

BIOAFM

Biosafety Containment Chamber

Delivering Nanoscale Analysis to BSL Labs

Bruker's Biosafety Containment Chamber enables high-resolution atomic force microscopy (AFM) imaging and nanomechanical characterization of biohazardous matter and pathogenic microorganisms in biosafety level (BSL) laboratories. This portable, hermetically sealed chamber supports the AFM analysis of living pathogens under near-physiological conditions. It is compatible with newer-generation NanoWizard® BioAFMs as well as the CellHesion® and ForceRobot platforms, extending advanced AFM capabilities to stringent BSL research environments.

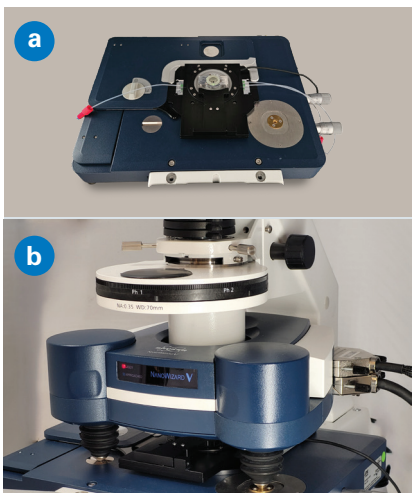
Unique Features for Biosafety Laboratories

The Biosafety Containment Chamber supports the handling and AFM analysis of biological agents under BSL-2 and BSL-3 containment conditions.* Following sample preparation and loading in a dedicated preparation area, the chamber is sealed and transferred to the AFM for analysis, then decontaminated for subsequent use.

The chamber features an ***integrated cantilever holder*** that facilitates AFM measurements directly in the sealed chamber, maintaining containment throughout the workflow. It also includes a ***magnetic-mounting mechanism*** between the AFM head and the Biosafety Containment Chamber for simplified setup and handling, while chemically inert, pressure-stable ***fluidic connections and ports*** provide controlled access to the chamber for liquid/gas exchange, introduction of agents, and removal of overflow.

Key Benefits of the Biosafety Containment Chamber

- **Biological agent containment**: Enables sample measurements and decontamination in a hermetically sealed chamber
- **Environmental control**: Supports CO_2 and temperature control for prolonged, time-dependent experiments under culture-relevant conditions
- **Correlative measurements**: Integrates with advanced optical microscopy
- **Streamlined design**: Eases handling under BSL working conditions
- **Integrated secondary fluid-retention reservoir**: Holds disinfectant and/or serves as an overflow safeguard



(a) The Biosafety Containment Chamber with fluidic connections mounted on a BioAFM motorized stage; (b) setup of a Biosafety Chamber with a Bruker NanoWizard BioAFM on an inverted optical microscope.

High-Resolution Nanoscale Analysis in BSL Environments

Designed for use in BSL laboratories operating under negative pressure and for researchers required to wear protective clothing, the Biosafety Containment Chamber allows high-resolution imaging while quantifying the nanomechanics of single molecules, viral particles, protein aggregates, and prion-related assemblies. The chamber also enables researchers to achieve multiparametric, multidimensional sample analyses with correlated AFM and optical microscopy measurements.

Diverse Range of Applications

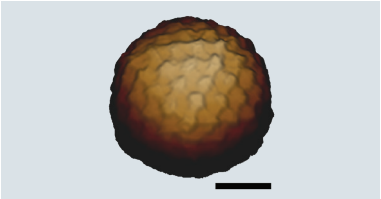
The Biosafety Containment Chamber allows researchers to observe cell membranes and cellular interactions, growth, and structure in an enclosed liquid environment, and is optimized for applications in:

- **Bacteriology**: Study bacterial morphology, division, adhesion, and biofilm growth. Resolve bacterial cell-wall architecture and quantify treatment response to antibiotics, disinfectants, or therapeutics.
- **Virology**: Investigate native and inactivated viral particles, virus-like particles (VLPs), and quantify virus-host interactions at the nanoscale.
- **Cell biology**: Perform temperature-controlled studies of cells and tissues exposed to biological agents under physiological conditions.
- **Controlled atmosphere**: Observe sensitive biological samples or reactive materials under controlled environmental conditions.

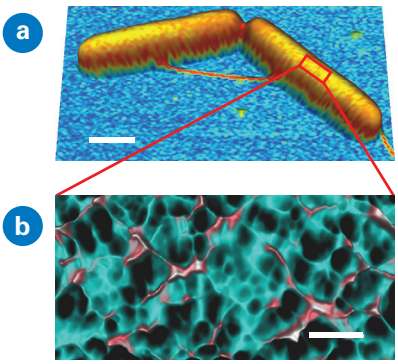
Biosafety Containment Chamber Specifications

- Suitable for BSL 1/2/3* containment environments
- Compatible with standard imaging and force spectroscopy modes
- Precise temperature control and stable operation from ambient temperature to 45°C
- Axial optical path supports transmitted-light, epifluorescence, and advanced optical imaging during simultaneous AFM measurements
- Compatible with commonly used microscope platforms
- Integrated cantilever holder with quick release mechanism
- Customizable for individual safety and containment requirements
- Designed for standard decontamination workflows by autoclaving or immersion in compatible disinfectants

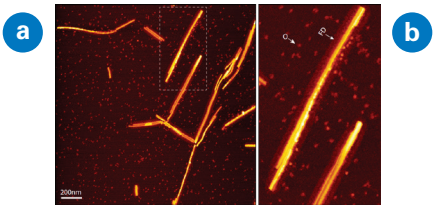
* Certification and approval for use in higher-level BSL environments are the responsibility of the operator and must comply with applicable local regulations and authority requirements.



3D topography image of a Herpes simplex virus capsid in liquid (scale bar: 100 nm). Mode: PeakForce Tapping®; probe: Bruker PEAKFORCE-HIRS-F-A.



AFM image of Lactobacillus in LB medium.
(a) 3D topography overlaid with the corresponding stiffness map of two bacterial cells (stiffness range: 50 nN/µm; scale bar: 1 µm); (b) flattened high-resolution image of the bacterial cell wall revealing nanoscale surface structure (height range: 15 nm; scale bar: 100 nm). Mode: QI; probe: Bruker PEAKFORCE-HIRS-F-A.



Representative morphological characterization of mouse recombinant PrP (rPrP) assemblies. (a) AFM image showing fibrils and associated oligomeric species (scale bar: 200 nm); (b) magnified view of boxed region in (a), highlighting oligomers (O) adjacent to fibrils and the fuzzy domain (FD) extending from the fibrillar core.
Data courtesy of Prof. Human Rezaei, INRAE, France.

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