

Keysight Technologies SECM Mode

AFM-Enabled Scanning Electrochemical Microscopy

Data Sheet



The Keysight EC SmartCart and nosecone as separate units.



The assembled Keysight EC SmartCart and nosecone.

Overview

The AFM combined with SECM mode is a seamlessly integrated technology package that enables scientists to perform scanning electrochemical microscopy (SECM) on conductive and insulating samples with a state-of-the-art atomic force microscope from Keysight Technologies. This new Keysight mode of AFM operation has been designed to provide ultimate performance as well as supreme ease of use.

SECM can now be performed quickly and reliably with nanoscale resolution. This technological advance, the latest of many innovations in AFM-related electrochemistry made by Keysight over the years, will be very useful for myriad applications, including the investigation of homogeneous and heterogeneous electron transfer reactions, the imaging of biologically active processes, surface modification, analysis of thin films, screening of catalytic material, and corrosion process studies.

Unique Technology

At the technological core of Keysight's new SECM mode is the novel EC SmartCart, an easy-to-handle cartridge that combines a nanoelectrode with a pre-mounted AFM tip. EC SmartCart probes come pre-tested and ready-to-scan for AFM-SECM applications. A special nosecone for the scanner accepts the cartridge. Hours of setup time are eliminated, so data can be collected immediately.

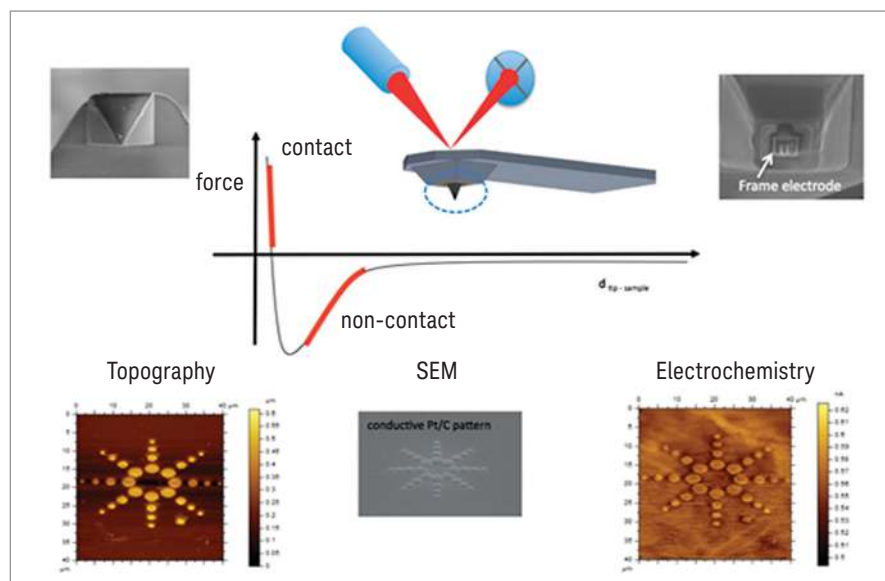
Keysight's EC SmartCart probes enable high resolution topographical imaging while simultaneously mapping electrochemical information via the AFM probe-integrated electrode; they uniquely provide researchers with inherently synchronized structure activity information. Produced via well understood microfabrication techniques, the bi-functional probes ensure a constant and controlled distance between the tip-integrated electrode and the sample surface significantly improving performance.

Features and Benefits

- Performs highly localized electrochemistry via a nanoelectrode combined with an AFM probe
- Integrates scanning electrochemical microscopy (SECM) and AFM technologies to deliver superior performance and ease of use
- Allows SECM on conductive and insulating samples
- Customized SECM nosecone designed exclusively for Keysight atomic force microscopes
- Convenient, preconfigured EC SmartCart probes reduce setup time
- Built-in potentiostat and full-featured software greatly enhance experimental flexibility

Applications

- Investigation of homogeneous and heterogeneous electron transfer reactions
- Imaging of biologically active processes
- Surface modification
- Analysis of thin films (e.g., pinhole detection, conformality)
- Screening of catalytic material (e.g., fuel cell catalysts)
- Study of corrosion processes



Top: Combined AFM-SECM, based on AFM tip-integrated electrodes. Bottom: Simultaneously recorded images showing the topography (left) of the Keysight logo (middle) deposited from platinum/carbon composite by an ion beam-induced deposition (middle) and the electrochemical image recorded in feedback-mode SECM (right).

Unique Capabilities

Not only does Keysight SECM mode deliver inherently synchronized structure-activity information at the nanoscale, it offers industry-leading in situ research capabilities including closed loop and STM scanners. A state-of-the-art environmental chamber and a special closed fluid cell sample plate designed specifically for EC applications. As well as a new dual-chamber glove box that allows the smaller inter box with the AFM to be placed inside the Pico IC isolation chamber for uncompromising results.

Keysight's SECM mode also utilizes a built-in potentiostat that affords researchers a series of different sensitivity settings covering four orders of magnitude of currents from pA up to mA.* Full-featured Keysight PicoView software further extends experimental flexibility and control. It brings a whole new range of EC capabilities to SECM including customized pulse voltammetry. Whether you work in an academic or an industrial setting, Keysight Technologies' new SECM mode can extend the vision of your electrochemistry research at the nanoscale.

* Full sensitivity on the Keysight 7500 AFM system. Range varies on the 5000 series microscopes.

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