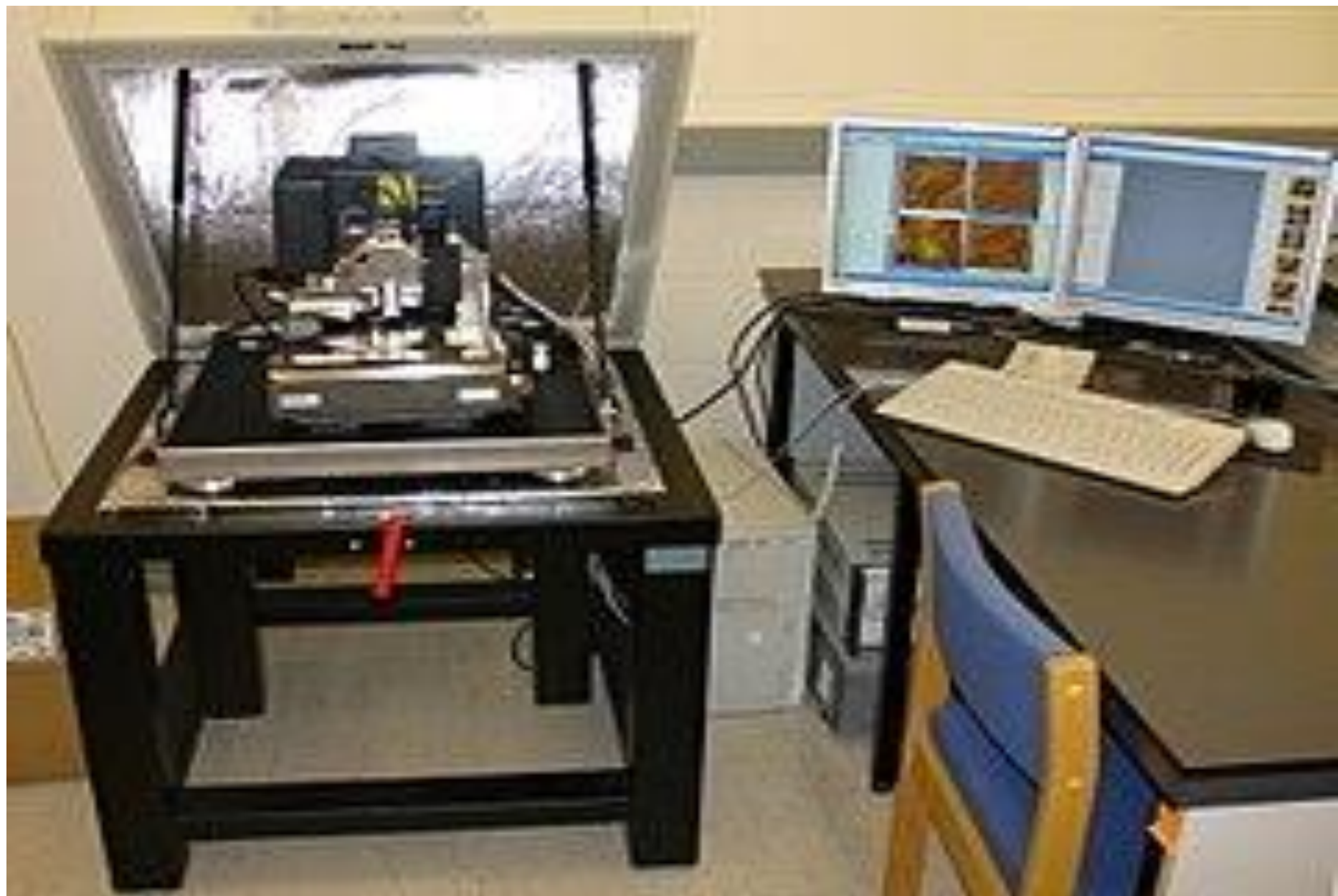


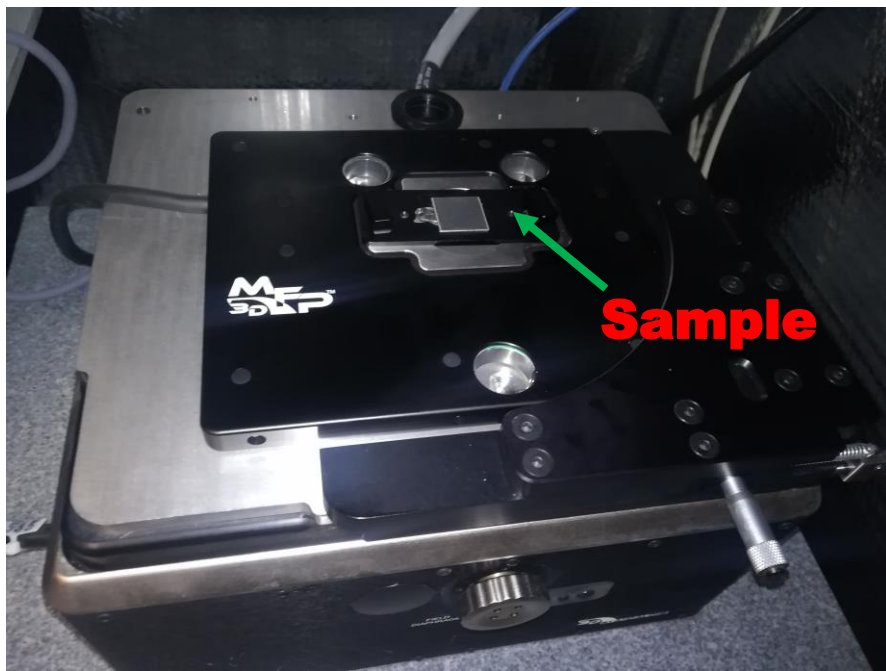
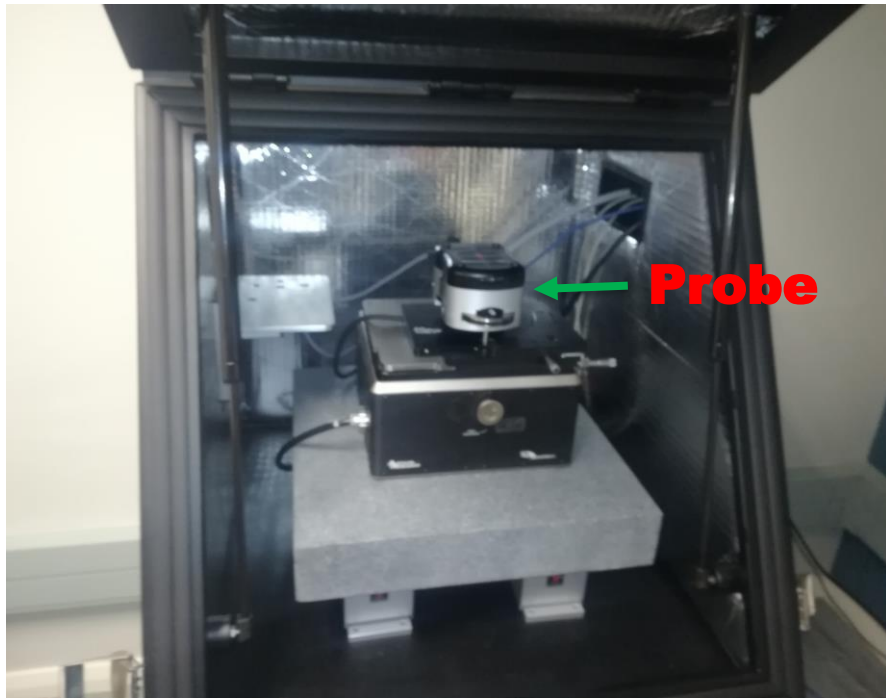
# How does it work?

Operate by using a small tip to scan very closely across a surface, detecting forces present between the surface and the tip.



## ➤ *AFM in the NIC*





➤ *The imaging modes of AFM*

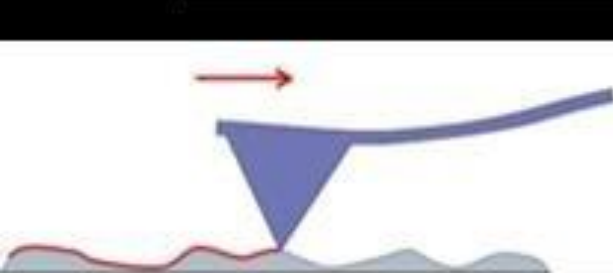
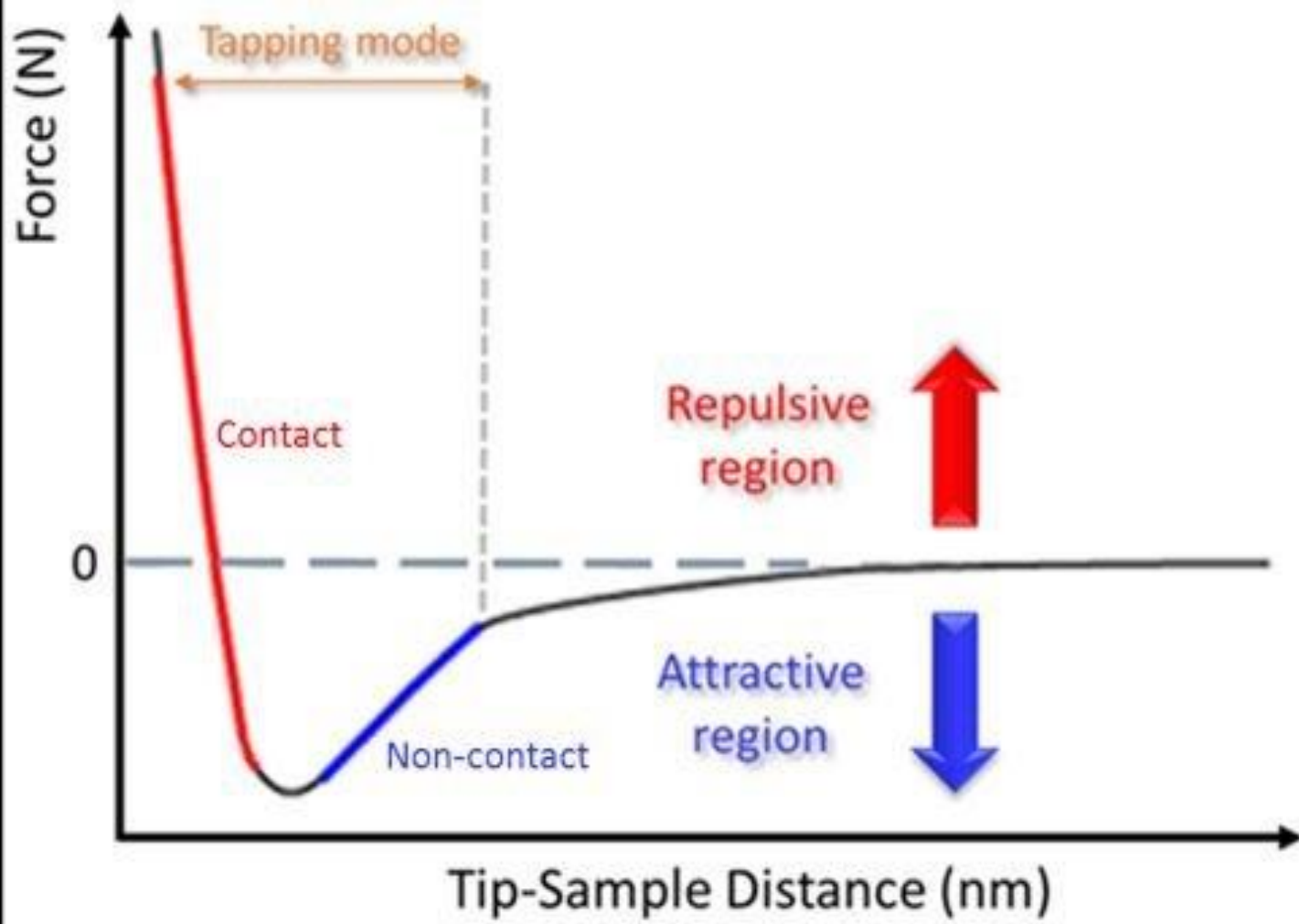
**Three modes of AFM imaging:**

**1. Contact mode**

**2. Non-contact mode**

**3. Tapping mode**





Contact



Tapping



Non-contact



# Advantages and disadvantages of AFM

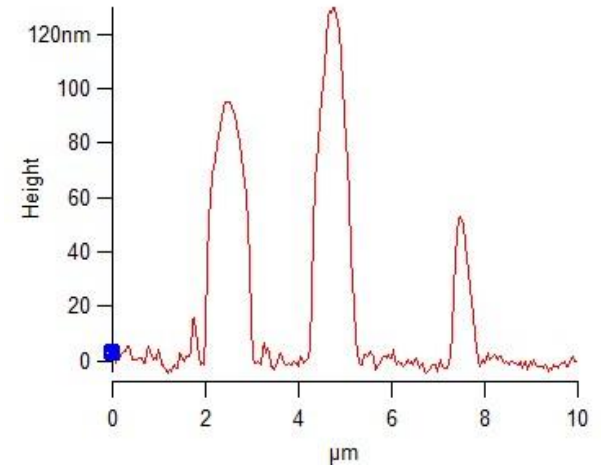
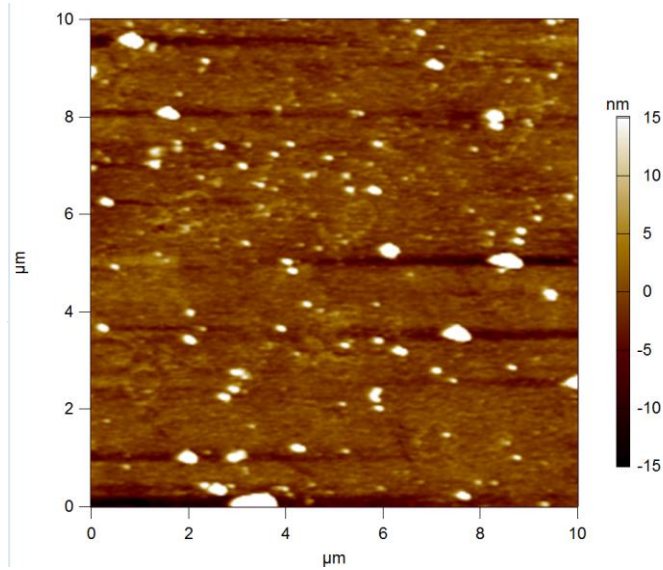
- Easy sample preparation
- Non-destructive imaging
- Precise height information
- Extremely high resolution
- Sample not required to be conductive
- Etc...

- Highly dependent on AFM probes
- Tip and sample can be damaged
- Etc...

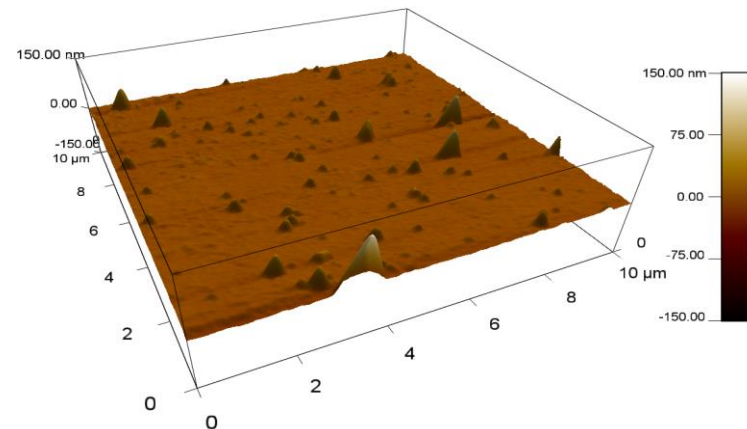
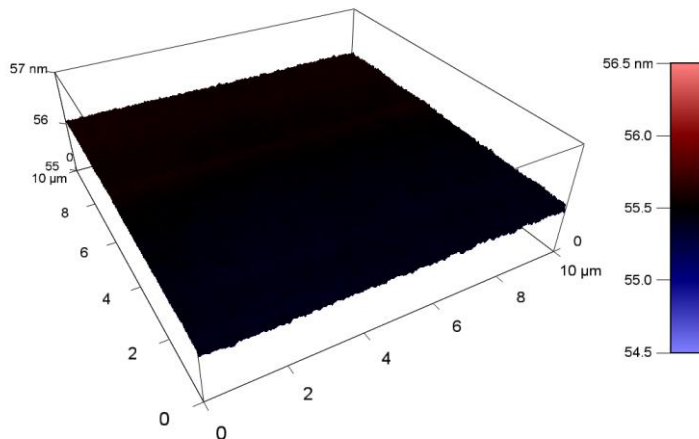
# Some Applications

- ✓ Loading of nanoparticles
- ✓ Electrodes modification
- ✓ Polymer coating
- ✓ Physical properties of materials  
(e.g. hardness, roughness)

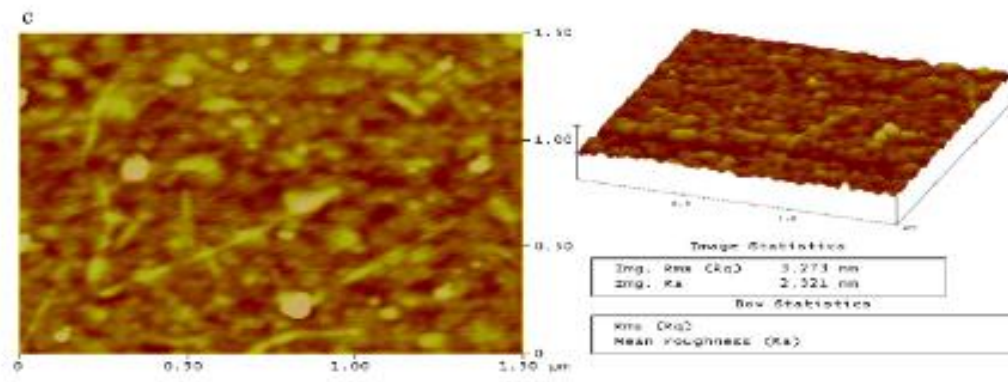
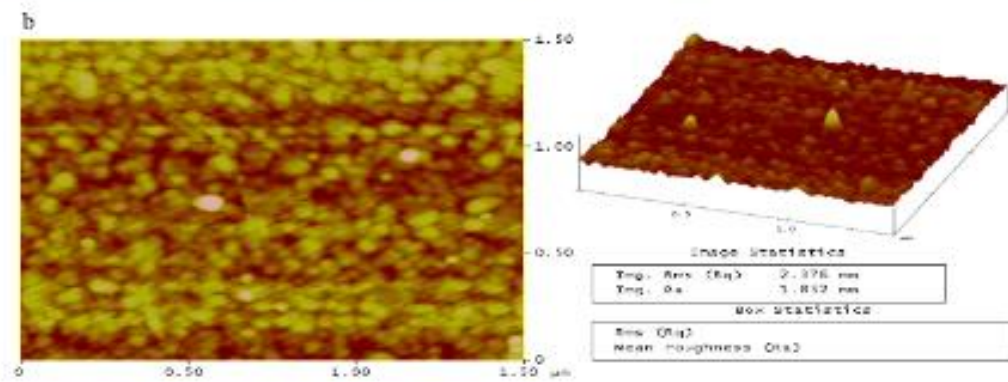
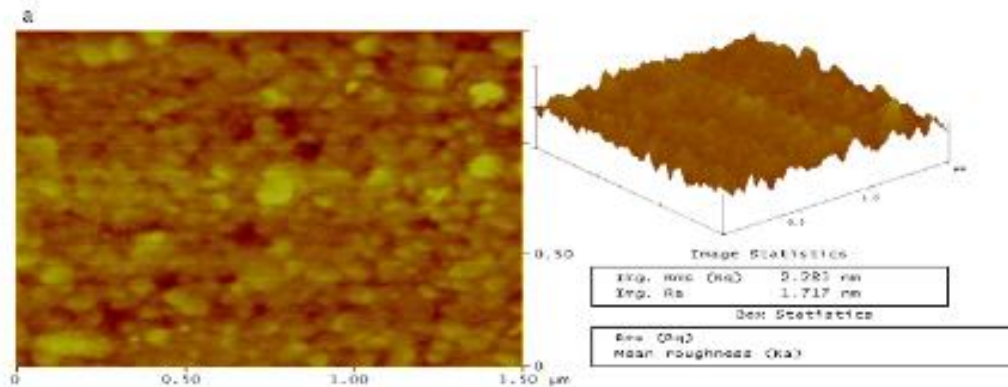
# ➤ Loading of Nanoparticles



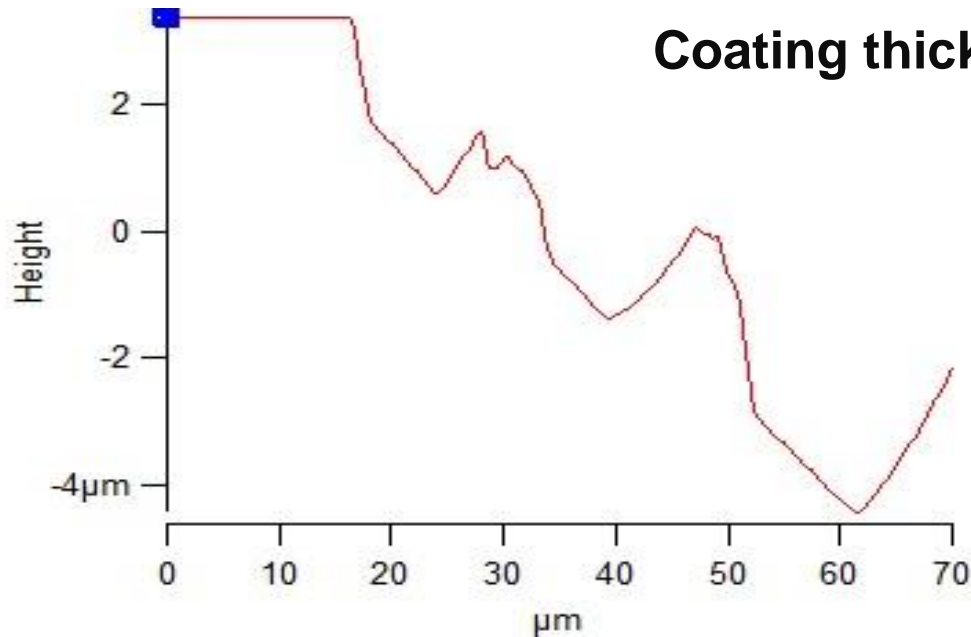
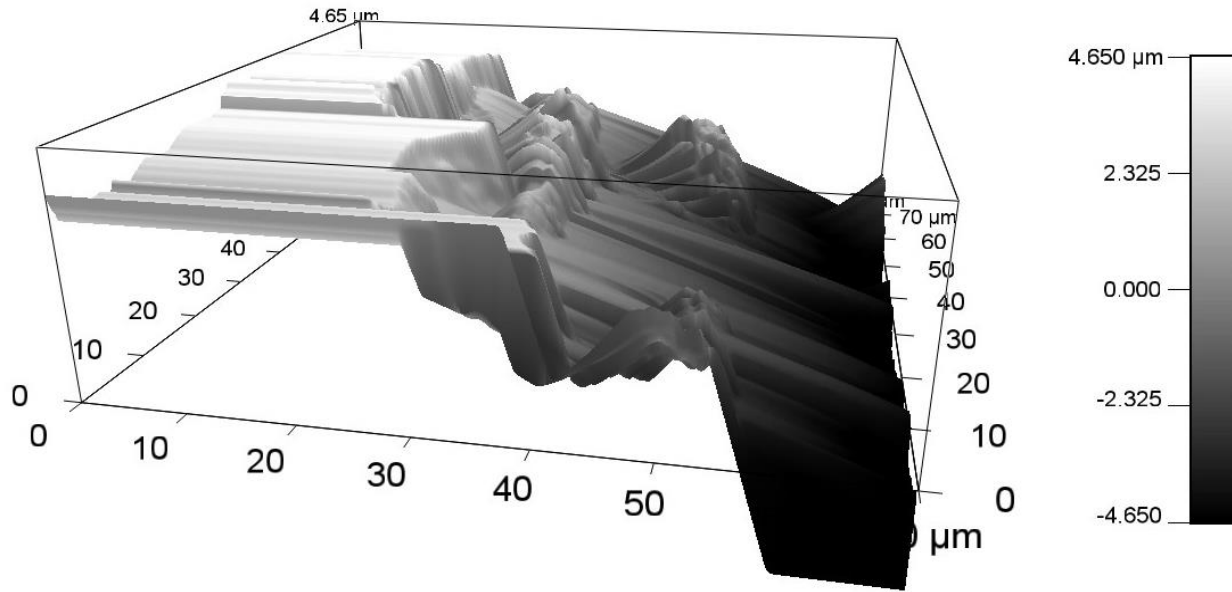
Cross-section



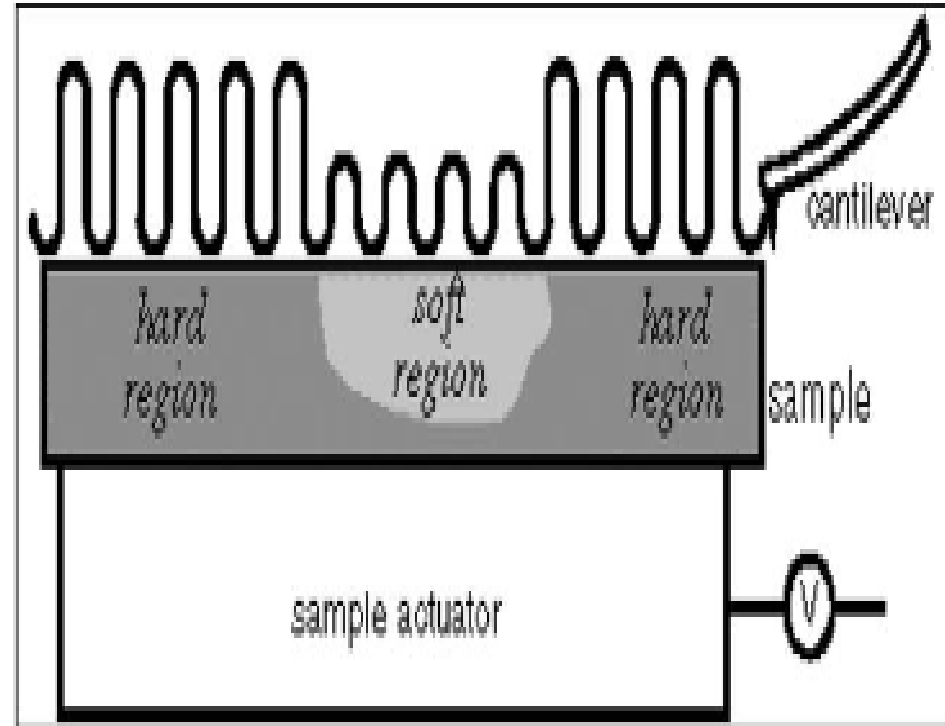
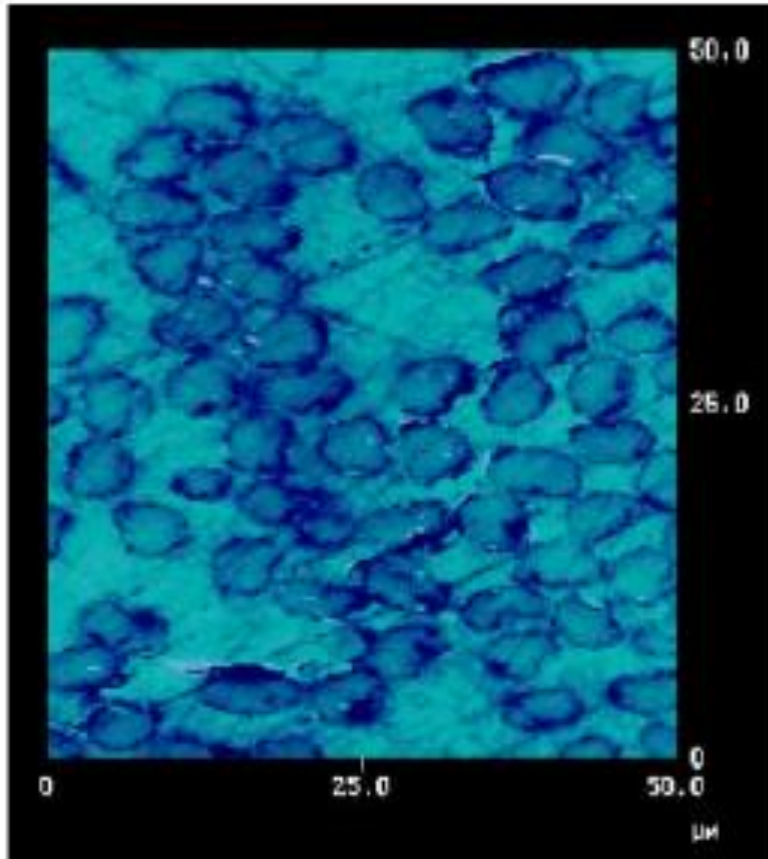
# ➤ Electrodes Modification



# ➤ Polymer Coating



# ➤ Imaging of hardness



**Thank you**

**Merci**

