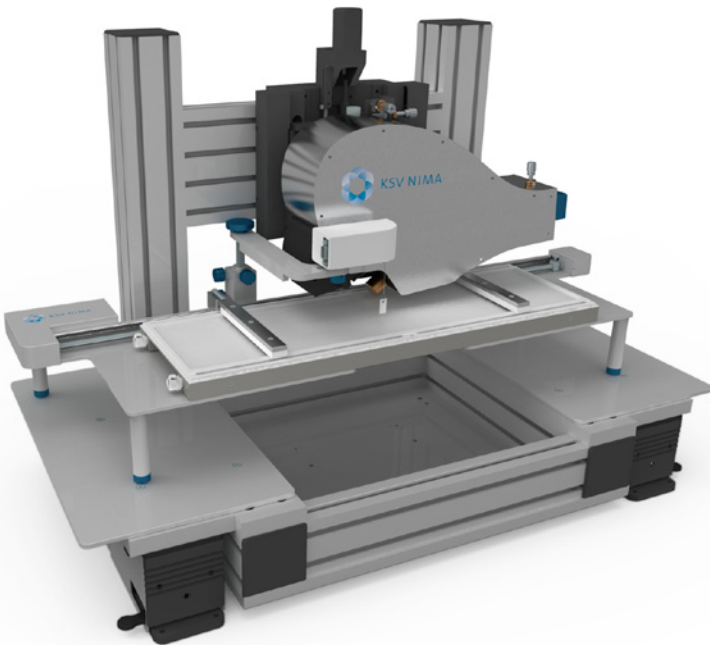




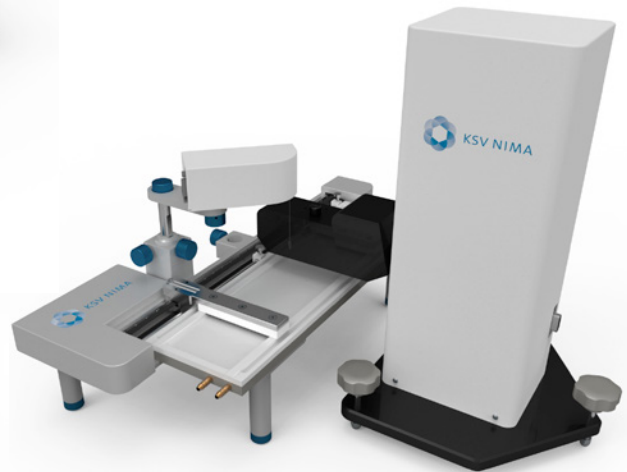
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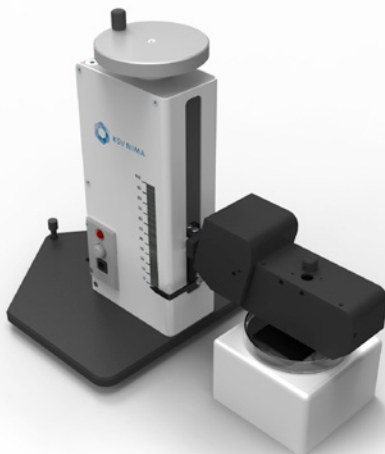
Brewster Angle Microscopes



KSV NIMA BAM & KSV NIMA LANGMUIR TROUGH LARGE



KSV NIMA MICROBAM & KSV NIMA LANGMUIR TROUGH MEDIUM



KSV NIMA STAND-ALONE MICROBAM

KSV NIMA Brewster Angle Microscopes

Brewster Angle Microscopes enable observation of monolayers, typically at the air-water interface using a Langmuir Trough. They create an image of the surface by detecting changes in the refractive index of the water surface in the presence of surfactant molecules. It provides information on homogeneity, phase behaviour and film morphology.

Applications

A Brewster Angle Microscope (BAM) enables the visualization of Langmuir monolayers or adsorbate films at the air-water interface. In conjunction with a Langmuir Trough, it enables the study of:

- **Monolayer/film behaviour**

It is possible to observe phase changes, phase separation, domain size, shape and packing.

- **Monolayer/film homogeneity**

When combined with a KSV NIMA L & LB Trough, observation can be performed during compression/expansion at known surface pressures.

- **Influence of subphase conditions on film structures**

Observe and study monolayer/film behaviour and formation in different subphase conditions including salt concentrations, pH and temperature to name a few (e.g. Gibbs adsorption layers).

- **Monitoring of surface reactions**

For example, photochemical reactions, polymerisation reactions as well as enzyme kinetics can be followed in real time.

- **Monitoring and detection of surface active materials**

For example protein adsorption and nanoparticle flotation.

BAMs are primarily designed for the air-water interface. However under some conditions the KSV NIMA BAM can be used for other interfaces such as air-glass.

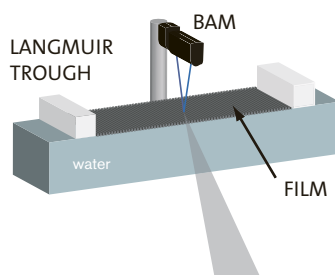
Working principle

Brewster Angle Microscopes utilize the fact that when p-polarized light is guided towards an air-water interface, no reflection occurs at a certain incident angle. This angle, the Brewster angle, is determined by Snell's law and depends on the refractive indices of the materials in the system.

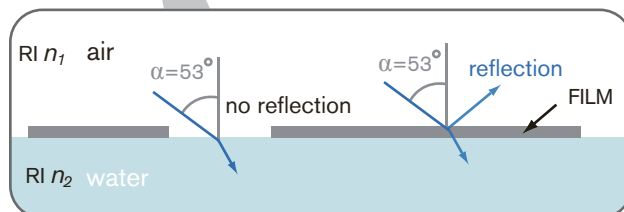
$$\text{Snell's law: } \tan \alpha = n_2 / n_1$$

where α is the Brewster angle in radians, n_1 the refractive index of air (≈ 1) and n_2 the refractive index of water (≈ 1.33).

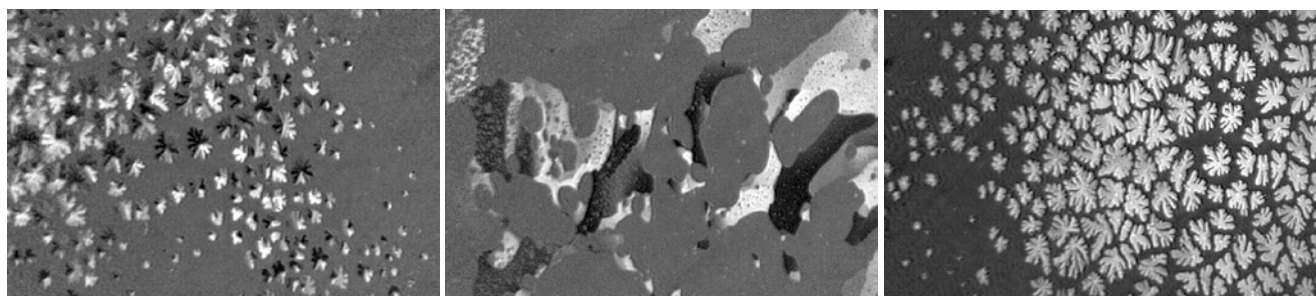
The Brewster angle for the air-water interface is approximately 53° , and under this condition the image of a pure water surface appears black as no light is reflected. Addition of material to the air-water interface modifies the local refractive index (RI), and hence, a small amount of light is reflected and displayed within the image. The displayed image contains areas of varying brightness determined by the particular molecules and packing densities across the sampling area.



- Polarized light is introduced to a pure subphase surface
- At Brewster angle no reflection occurs
- When laser hits monolayer an image is reflected to detector
- Changes in monolayer can be observed in real time during the measurement



KSV NIMA BAM IMAGES: MONOLAYER OF DMPE DURING FIRST-ORDER PHASE TRANSITION, CONTRAST IN DOMAINS CAUSED BY LONG RANGE ORIENTATION ORDER



KSV NIMA MICROBAM IMAGES: STEARIC ACID MONOLAYER FORMATION DURING COMPRESSION



Product range

KSV NIMA offers two different Brewster Angle Microscopes, the advanced KSV NIMA BAM and the compact KSV NIMA MicroBAM.

KSV NIMA BAM

The KSV NIMA BAM represents the latest in BAM instrumentation allowing high resolution and fully focused real-time imaging of monolayers. The KSV NIMA BAM provides completely undistorted images unlike other BAMs. A precise motorized vertical lift allows fine positioning to focus the water surface. An automatic vertical position tracking is included to follow water level changes. An active isolation system is integrated to the KSV NIMA BAM to eliminate disturbing vibrations caused by the environment (e.g. air conditioning, traffic).

A high performance camera and dedicated calibration algorithms allow for quantitative measurements of reflectivity, thus monitoring adsorption kinetics or thickness variation. The KSV NIMA BAM is equipped with a motorized analyser to visualize optical anisotropy due to long range molecular orientation order in monolayers.

The Software offers advanced and comprehensive image analysis and processing functionalities. A Langmuir trough can be used together with the KSV NIMA BAM for control over the monolayer packing density and recording of surface pressure. The compatible KSV NIMA Langmuir and Langmuir-Blodgett Deposition Trough Large are the recommended systems. A PC is included with the instrument.

Product benefits:

- Best resolution (2 μm) and image quality.
 - *Highest lateral resolution in the field of Brewster Angle Microscopy*
 - *Unique fully focused and undistorted real time images at 20-35 fps*
- Real-time visualization of the samples.
- Easy integration of a KSV NIMA L & LB Trough Large.
- Advanced image analysis and processing with for instance the ability to simply select domains to get their dimensions.
- Adjustable incident angle (52-57°) enabling measurements with popular dielectric solid substrates like glass or quartz.
- Imaging of anisotropic layers thanks to the motorized analyser.
- On-line automatic subtraction of a constant background image.
- Possible desktop remote control for support purposes.

KSV NIMA MicroBAM and KSV NIMA Stand-Alone MicroBAM

The KSV NIMA MicroBAM and KSV NIMA Stand-Alone MicroBAM are easy-to-use entry level instruments for non-invasive imaging of mono-molecular layers at the air-water interface. The excellent image quality and good lateral resolution make them ideal instruments for the visualisation of morphological film parameters (e.g. compressed film homogeneity, domain size, shape and packing). Real-time observation and recording of film structure enables dynamic activity to be captured.

Both the KSV NIMA MicroBAM and KSV NIMA Stand-Alone MicroBAM can be used with most KSV NIMA Langmuir and Langmuir-Blodgett Troughs, namely the Medium, Large, High compression and Alternate, to enable automatic image measurements as a function of time or surface pressure. Both instruments are easy to set up with the measurement head height adjustment either motorized, KSV NIMA MicroBAM, or manual, KSV NIMA Stand-Alone MicroBAM. Both instruments have a safety key interlock for the BAM laser. The KSV NIMA Stand-Alone MicroBAM can also be used with most Langmuir and Langmuir-Blodgett Troughs from other manufacturers as well as free standing vessels. The KSV NIMA Stand-Alone MicroBAM connects directly to the computer via USB making it remarkably easy to setup and use.

KSV NIMA MicroBAM and KSV NIMA Stand-Alone MicroBAM Product benefits:

- Appropriate resolution (12 μm) for most applications.
- Capture and save still images and real-time video footage of monolayers.
- Compact design, small footprint.
- Simple, intuitive operation.
- Imaging and control software included.
- Operates with a PC or Notebook (Windows XP to Win 7).
- Compatible with most Langmuir troughs and Langmuir-Blodgett troughs.
- Can be used as a stand-alone instrument.

Technical specifications



	KSV NIMA BAM	KSV NIMA MicroBAM KSV NIMA SA MicroBAM
Angle-of-incidence range in (°)	52...57, motorized with 0.001° resolution	53, fixed
Light source power (mW)	50	50
Light source wavelength (nm)	658	659
Image resolution (µm)	2 (horizontal image direction) according to Rayleigh's criterion	12 (horizontal image direction, centre) according to Rayleigh's criterion
Field of view (µm)	720 x 400	3 600 x 4 000
Polarizer	Glan-Thompson prism, motorized, 0.001° resolution	Fixed (p-polarisation of the incident beam)
Analyser	Motorized, 0.001° resolution	Fixed
Camera	CCD camera, 1360 x 1024 pixels, 20 - 35 fps, adjustable exposure time and gain, AVI video recorder	USB camera providing 640 x 480 pixels, 30 fps, adjustable exposure time and gain
Image processing	Automatic background compensation, geometric image deformation for unskewed images, scale bar overlay, contrast enhancement and image filtering, various image formats, advanced particle size determination	Various dedicated image processing functions: resizing, contrast profile, filtering, particle size determination
Dimensions (H x L x W, cm)	Instrument: 65 x 85 x 47 Measuring head: 25 x 45 x 10	Instrument: 40,2 x 22 x 27,7 Measuring head: 7.2 x 5.7 x 16.2
Power supply	100 - 240 V, 50 / 60 HZ	100-240 V, 50/60 Hz.
Compatibility with L & LB Troughs	KSV NIMA L & LB Trough Large	KSV NIMA L & LB Trough Medium, Large, High Compression and Alternate
Weight (Kg)	45	10

KSV NIMA – at the creative interface of people and technology

We create value for our customers by providing advanced, innovative instruments for thin film fabrication and characterisation, by constantly exchanging knowledge with our customers and through building open, trusting relationships with customers and partners.

Availability

KSV NIMA products and services are provided to customers all over the world through Biolin Scientific in co-operation with a highly competent network of Distribution Partners. For a list of relevant contact details, visit www.ksvnima.com

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