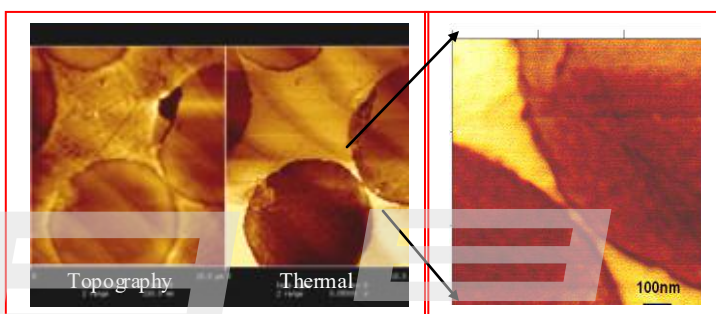


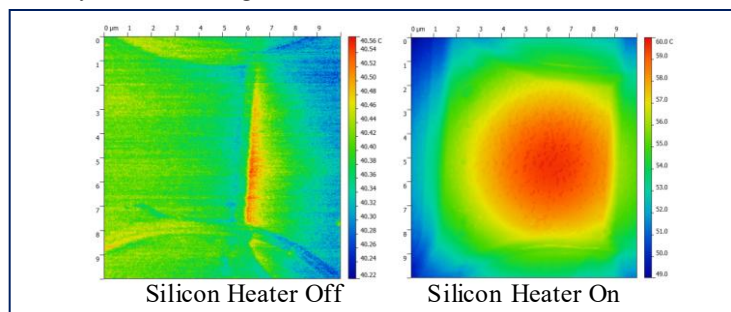
The VertiSense™ Scanning Thermal Microscopy (SThM) technique uses a specially designed AFM probe with an embedded thermocouple (Thermal Probe) that is raster scanned over a sample. The temperature of the thermocouple is measured using the VertiSense™ SThM Imaging Amplifier as a function of the position and is used by the AFM system to generate a thermal map in conjunction with the topography.

These most advanced thermal probes exhibit unique feature to map thermal properties of the sample in Temperature Contrast and Thermal Conductivity Contrast Modes. The thermocouple sensor is located at the apex of the tip to facilitate true temperature measurement with less than 50 nm lateral thermal resolution.



Thermal Conductivity Contrast Map
of carbon fibers embedded in epoxy in Contact Mode AFM

In **Thermal Conductivity Contrast Mode** the thermocouple of the probe is heated few degrees above the room temperature using the AFM laser (by positioning a small portion of the AFM laser on the back of the thermocouple). When the thermal probe is scanned over the sample with different thermal conductivity regions, the heat loss from the thermocouple to the sample is monitored as change in the temperature. The thermocouple and electronics being very sensitive can easily detect a change less than 0.01 C.



Temperature Contrast Map
Of microfabricated silicon heater in Non-Contact Mode AFM

Thermal Map of a sample in the Temperature Contrast Mode is acquired by directly monitoring the thermocouple temperature. The thermocouple can be calibrated using a VertiSense™ Calibrator.



Thermal Probe

Uniquely designed and microfabricated SThM Probe for Thermal and conductivity Mapping.

- Embed the thermocouple sensor located at the tip apex
- Direct temperature mapping
- Supports multiple mode of scanning
- High lateral thermal resolution
- Measures up to 700 °C.



SThM Imaging Amplifier

VertiSense™ Scanning Thermal Microscopy (SThM) module is designed to integrate with most commercial AFMs in the market.

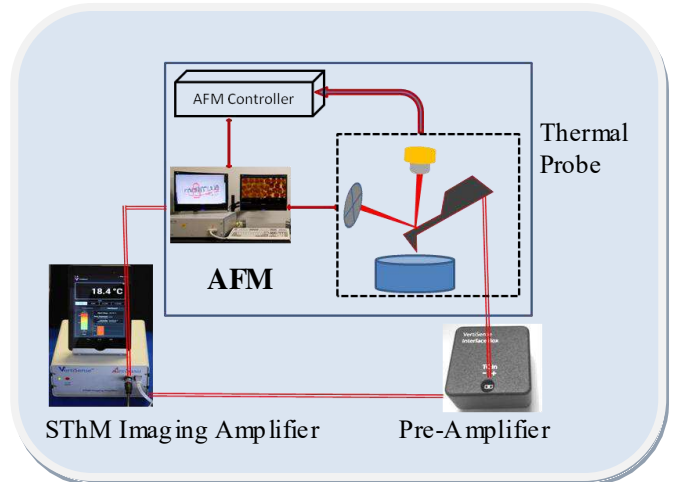


Android App based Wireless Bluetooth Low Energy Technology to control VertiSense™ system. Features include:

- Step by step instructions.
- Gain control.
- Live temperature display.
- Temperature Calibration

Compatibility: VertiSense™ SThM module has been designed to integrate with most commercial AFMs including those in service with minimum peripheral requirement. The module utilizes the AFM software to generate Thermal Map.

The **thermal probes** are delivered pre-mounted and ready to be used. The mounting chip is ensured to be compatible with the AFM. There are two models of Thermal Probes to suite wide range of applications.



Schematic layout of an AFM integrated with VertiSense™ SThM module

Physical Parameter	Probe Models	
	VTP-200	VTP-500
Spring Constant (N/m)	9.9	0.63
Frequency (kHz)	107	17
Length (μm)	200	500
Width (μm)	50	50
Thickness (μm)	3.5	3.5

Thermal Properties of VertiSense™ Thermal Probe

Sensor Type: Thermocouple at the tip Apex
 Tip ROC : 50 nm
 Lateral Resolution: <50 nm in contact mode
 Temperature Resolution: (i) 0.1 °C (@gain100);
 (ii) 0.01 °C (@gain1,000);
 Temperature Range: up to 700 °C
 Thermal Band width: up to 30kHz (@ gain 100)
 Thermal latency : ~100μsec (Low Thermal Mass)

VertiSense™ Thermal Imaging Amplifier

Input: ± 10 mV
 Output range: ± 10 V
 Signal Gain: 100x to 10,000x
 Noise: <1 nV @ 1 kHz bandwidth
 Common-mode rejection: High (>115 dB)
 Display: Real Time Tip Temperature
 Adjustable: Thermocouple Calibration Range

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