k-Space Associates, Inc.

kSA MOS Ultra-Scan

Curvature, Bow, and Stress Mapping

High Resolution, Stress-Induced 2D Curvature & Bow

The **kSA MOS Ultra Scan** is a flexible, high-resolution scanning curvature, bow, and tilt-measurement system. Based on the proven technology of our standard in-situ kSA MOS system, the Ultra Scan uses a laser array to map the two-dimensional curvature, bow, and stress of semiconductor wafers, optical mirrors, lenses— practically any polished surface. The standard system provides a 200 mm x,y scanning range with 1 um scanning resolution. Optionally, larger scanning stages (300mm diameter, or much larger glass panel mapping platforms) are available. Scans are fully programmable for selected area, line scan, or full area map. The system also provides quantitative film stress analysis with full area map by first scanning the bare substrate and then re-scanning the sample post-process.

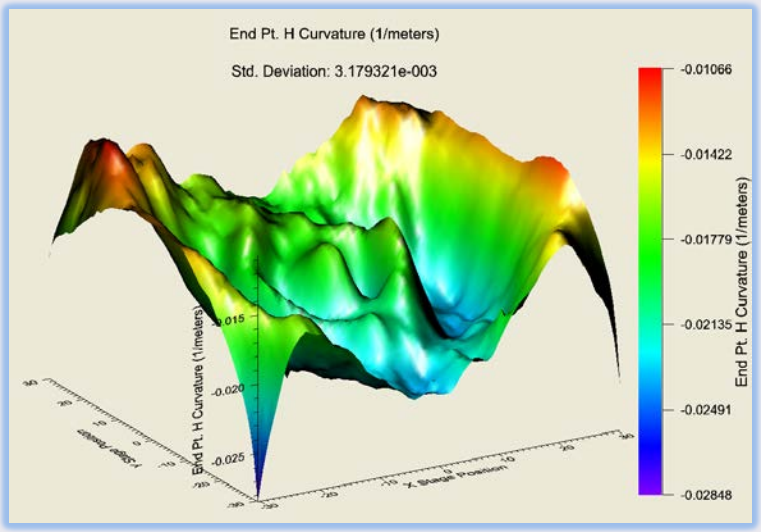
A single laser is used to generate a two dimensional laser array of spots which are reflected off the sample surface. Changes in the relative spot spacings are used to determine curvature and subsequent stress via pre- and post-mapping. In this way, the MOS Ultra Scan measures a true physical property in two dimensions that other systems—that use a point/line scan with mechanical restoring technique—cannot capture. The ability to directly image and view the entire reflected laser array greatly simplifies use and alignment compared with position-sensitive detector techniques. Simultaneous detection of the array makes the measurement inherently less sensitive to sample vibration compared with scanning-laser systems, leading to increased curvature resolution capability. And because all the laser spots move together at the same frequency, movement or tilt is not detected as a change of curvature. Through the use of sophisticated image processing and data analysis algorithms, the Ultra Scan can easily detect micron-sized changes in spot position due to curvature changes.

Features	Benefits	Applications
Patented kSA MOS 2D laser spot array reflected off sample surface	Provides curvature, stress, and bow in both x and y planes directly and simultaneously	Map the 2D curvature of semiconductor wafers, optical mirrors, lenses, or practically any polished surface
Hi resolution X,Y scanning stages	1um spatial scan resolution over entire wafer/sample surface	Detect localized stress changes directly in very small areas. Helpful for analyzing patterning and processing effects on small scales instead of overall wafer bow.
Vibration controlled environment	Highest resolution curvature measurements in most any laboratory	No need for expensive vibration controlled tables or laboratory modifications to achieve world-class curvature/stress/bow measurements
Fully programmable scanning for selected area, line scan, or full area map	Recipe-based scanning routines for repeatable and simple scanning	User-defined scanning of all sample sizes and within sample area regions
Upgrade path to kSA MOS Thermal-Scan	Add vacuum heating up to 1200 degrees C with process gas capability	Thermal stress analysis and mapping during sample heating and process gas introduction

kSA MOS Ultra-Scan

Standard Hardware and Software

- 2-D array of parallel laser beams generated from a single beam laser source
  - Simplified optics and alignment system
- Optics are rigidly mounted to reduce vibrational noise
- Fiber coupled, Peltier cooled laser diode package with integrated current controller and temperature controller
- Linear, low-noise diode laser controller operates in constant current mode with long term output power stability of 0.2%
- Wafer stage machined from solid aluminum block for mechanical stability
- Built-in flat reference mirror and curved reference mirror
- Custom X,Y stages and system platform for glass panel scanning up to 2m x 2m



Hardware Options

Option/Part Number	Description
MOS-US-200	Sample holder and scanning for samples up to 200mm diameter
MOS-US-300	Sample holder and scanning for samples up to 300mm diameter
MOS-US-C	Custom scanning stage and system platform for larger samples up to 2m x 2m
MOS-US-TS/U	Upgrade to heating and process gas capability *See kSA MOS Thermal-Scan details

Performance Specifications

Sample Capability	Any polished surface with >1% reflectivity at laser λ
Max scan speed (x,y)	20 mm/sec
Spatial Scan Resolution	User selectable, down to 1um
Radius of Curvature Resolution	Up to 2e-5 1/m (1 sigma std. dev.)
Sample size range	10mmx10mm– 200/300mm diameter *Up to 2mx2mm^2 stages also available*
Average Curvature Repeatability	<2×10^{-5} 1/m (1 sigma std. dev.)
Average Tilt Repeatability	<1 microradian (1 sigma std. dev)

Your partner in thin film metrology

k-Space Associates, Inc., is a leading supplier to the surface science and thin-film technology industries. Since 1992, we've delivered the most advanced thin-film metrology tools and software thanks to close collaboration with our worldwide customer base.