

## Who we are:

A.P.E. Research (Applied Physics and Engineering Research - APE) is an high-tech company specialised in the production of advanced instrumentation in the field of NanoTechnologies .

A.P.E. Research provides top level scientific instrumentation for research institutes and for industries: instrumentation for surface analysis, such as Scanning Probe Microscopes (SPM), profilometers and different kinds of electronic devices.


Main applications are in fields of basic sciences: chemistry, physics and biology.

Based in Trieste, APE is a dynamic company with over 15 years experience in nanotechnology.

As a part of **Trieste's Science System**, APE mission is to promote the state of art of technology for everyday and advanced applications, with special focus to **support Universities, Research and Training centres**.

A.P.E. Research invested a lot on the latest AFM, making it more affordable for researchers. This would enable more and more researchers to perform advanced research studies, favouring the growing demand for SPM products and **promoting scientific capacity and excellence for science-based development**.

A.P.E. Research supports the idea of **human mobility and training on nanotechnologies**, which have been recognized by the EU as one of the four key enabling technologies. It also stresses that the **Trieste Science System** can offer a comprehensive approach on nanotechnologies.

For these reasons APE would share some opportunities with The logo for twas, featuring the word "twas" in a stylized, blue, lowercase font.

Opportunities to be shared with TWAS for: **twas**

**PhD Students, Junior and Senior Scientists/Researchers, Professors**

### 1) PROPOSAL FOR TWAS RESEARCH GRANTS PROGRAMME

Providing cost effective instruments to **research groups** with close support in terms of training.

- a) special **scanning probe microscopy** E-20 designed for TWAS holder of Research Grants.  
Configuration for S&TL (Science & Technology-Lagging) Countries involved in TWAS Research Grants programme.
- b) special **multipurpose profilometer** designed for TWAS holder of Research Grants.  
**Optical & Stylus profilometer and Optical Coherence Tomography (OCT)**  
Configuration for S&TL (Science & Technology-Lagging) Countries involved in TWAS Research Grants programme.

### 2) PROPOSAL FOR TWAS YOUNG AFFILIATES INITIATIVES

Providing cost effective SPM to research groups with close support in terms of training.

- c) special **scanning probe microscopy** system.  
Configuration for Emerging Countries involved in TWAS Young Affiliates initiatives: two models for TWAS
  - **A100 AFM Material Science** <http://www.aperesearch.com/products/afm/a100/index.html>
  - **TriA AFM BioMaterial** <http://www.aperesearch.com/products/afm/triaspm/index.html>
- d) Under some limitations (only for selected Countries and with approval of A.P.E. Research ) it will be possible to purchase also the instruments in point 1 a) and 1 b).

### 3) HIGH ADDED VALUE ACTIVITIES FOR KNOW-HOW TRANSFER

Complementary access to our laboratory located in Basovizza Campus (Trieste-Italy) for:  
Students PhD and scientists for training on use of SPM and Raman spectroscopy ;  
Researchers for using advanced instrumentation for targeted nanotech research activity;  
Know-how and technology transfer on nanotech SPM applications.

## A100 SPM scanning system:

The system can be equipped with various type of scanners for different working ranges

### Standard scanner technical data:

X-Y scan size:

100 x 100  $\mu\text{m}$  (high voltage mode);

10 x 10  $\mu\text{m}$  (low voltage mode)

Resolution high voltage mode:

Closed loop: 2 nm, Open loop: 0.2 nm

Closed loop linearity: 0.1%.

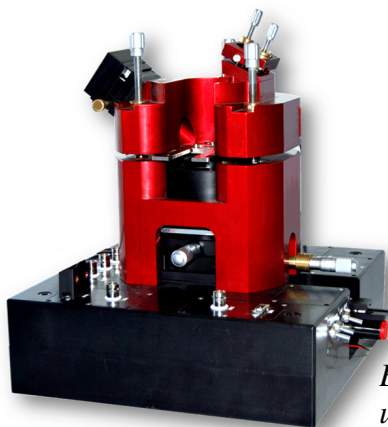
Z scan size:

10  $\mu\text{m}$  (high voltage mode)

1  $\mu\text{m}$  (low voltage mode)

Resolution: 0.16 nm (high voltage mode),

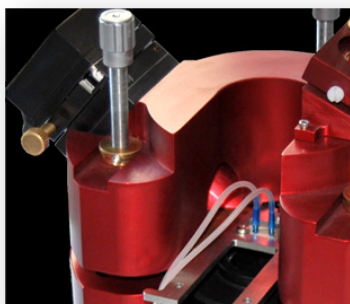
0.02 nm (low voltage mode).



*Based on specific demands other scanning ranges can be combined by the user in different configurations\*\*.*

### AFM Head

AFM Head with holder for commercial cantilevers. The holder can be removed to easily mount cantilevers. The head also houses laser, photo-diode sensor with preamplifier.



### SPM Control System:

SPM Control Unit and PC (equipped with a multi input-output board) drives the scanner, data acquisition and sample motion.

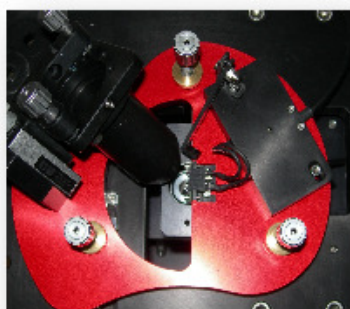
Tip to sample distance is controlled by ultra-low noise analog feedback, digitally driven by PC. High speed and temporal precision are provided by hardware timing.

### High Voltage Amplifier

HVA is an amplifier module projected to drive A-100 scanning Stage

### Acquisition software

Software runs under Windows and is composed of a multi-window applications for instrument control and data acquisition. The software comes equipped with simple filters for immediate analysis of acquired images. The software controls all the parameters of the instrument



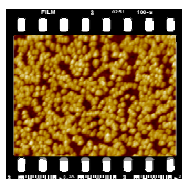
### Accessories:

A.P.E. Research has developed additional AFM tools for specific measurements modes\* (EFM, MFM, STM, Phase Imaging, CAFM, KPM Nanolithography, etc...).

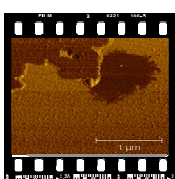
\* Some of the SPM techniques are requiring additional specific tools/accessories.

\*\* Please contact us for specific configuration.

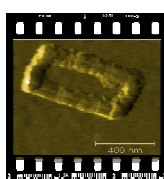
## SOME SPM IMAGES EXAMPLES



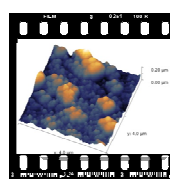
TiO<sub>2</sub>  
nanoparticles



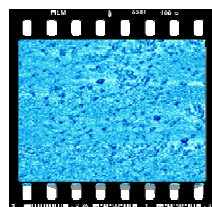
Phase contrast  
Co-polymeric film



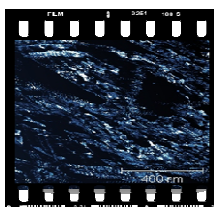
Lateral force on  
In<sub>2</sub>O<sub>3</sub>Sn<sub>10</sub>



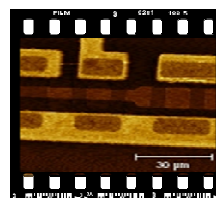
3D rendering of  
CuInS<sub>2</sub>



EFM map  
HFB assemblies on Si



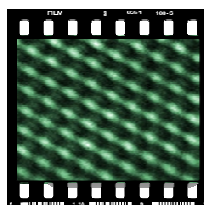
ITO  
conductive map



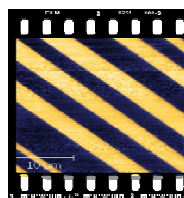
Kelvin potential map on a circuit



Nanolithography



Photocrystal  
SNOM collection mode



Piezo force on PPLN

## SOME OF OUR USERS WORLDWIDE



ÉCOLE POLYTECHNIQUE  
FÉDÉRALE DE LAUSANNE

