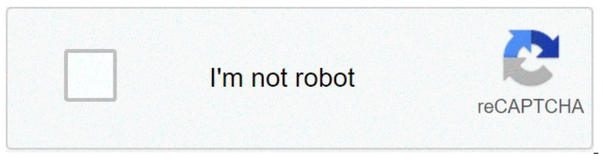

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Bruker multimode 8 afm manual

Surface Probe Microscopy, SPM, consists of a family of modes which monitor the interaction between a very sharp tip and the sample surface to produce nanometer scale images in three dimensions. Bruker MultiMode 8 This versatile system can be used for a variety of studies involving Contact Mode (CM), Tapping Mode (TM), Magnetic Force Microscopy (MFM), Conductive AFM (C-AFM), Force Modulation (FM), Lift Mode (LM), Kelvin Probe Force Microscopy, aka Surface Potential (KPFM), along with Peak Force Quantitative Nanomechanical Property Mapping (PF-QNM) and Nanoindentation. * New ScanAsyst mode automatically adjusts imaging parameters to optimize your image. Scans up to 140 microns laterally (X and Y) and 5.5 microns vertically (Z) Stage accommodates samples up to 12 mm x 12 mm Nanoscope V controller for improved resolution using higher scan rates. Mechanical properties can also be studied using a diamond tip for Nanoindentation, Nanoscratching, Nanolithography and Nanomanipulation. All modes currently operate in ambient only. Bruker D3000 Modes provided include CM, TM, and MFM. Stage allows 133 mm of x-axis travel, 102 mm for y-axis accommodating samples up to 150 mm in diameter and 12 mm in thickness. Scans up to 100 microns laterally and 5.5 microns vertically Vibration Isolation chamber with an air-table provides vibrational, acoustic, and temperature isolation All modes operate in ambient only. Sample preparation User Manual To access the manuals for using this equipment, contact Diana Convey. Qualification and Training Students must be trained to use the SPMs in the facility. Appointments need to be made for training via iLab. Initiate a Service/Training Request in iLab through the GMSF Core. Training typically consists of 3-5 sessions. Session 1 consists of a short overview of the SPM, with complete instruction on how to obtain an image. Each session is usually 2-3 hours in length. Sessions are scheduled and confirmed through your iLab request. Once trained, student may use the lab 24 hours a day, 7 days a week, with the exception of training hours, certain tours, and classes. Users must attend the ASU Lab Safety and Fire Safety courses. Contact Diana Convey Principal Materials Engineer diana.convey@asu.edu 480.965.9614 Contact:John Jacobsjacobs@engr.wisc.edu608-262-3787 1.2. Microscope Specifications Following is a list of basic specifications: 1.2.1. Image size and resolution. Images consist of raster-scanned, electronic renderings of sample surfaces. There are three default sizes: 128 x 128 pixels, 256 x 256 pixels, and 512 x 512 pixels. In addition, six width-to-height aspect ratios may be specified by the user: 1:1, 2:1, 4:1, 8:1, 16:1, and 32:1. Thus, it is possible to obtain “strip scans” which require less time to capture. The controller provides 16-bit resolution on all three axes, with three independent 16-bit digital-to-analog converters (DACs) in X and Y for control of the scan pattern, scaling and offset. This configuration provides 16-bit resolution of the lateral scanning motion at any scan size, and the ability to perform atomic resolution imaging throughout the full lateral range of the scanner. The patented digital feedback is governed by integral and proportional gain controls, providing immediate response to scanning parameter changes. The MultiMode can scan up to 200 mm laterally (in X and Y) and 10 mm vertically (Z axis). A table summarizing each scanner’s capabilities is provided in Chapter 2. MultiMode™SPM Instruction Manual 1-5 Part I: Introduction Introduction to the MultiMode™ SPM 1.2.2. Scanning techniques with the MultiMode SPM. The MultiMode is so called because it offers multiple SPM modes, including AFM, ECAFM, ECSTM, STM and TappingMode. While many early SPMs offered only one dedicated operating mode (e.g., STM), the MultiMode was the world’s first multiple-use SPM. It remains one of Digital Instrument’s most versatile instruments. A complete range of Atomic Force Microscopy (AFM) and Scanning Tunneling Microscopy (STM) techniques is available with the MultiMode SPM. Some of these techniques are available only through Digital Instruments. • Contact AFM — Measures topography by sliding the probe’s tip across the sample surface. Operates in both air and fluids. See Chapter 6. • TappingMode™ AFM — Measures topography by tapping the surface with an oscillating tip. This eliminates shear forces which can damage soft samples and reduce image resolution. TappingMode is available in air and fluids (patented). This is now the technique of choice for most AFM work. See Chapter 8. • Phase Imaging — Provides image contrast caused by differences in surface adhesion and viscoelasticity. Requires an Extender™ Electronics Module (patent pending). See Chapters 8 and 13. • Non-contact AFM — Measures topography by sensing Van der Waals attractive forces between the surface and the probe tip held above the surface. Provides lower resolution than either contact AFM or TappingMode. • Magnetic Force Microscope (MFM) — Measures magnetic force gradient distribution above the sample surface. Performed using LiftMode to track topography (Extender Electronics Module recommended). See Chapter 13. • Electric Force Microscope (EFM) — Measures electric field gradient distribution above sample surfaces. Performed using LiftMode to track topography (Extender Electronics Module recommended). See Chapter 13. • Surface Potential Microscopy — Measures differences in local surface potential across the sample surface. Performed using LiftMode to track topography (Extender Electronics Module only). See Chapter 13. • LiftMode™ — A combined, two-pass technique that separately measures topography (using TappingMode) and another selected property (e.g., magnetic or electric force), using the topographical information to track the probe tip at a constant height above the surface (patented). See Chapter 12. • Force Modulation — Measures relative elasticity/stiffness of surface features (patented). Force modulation is only one of several types of force imaging which are possible. See Chapter 11. • Lateral Force Microscopy (LFM) — Measures frictional forces between the probe tip and sample surface. See Chapter 10. Introduction to the MultiMode™ SPM Part I: Introduction • Scanning Tunneling Microscopy (STM) — Measures topography of surface electronic states using a tunneling current which is dependent on the separation between the probe tip and a conductive sample surface. An optional Low-Current STM Converter allows operation in the subpicoamp tunneling current region which can be useful when scanning poorly conductive samples. Tunneling spectroscopy may also be performed. See Chapter 9. • Electrochemical Microscopy (ECSTM and ECAFM) — Measures the surface structure and properties of conducting materials immersed in electrolyte solutions with or without potential control. See ECSTM/ECAFM manuals. • Lithography — Use of a probe tip to mechanically scribe or indent a sample surface. May be used to generate patterns, test surfaces for microhardness, etc. Performed using AFM and STM. See the Command Reference Manual and Support Note 225.

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