

Conductive AFM

Probing the Local Electronic Structure of a Sample's Surface

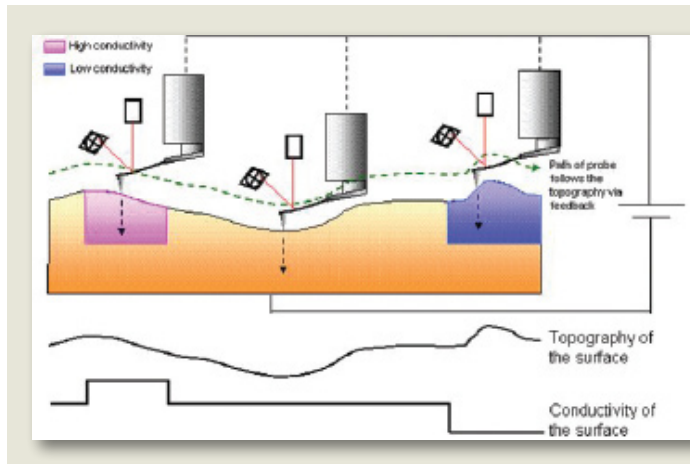


Figure 1. Schematic diagram of the XE-series Conductive AFM system

The operations of Conductive AFM and STM are identical in which a bias voltage is applied between the tip and the sample. The difference between the two is that STM uses a sharpened conducting tip whereas Conductive AFM uses a conductive AFM cantilever.

In Conductive AFM mode, a conductive AFM tip scans the surface while in contact. As shown in Figure 1, Conductive AFM is able to image both the topography and the conductivity of the surface at the same time. The current flows between the tip and the sample allowing Conductive AFM mode to measure the surface conductivity of a sample. Contact topography image is generated by using feedback loop to maintain the constant tip deflection and Conductive AFM image is generated by measuring the current flow.

Easy sample preparation and convenient measurement conditions in Conductive AFM attract many academic and industrial applications. In Figure 2, the topography of ITO glass is imaged with contact AFM while the Conductive AFM image shows the current path on the surface of the sample.

There are two Conductive AFM modes according to the current amplifier being used. They are 'Internal Conductive AFM' and 'External Conductive AFM'. The 'Internal Conductive AFM' mode refers to the Conductive AFM mode that uses the current amplifier with fixed gain in the head extension module. The 'External Conductive AFM' mode refers to the Conductive AFM mode that uses the external low noise current amplifier with variable gain. (See "External Low Current Amplifier")

I/V spectroscopy mode supports the acquisition of Current (I) vs. Voltage (V) curves to investigate electrical properties of a sample surface. An I/V curve is a plot of the current as a function of the tip bias voltage applied to the sample. In Figure 3, the I/V curves are acquired from the self assembled gold monolayer with different bias loading.

Figure 2. Topography and Conductive AFM image ((a) and (b)) of a contact pad on IC chip. (5 μ m scan)

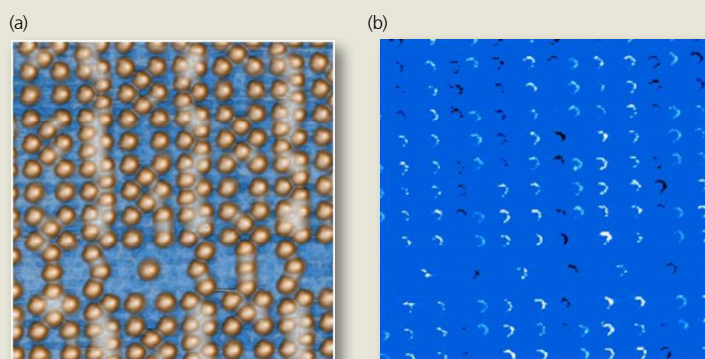


Figure 3. I/V curves acquired at Alkyl thiol(R-CH₂SH) Self Assembled Monolayer on the Au surface with different loads.

