LIFE SCIENCE IN NANO SCALE

ara-research.com

INTRODUCTION

Biological Atomic Force Microscope (Bio-AFM) is one of the most important tools for studying samples in biology.
Bio-AFM provides an appropriate platform for merging atomic force microscope and optical microscope in biological research projects.
The ability of Bio-AFM to capture images in various environments along with different operation modes allows scientists to study the structure and properties of living cells and other biological samples such as DNA and RNA, proteins, viruses, bacteria, tissues, etc. The microscope uses physical scanning for nano imaging and sample preparation is relatively simple and does not require **freezing**, **metal coating**, **vacuum**, or **dye injection**.

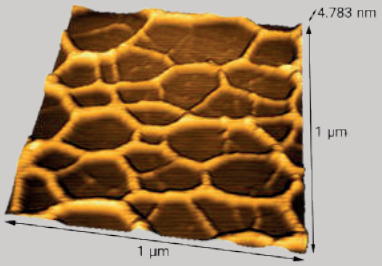
APPLICATIONS

- Imaging **biological samples** with high resolution in buffer solution.
- Topographical imaging down to angstrom scale resolution from **live organisms**.
- Investigation of intermolecular forces (**force spectroscopy**) in biological structures.
- Nano-scale study of **mechanical properties** of biological Samples.
- Investigation of the **Ligand-Receptor** binding.
- The **Antibody-Antigen** interactions studies.
- Study of the **unfolding of proteins**.
- **Cutting out different sections** of chromosome for genetic analysis by applying directed force.
- The possibility of performing **Chemical Lithography.**

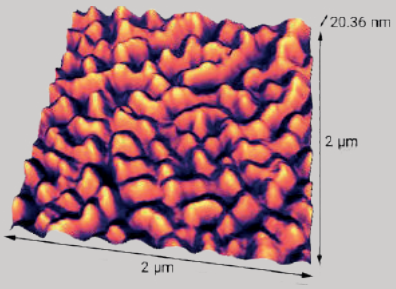
KEY FEATURES

- Simultaneous use of an **inverted microscope** and a **digital microscope** from above during scanning.
- Easing optical adjustments by **changing the laser optical path.**
- A modern and easy way of **tip fixation** with a **vacuum pen**.
- Accurate fixing of tip position by using **Chip Alignment** template.
- Optimum and easy application due to **head weight reduction**.
- **Fast, automatic, and safe approach** at any distance of tip and sample.
- Single **LAN** cable connection of the **device to the computer**.
- Improvement of the **user-friendly interface** for the system software.
- Ability to **view** and **save** optical images in addition to nano-scanned images.

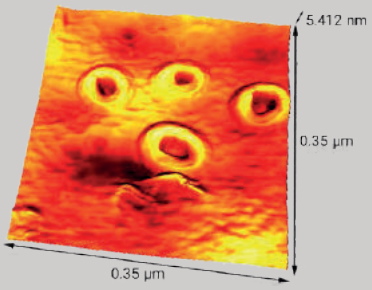
SAMPLE PICTURES



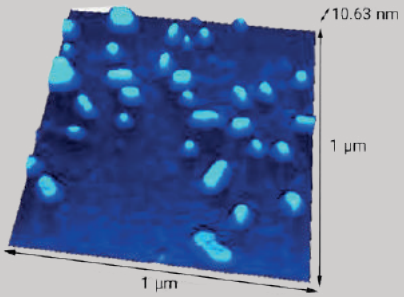
DNA



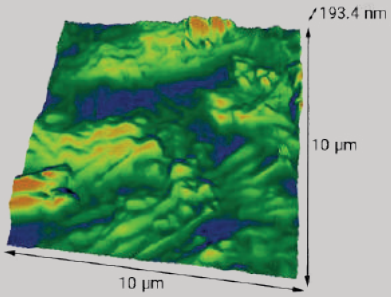
Bee's eye



Tau proteins after injection



Flu Vaccine



Rabbit Cartilage

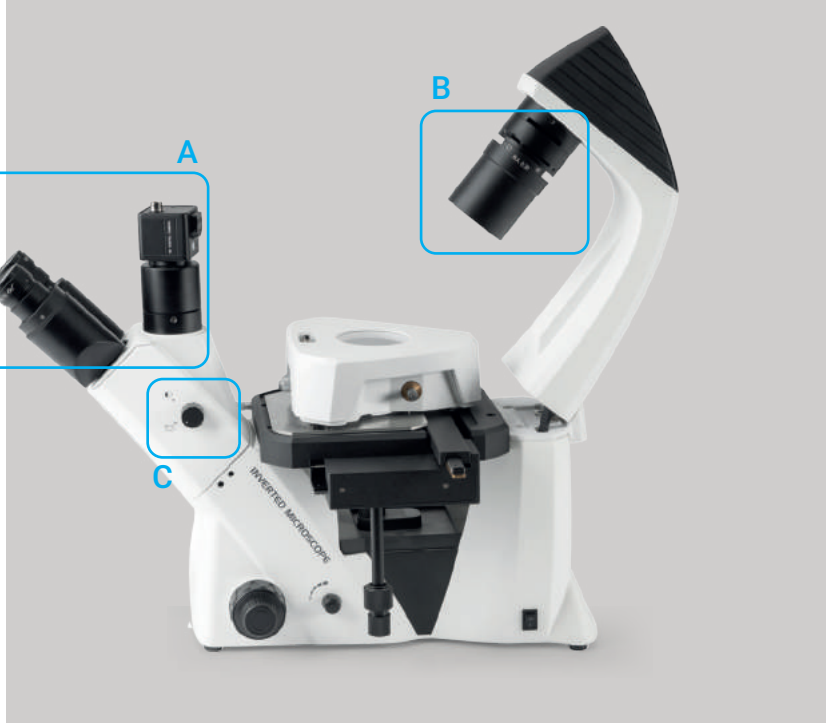
AFM and INVERTED MICROSCOPE INTEGRATION

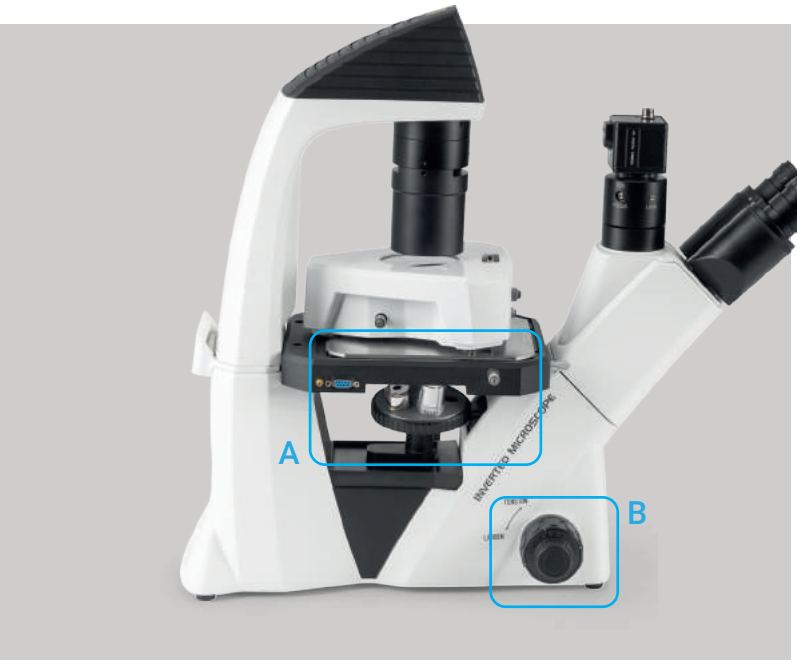
A: Biological samples are viewed from under neath by an **inverted optical microscope.**
The **Bio-AFM** model can be coupled with **desired types of inverted microscopes** according to the client's needs.

B: **Exposure from above** and the possibility of adding a **condenser** and **optical filters** with different color spectrums to view all kinds of biological samples such as cells, viruses, etc.

C: The possibility of viewing the inverted image as **CCD** output or through **ocular lenses** according to the user's choice.

- The possibility of being equipped with an **inverted fluorescent microscope.**



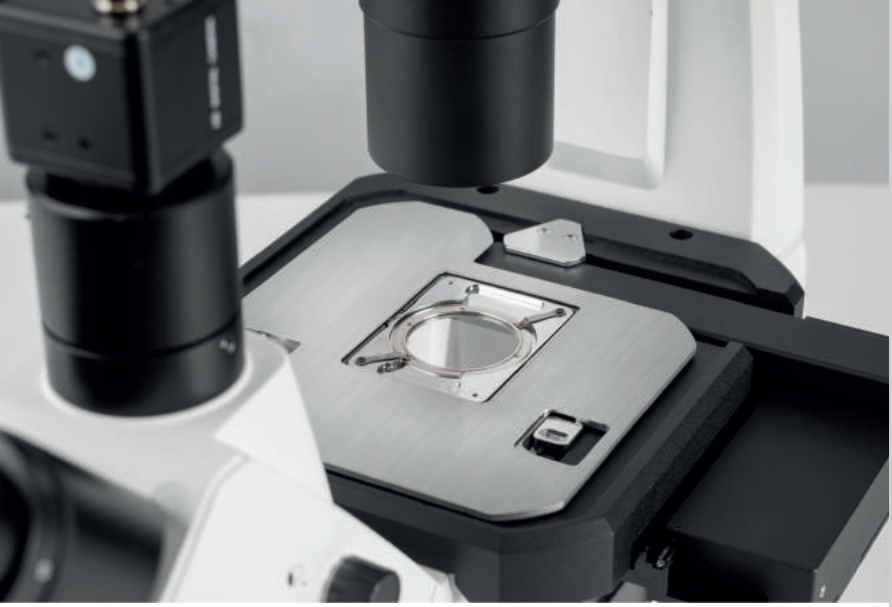


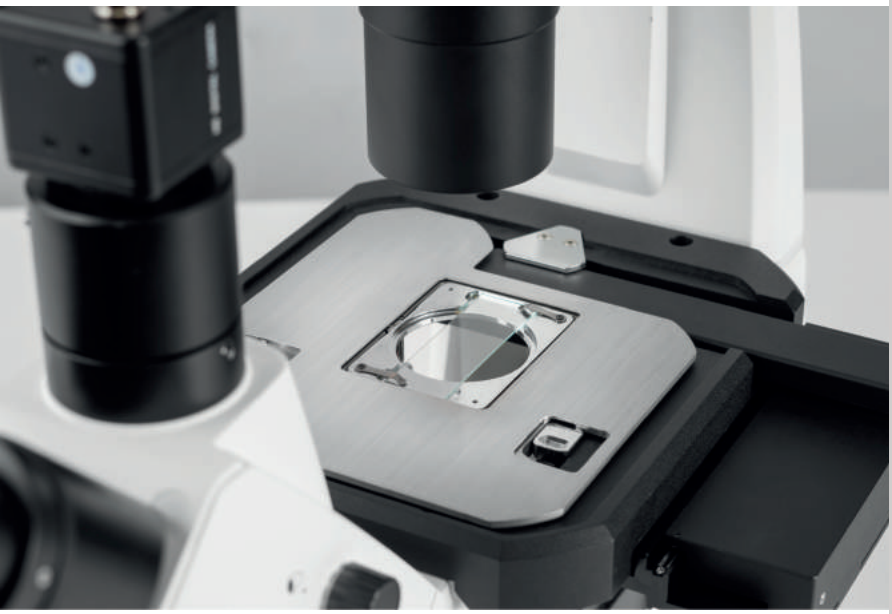
OBJECTIVE LENSES & COARSE/FINE ADJUSTMENTS

A: **Bio-AFM** is equipped with **objective lenses** for inverted displaying samples with high resolution and magnification at scales of **4, 10, 20, and 40 X.**

Easy replacement of objective lenses with user demanded magnifications.

B: Accurately performing **focusing operation** in order to obtain high-resolution images by using **coarse** and **fine** adjustments.





SAMPLE HOLDER

- Equipped with a large **liquid cell** for imaging **biological buffer** matrices, **physiological conditions**, and other solvents.
- The **minimum effect of the liquid environment** on the quality and clarity of the images due to using the world's latest standards and methodologies.
- The liquid cell is made of material resistant to **chemical effects**, **thermal changes**, and **environmental pH**.
- Capability of **simple** and **quick slide replacement** for imaging the surfaces of different samples in air.
- **Newly designed scanner** to reduce noise level.
- Increasing the scanning range to **50 µm** and the possibility of customizing to **100 µm** range.

DIGITAL OPTICAL MICROSCOPE

- The possibility to observe the **opaque sample** from the top during scanning using an advanced **digital optical microscope**.
- **No need for a head** in the use of a digital microscope for various optical analysis.
- Determination of the **precise location in the scan step**, accurate and fast imaging thanks to the smart design of optical parts.

TECHNICAL SPECIFICATIONS

Scanner
XY Scanner
50 µm maximum XY scan range (The possibility to customize to 100 µm)
1 nm XY resolution
Z Scanner
3 µm Maximum Z movement range
0.1 nm Z resolution

Stage
XY Stage
Mechanical Stage 12 mm Travel range
Head Stage
Mechanical XY stage: Positioning cantilever in the center of the objective lens

Sample Mount
75 x 26 mm microscope slide mounting
Customized 50 mm culture dish
Slide and culture dish holder spring
-10 V to +10 V Bias voltage range to the sample

Inverted Microscope
See Table of Inverted Microscope Items

AFM Unit
Plug and Play
Dimension
580 mm × 370 mm × 600 mm
Net Weight
20 Kg

Head
High precision adjustment micrometer
Optic designed for both dry and liquid environments
670 nm Laser frequency
5 mW Maximum laser diode power
High-grade quadruple photo-diode
Dithering mechanism
Optimized optical path design
Spring lever tip holder mechanism
Chip alignment mount for accurate tip mounting
Head Z actuators
3 independent Z positioning actuator for Leveling ability
15 mm Travel range
40 nm Movement steps
Automatic engagement of the cantilever to the sample surface (Auto Fast Approach)

Accessories
Sample mounting kit
The sample substrate
Various types of cantilevers
Tweezers and magnet box
head-holder unit

Standard Modes
- Contact Mode (Static, DC)
- Non-Contact Mode (Dynamic, AC)
- Tapping Mode (Semi-Contact, Intermittent-Contact)

Electronics
Plug and Play control box
ADC and DAC Channels
4 Channel ADC 24bit
4 Channel DAC 24bit
Signal processing
40 MHz Frequency zynq processor
Integrated functions
100 MB/sec Via LAN

Software
Data acquisition
Real-time 100 MB/sec Microsoft Windows compatible
Integrated optical view windows for sample and cantilever vision
Monitoring all system signals with a high-rated oscilloscope
Auto saving captured images in the software gallery
Scanning zoom-selected area on captured images
Automatic fast approach of the cantilever to the sample surface (Auto Fast Approach)
Image processing
Independent software for image processing, data analysis, and presentation
The capability of exporting different data of images
Built-in with all Microsoft OS

Dedicated all in one (AIO) Computer
21" Display Monitor: 1920 *1080 Resolution
The latest generation of processors
8 GB RAM

Options
Top View Optical Microscope
8-Megapixel resolution, color
60X to 600X Optical zoom
Integrated lighting
Include microscope dimmer

XY Scanner
Possibility to customize the XY scan range to 100 µm

Tip changing kit
Vacuum pen

Functional Kits

Fly Kit
- Magnetic Force Microscopy (MFM)
- Electric Force Microscopy (EFM)
- Phase imaging

Pro Contact Kit
- Lateral Force Microscopy (LFM)
- Force Spectroscopy
- Mechanical Nano-Lithography

Experts Kit
- Chemical Nano-Lithography
- Force Modulation Microscopy (FMM)
- Conductive AFM (C-AFM)
- Kelvin Probe Force Microscopy (KPFM)
- Piezo response Force Microscopy (PFM)

Any requirement for specific applications or modifications can be customized.

INVERTED MICROSCOPE ITEMS

Head	Seidentopf Trinocular Head Inclined 45°, Interpupillary Distance 48~76mm, Light Split Switch E100:P0 / E20:P80	
Eyepiece	WF10x/22mm, Dia.30mm, High Eyepoint, Diopter Adjustable	
Nosepiece	Quintuple	
LWD Infinity Plan Objectives	LPL 4 × / 0.11	W.D. = 12.1 mm
	LPLAN 10 × / 0.25	W.D. = 8.3 mm
	LPLAN 20 × / 0.40	W.D. = 7.2 mm
	LPLAN 40 × / 0.60	W.D. = 3.4 mm
LWD Infinity Plan Fluorescent Objectives	L Plan FL 10 x / 0.25	W.D.= 10.3 mm
	L Plan FL 20 x / 0.45	W.D.= 5.8 mm
	L Plan FL 40 x / 0.65	W.D.= 5.1 mm
LWD Infinity Plan Phase Contrast Fluorescent Objectives Newly Update 2021	L Plan FL PHP 20x / 0.45	W.D.= 5.8 mm
	L Plan FL PHP 40x / 0.65	W.D.= 5.1 mm
Phase Contrast	Centering Telescope 11x	
Annular Spot	4x	
	20x / 40x	
	10x	
Working Stage	Mechanical Stage Size 210 x 241mm, Round Slide Size Φ110mm	
Condenser	Long Working Distance, Quickly Detachable, N.A.0.3, Working Distance 72 mm (With Condenser), 195 mm (Without Condenser).	
Transmit Illumination	Koehler Illumination Halogen 6V/30 W, Input Voltage 100 V ~ 240 V	
Filter	Blue, Dia.34 mm	
Reflect Illumination	Green, Dia.34 mm	
Inverted Fluorescent	Optional	

ARA RESEARCH

ARA RESEARCH Co.
No 151, Pardis Techno Park
20th Km Damavand Rd, Tehran, Iran.
Tel: +98-21-76250186-7
Fax: +98-21-76250596
ara-research.com
info@ara-research.com