KLA✛

MicroSense® STR1

Thin Film Stress Measurement System

Automatic, non-contact measurement of filmed, patterned and bare wafers, 150mm & 200mm diameter

The MicroSense STR1 measurement system provides full wafer, high speed geometry measurements of semiconductor wafers using non-contact capacitance sensors with nanometer level thickness resolution. The system measures the thickness, flatness, bow and warp of the wafer in compliance with SEMI standards. MicroSense StressMap software provides accurate measurement of wafer stress based on high resolution wafer pre-and post deposition shape data. Over 120,000 data points are measured on each wafer to generate high resolution wafer maps.

- Wafers are loaded into the system and automatically positioned for measurement by a precise, direct drive air bearing X-Y stage

- A system self calibration is performed before and after each wafer is measured for best repeatability and tool to tool matching

- MicroSense StressMap software provides a complete array of SEMI standard wafer measurements including thickness, flatness and shape, local and global flatness, and wafer stress

- 2D stress is based on mean curvature

- Both 2D and 3D full wafers maps are provided
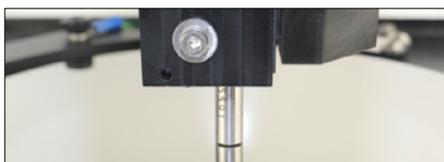
Nanometer Resolution Capacitance Sensors

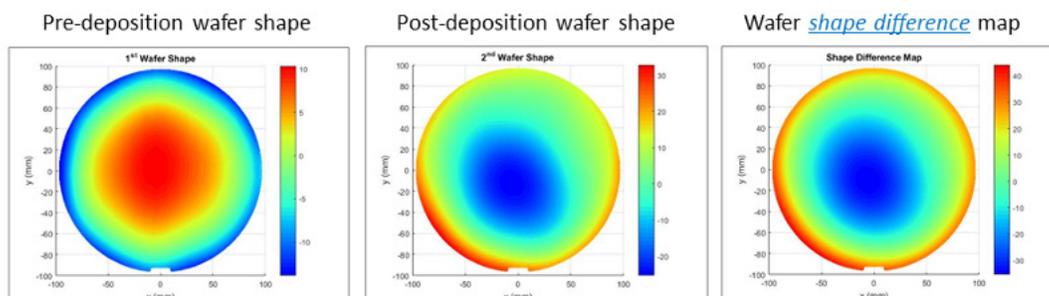Pre-deposition wafer shape   Post-deposition wafer shape   Wafer _shape difference_ map

Figure 1: Full wafer shape difference map derived form pre and post deposition shape maps

Get your thin film processes under control to improve yield

Stress measurements of critical thin film layers are essential for process tool monitoring, process tool matching and optimization to maximize product yield

- Stress non-uniformity can influence device performance and lead to failure due to peeling/cracking

- High stress can cause chucking problems (defocus) at lithography due to excessive wafer bow

- Develop, characterize and control new processes

- Match process tool chambers better and more effectively to minimize on product variability

- Identify and correct stress related yield issues, particularly along the edge of the wafer

- As manufacturers transition from 150mm to 200mm wafers, stress metrology can help to characterize and reduce wafer edge exclusion zone issues that impact near edge die yield (Figure #2)

High density, full wafer stress mapping at high speed, for the entire wafer

The MicroSense STR1 rapidly scans the entire wafer and collects 120,000 measured points before and after deposition, generating a shape difference map. This full wafer shape difference map is used to generate wafer Radius of Curvature, one of the key variables in Stoney's equation which is used to calculate stress.

Integrate the MicroSense STR1 into your existing fleet of Flexus tools

Legacy stress measurement tools like the Flexus use a single sided laser measurement of the wafer and have significant limitations. These include limited data – typically a single diameter scan of the wafer with 50 or 75 data points, large edge exclusion – 10mm to 25mm, and low throughput. The MicroSense STR1 SW platform includes a **Flexus emulation** algorithm. This mode was developed to achieve optimal Bow and Stress correlation to existing Flexus baseline and ensure seamless production integration.

The MicroSense STR1 also generates local line stress graphs. These are particularly useful for comparison to existing manufacturing baseline from legacy systems.
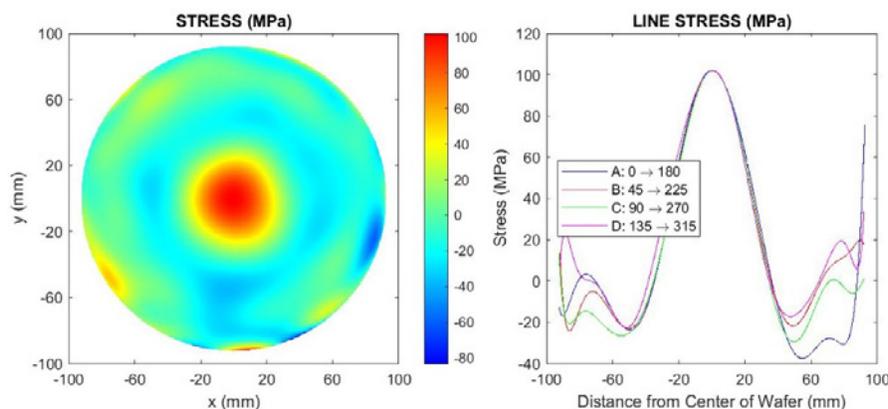

Figure 2: Full wafer and line stress output, based on full wafer mapping