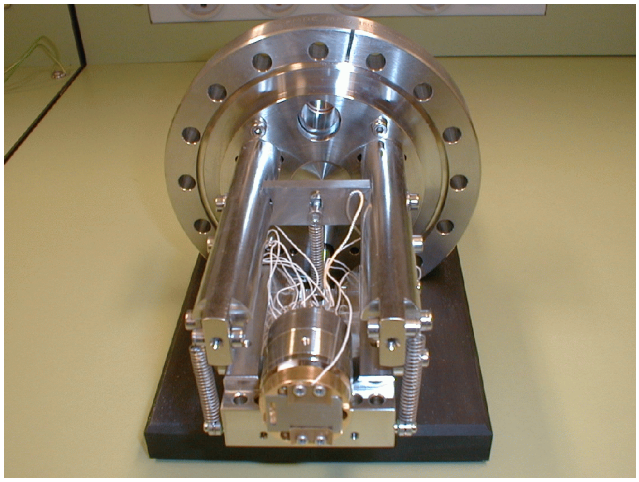
Rasterscope™ UHV STM

System specification DME 2395



Rasterscope™ UHV STM.

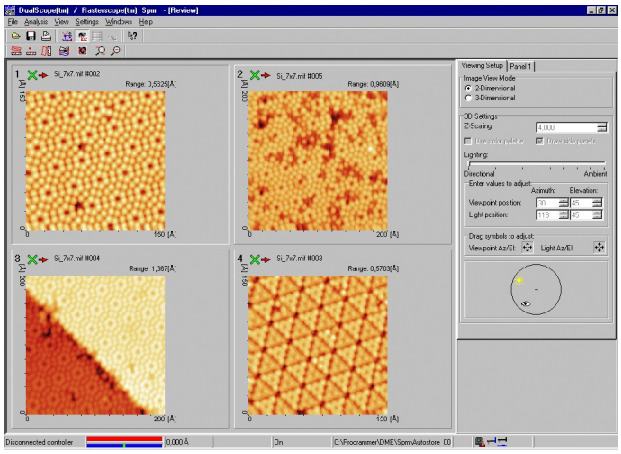
Introduction

The possibility of investigating surfaces on an atomic scale has been deeply wished for many years, and the first Scanning Tunneling Microscope (STM) was born in 1981, developed by G. Binnig and H. Roher; a development for which they received the Nobel Prize in 1986.

The study of atomically plane surfaces on conduct-ing and semi-conducting samples in a controlled environment in Ultra High Vacuum (UHV) provides the possibility of a profound understanding of the physics in the upper surface layers, including the interaction with the surroundings.

Since mid 1991, DME has produced Rasterscope™ UHV-STM microscopes as bolt-on equipment for existing vacuum chambers as well as for chambers acquired for this purpose. These microscopes, supplied to Europe, the Far East, and the USA, have given rise to a series of scientific articles on surface physics and thin film constructions (surface engineering).

Today, UHV-STM is a standard analysis method for the study of surfaces, and STM images provides a significant supplement to other well-known vacuum analysis techniques.



System Description

Rasterscope™ UHV-STM Microscope [DME 1749] is developed in a collaboration with leading scientists and comprises a most flexible, uncomplicated, compact, and rigid microscope. It adapts to various experimental set-ups and has a simple damping system. It is extremely insensitive to vibrations, arising from e.g. turbo pumps, buildings, or speech.

Fast optimization of tunneling parameters (e.g. bias voltage, current, loop gain, and spectroscopy functions) is achieved simultaneously with the recording of the topographies. Thus, changes resulting from changed tunneling parameters show up immediately in the images, when a function has been activated.

The main parts of the system are,
- Rasterscope™ UHV-STM Microscope [DME 1749]
- Rasterscope™ C-21 Control System [DME 2366]
- Windows SPM program [DME 2355]

(PC is optional, since this is often already available.)

If the above units are connected with a PC, and the Rasterscope™ UHV-STM Microscope is mounted on the vacuum chamber, you have at your disposal a complete, easy to use SPM microscope with the capability to maintain atomic resolution.

Typical Application Areas

Typical applications of the Rasterscope™ UHV-STM Microscope [DME 2395] are,

! Study of atomic structures on conducting or semi-conducting surfaces, e.g. metal on metal systems or a long series of surface reaction processes, where the surface is reacting with gas atoms.

! Measurement /illustration of dynamics in surface reactions and self-organizing mechanisms in semi-stable thermal equilibria.

Key Benefits

Rasterscope™ UHV-STM Microscope has the following main advantages,
- Extremely high stability, thermally as well as mechanically (vibration wise)

Rasterscope™ UHV STM

System specification DME 2395

System Specifications

Rasterscope™ C-21 Control System

[DME 2366], see product specification

Windows SPM program [DME 2355], see product specification.

- Plug and Play support for DME's Scanning Probe Microscopes.
- Also supports off-line Data Processing and Data Presentation.
- Automatic Image enhancement.
- One-screen simultaneous measurement and analysis.
- OLE automation support.
- Wizard based instrument setup.

Rasterscope™ UHV-STM Microscope

[DME 1749].

- SPM measuring volume 4.5 × 4.5 × 1.3 micron
- Automatic coarse approach
- STM modes as well as STS modes

STS modes	I/V	Ext./t	Z/t	Z/I	Z/V
Curve	X	X	X	X	X
Raster	X	X	X		

Microscope Specifications

Physical size of STM suspension

Mounted on a 6" or 8" OD rotatable flange
Diameter inside chamber: max. Ø 96.0 mm (7 mm from flange, max. Ø 88.5 mm)
Insertion depth: 153.5 mm
Nominal distance to sample surface: 150.0 mm

Scan head

Scan area by scanner tube: 4.5×4.5 Fm^2
Transverse and longitudinal eigenfrequencies of scanner: 8 kHz and 90 kHz, respectively
Coarse approach by piezo motor: 1.5 mm

Sample holder suspension concept

Leaf springs, symmetric three point contact

Standard sample dimensions

Diameter: max. Ø 10 mm
Weight: should be lower than 15 g
Height above holder plate: max. 0.5 mm

Recommended sample transfer

E.g. wobble-stick or goniometer

Bake out: Maximum temperature 150EC

Pressure: Typical base pressure < 10^{-8} Pa

UHV chamber considerations

UHV chamber should be mounted in a solid, rigid frame. Turbo pumps should be connected to the UHV chamber by bellows

Optional Equipment:

PC

consisting of:

- Pentium III 1 GHz
- 128 MB RAM
- 13 GB hard disk
- 32X CD-ROM drive
- 3D graphic adapter, AGP×2
- 17" Monitor (1280×1024)
- Mouse
- Windows98, US version

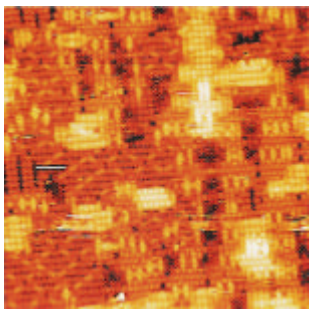
In situ tip exchanger. [DME 2048]
Tip stock w. 6 positions. [DME 2032]
In situ sample exchanger. [DME 2049]
Sample store, moveable. [DME 2083]

Variable temperature UHV-STM. [DME 2088]

Individual adaption.
Upon request, the dimensions of the flange, the insertion depth, the top plate of the scan head, and the spatial orientation can be adapted.

Accessories:

DME 1744	10 pcs STM tips, Pt/Ir, Ø0.4 mm, mechanical sharpened.
DME 1539	25 pcs STM tip holders, Ø0.4 mm, magnetic.
DME 2052	Test sample, HOPG, UHV.
DME 1186	Test sample, HOPG, 4×4 mm.
DME 2274	UHV sample holder (plate).



Oxygen on Ni(110)

Local representative

DME - Danish Micro Engineering A/S
Transformervej 12 ·DK-2730 Herlev ·Denmark
Phone: +45 4484 9211 ·Fax: +45 4484 9197
e-mail: sales@dme-spm.dk
web-site: www.dme-spm.com