

CONTROL ID: 2876763

TITLE: Remote bias induced electrostatic force microscopy for subsurface imaging

Abstract Body: Contrast in electrostatic force microscopy (EFM) depends on the electrostatic force between the tip and sample. In the related technique, scanning Kelvin force microscopy (SKFM), contrast arises from the force due to the capacitance gradient with tip-to-sample distance (dC/dz). Since these forces act over long distances, EFM can image structures beneath the sample surface. The measured quantities arise from variations in sample dielectric constant, any charge accumulated on subsurface structures or interfaces, and subsurface variations in conductivity. Using subsurface structures that could be independently biased, we were able to implement a mode of EFM where the AC+DC signal was applied to the buried structures instead of the cantilever. An external high frequency lock-in amplifier (LIA) monitors the deflection signal of the cantilever, using the AC signal applied to the buried structure as its reference. Small changes in the phase of the cantilever oscillation can then be detected to map subtle electrostatic force variation between the subsurface metal lines and the EFM tip. Our technique allows us to separate the effect of buried charge and capacitance gradient. By applying a backing potential to the substrate, the subsurface resolution can be enhanced.

PRESENTATION TYPE: Oral

UNIT: 19.0 INSTRUMENTATION AND MEASUREMENTS (GIMS)

SORTING CATEGORY: 19.1.1 Advances in Scanned Probe Microscopy 1: Novel approaches and ultra sensitive detection

Category Type: Experimental/Theoretical

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