



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
Powai, Mumbai 400076.

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Detailed Technical Specifications for Electrochemical STM:

1. Should perform the following major SPM imaging modes:

1. Scanning tunnelling Microscopy
2. Electrochemical STM with 10^8 V/A trans-impedance amplifiers
3. Includes Potentiostat / Galvanostat hardware attachment to perform electrochemical STM (ECSTM) experiments
4. Contact and non-contact/tapping mode
5. Tapping mode (air and fluid)
6. The system must be capable of achieving high resolution imaging in air and liquid either by tuning with the cantilever resonance frequency by photo thermal (not by piezo) or by Imaging at off-resonance frequency by driving the z scanner sinusoidally without the need to tune the cantilever
7. Lateral/frictional force microscopy
8. Conductive-AFM in contact and tapping mode
9. Magnetic and Electric Force Microscope
10. Kelvin Probe Force Microscopy

2. Control system:

1. SPM Control Station with Software and Windows Operating System with intel i7 processor or better
2. At least 30-inch LCD monitor 2560x1600, 50/60 Hz refresh rate, auto switching
3. Must include at least 10 ADCs (with at least two high speed operating at 50MHz or greater); and at least 10 DACs (with at least two high speed operating at 50MHz or greater)
4. three digital lock-ins
5. Eight simultaneous data channels
6. Digital Q control
7. Fully motorised and automated engage mechanism
8. More than 10 software configurable BNC I/O signal connections, Virtual Signal Access, and more

9. Must offers the highest resolution at least 4k x 4k
 10. Signal Access Module - For users planning to do custom experimentation involving adding or modifying electronic hardware to the Control Station or to the SPM Application Modules. Must allow the user access to each of 25 signals to and from the Controller through the 53 BNC connectors, 10 signals to and from the Application Modules through 20 BNC connectors, and a serial 9-pin connector
- 3. AFM scanners with single symmetrical piezoelectric tube:**
1. Small scanner (~ 0.4-micron maximum XY scan range and 0.4 μm Z range)
 2. Medium scanner (~ 10-micron maximum XY scan range and 2.5 μm Z range)
 3. The controller must provide three independent digital to analog converters (DACs) per axis (X,Y & Z) = 9 in total
 4. < 30 pm RMS (Z noise using Tapping Mode in air at zero scan size)
- 4. Conductive AFM (C-AFM) Application Module:**
1. Operate CAFM in contact and tapping mode at conventional imaging speeds
 2. Includes 6 gain settings ranging from 100nA/V to 20pA/V. Achieves >10kHz bandwidth for peak current detection at highest amplifier gain setting, which at the same time provides sub-100fA noise level in the cycle averaged current under imaging conditions
 3. A special mode that uses torsional resonance feedback to reduce both vertical and lateral forces on samples
- 5. Optical Microscope for tip-sample positioning:**
1. Video (preferred) through which the tip-sample position may be observed through the SPM software interfaced via a USB camera
- 6. Vibration Isolation Table:**
- i. Pneumatic table with caster assembly from any technical manufacturing company
 - ii. Weight and dimensions should be compatible with the system.
- 7. Warranty: Vendor must provide one year free warranty and additional extended warranty for another 3 years.**

The vendors are also requested to provide the following accessories:

1. Illumination set up to deliver light preferably via fibre optic cable, top illumination for performing STM under light illumination
2. Extra lock in amplifier to perform chopped light experiment
3. Faradaic cage to keep electronic items safe from damage or attack and to prevent signals from reaching others