

**“AFTER EVERY PROCESS STEP A WAFER HAS A SPECIFIC MASS FINGERPRINT  
– UNDERSTANDING THAT MASS FINGERPRINT BRINGS UNPRECEDENTED  
PROCESS CONTROL TO SEMICONDUCTOR MANUFACTURING ON PRODUCT  
WAFERS. THIS IS THE METRYX VALUE PROPOSITION.”**

*Adrian Kiermasz, President & CEO, Metryx Limited*

### **Company History**

In 2000, Dr. Adrian Kiermasz and Rob Wilby came together to develop a technology that would improve the way processing is done in semiconductor manufacturing. With over 20 years’ experience in semiconductor equipment and processing, Kiermasz and Wilby are industry veterans, each having published numerous papers and holding numerous patents. Later that year, Metryx was born as a company and development on an innovative mass metrology tool began.

### **Technology Overview**

A wafer has a different fingerprint after every process step, whether mass has been added or subtracted during the process. Metryx offers unique nanotechnology mass measurement techniques that provide atomic layer accuracy for characterisation of individual materials and processes, or process control of the manufacturing sequence. The company’s technology enables any process change within microelectronic device manufacturing to be determined with unprecedented accuracy based on the mass and density of the materials used in production. In simple terms, by measuring every processed wafer mass change, variations can be detected on actual product wafers and problems in the process can be identified very early on – saving valuable time and money.

The technology has proven to be both reliable and cost effective, improving yield and reducing scrap with a low cost of ownership. Offering throughput in excess of 60 wafers per hour, the measurement technique is effective for all substrates, wafer sizes, wafer types, and materials. It is also non-destructive and compatible with product, test and blanket wafers.

### **Metryx Mentor**

The Metryx Mentor family of automated measurement systems uses advanced compensation algorithms that improve accuracy by an order of magnitude over previous techniques. The system operates by using ambient sensors that continuously monitor temperature, pressure and relative humidity. Instantaneous correction to air density allows mass measurement correction for changes in atmospheric buoyancy of the substrate. This correction results in the Mentor's extraordinary mass measurement accuracy. Pre- and post- measurements allow the change of mass of the substrate, due to deposition or removal of a thin layer of material, to be determined.

The technology is highly effective following critical material removal and deposition steps, which require careful checking and monitoring to avoid failure later in the manufacturing sequence. Applications include:

- Control of critical etch steps, both wet and dry
- Determination of dielectric constant for inter-level BEoL materials, using density
- Measurement of average thickness for very thin deposited films, including ALD barrier metal or seed layers
- General measurement and control of films deposited from new techniques such as atomic-layer deposition
- Property determination of new materials, including high dielectric constant materials, ultra low k materials and unique metals.
- CMP
- Step coverage
- Stacked materials: Especially mixed metals & dielectrics
- Statistical process control of individual process steps and the overall manufacturing process

Almost any process that results in a change in mass can benefit from Mentor's technology. Product wafers can be measured directly using Metryx' tools, or the technique can be combined with other metrology tools to provide additional data.

Metryx technology allows, for example, low k determinations where alternative approaches are generally slow and require either test wafers or risk contamination (such as Hg, CV dots) or damaging of the film. The Mentor measures production wafers as standard, is completely non-intrusive, yet is sensitive enough to distinguish, for example, k variations from small changes in deposition parameters, or anneal state in copper films not detectable by other methods.

## **Technology Adoption**

Metryx metrology equipment is being used in volume production of semiconductor devices, and has been endorsed by major 200mm and 300mm fabs worldwide. Leading semiconductor device manufacturers have installed multiple units, running critical applications in fully automated 300mm production environments.

## **Global support**

Metryx is headquartered near Bristol in the UK and serves all major areas of semiconductor fab in Europe, the USA and Asia through an extensive partner network. For further information contact Dr Adrian Kiermasz, Metryx Ltd., Unit 2, Manor Park, Nailsea Wall Lane, Nailsea, Bristol BS48 4DD, UK. He can be reached by telephone at +44 (0) 127 586 6260, fax at +44 (0) 127 586 6112 or send e-mail to [adrian.kiermasz@metryx.net](mailto:adrian.kiermasz@metryx.net).