



# UNIVERSAL NANO+MICRO MATERIALS TESTER UNMT-1

## ATOMIC FORCE MICROSCOPE (AFM) MODULE

### NANO-IMAGING

TOPOGRAPHY  
MAGNETIC PROPERTIES

### NANO-MEASUREMENTS

NANO-ROUGHNESS  
WEAR/SCRATCH/INDENT

### NANO-MAPPING

LATERAL NANO-FRICTION  
PULL-UP NANO-ADHESION

### Applications

#### Nano-imaging in mechanical and tribological testing without sample removal:

- comparison of surface topography before/after and periodically during tests
- periodic nano-imaging (AFM) and continuous micro-imaging (OM) of wear, scratch, crack, indent development, growth and propagation
- lateral and adhesion mapping of test surface before/after and periodically during tests

#### Force measurements in mechanical and tribological testing without sample removal:

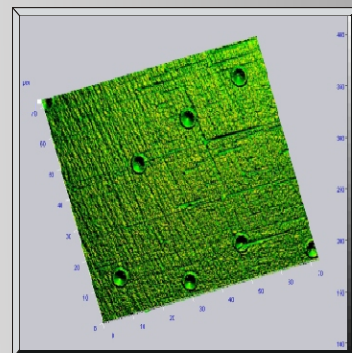
- comparison of AFM nano-friction and UMT micro/macro-friction on surfaces
- comparison of AFM nano-adhesion and UMT micro/macro-adhesion on surfaces

#### Nano Defectoscopy

- auto-positioning on surface defects with known coordinates (X&Y or R& ), easily downloadable from optical or stylus macro-characterization instruments,
- rotary or linear sample table with sub-micron positioning resolution
- failure analysis and quality control on samples up to 6", optional 8":
  - optical displays (LCD, LED, Plasma)
  - optical disks (DVD, CD, PD)
  - magnetic disks and head wafers
  - semicon and MEMS wafers



AFM Module Integrated in the UNMT-1 with Linear Stages



Process artifacts of a laser textured hard magnetic disk with 5-mm texture bumps and 2-mm wide scratches.

### Technical Highlights

#### Commercial advanced atomic force microscope (AFM) Functions:

- atomic-force microscopy
- phase imaging
- magnetic force microscopy
- lateral force mapping
- adhesion force mapping
- contact and semi/non-contact

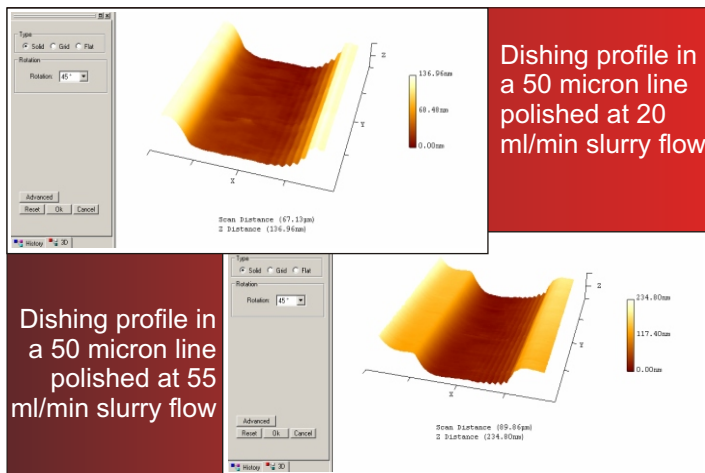
#### Scanning ranges:

50x50x3 m    85x85x7 m    100x100x9 m  
Resolution: 0.1 nm

#### Digital high-resolution, wide field-of-view optical microscope (OM) and a color CCD camera

- continuous video
- still micro-images
- micro-positioning of AFM tip

#### Full mechanical and electrical integration into UNMT



Post-CMP of semiconductor wafers: two 3-D nano-images of dishing profiles on the copper lines