AtOMS:
NEXT GENERATION OF PVD PROCESS CONTROL

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Is the control of thin film's deposition important to you?

Agenda:

- Partners
- AtOMS Overview
- System Approach
- Mounting
- Data
- Comparison

Let's explore the possibilities then...
WHO WE ARE

AccuStrata
- AccuStrata is a Leader in customized instrumentation hardware and software products and services
- Specializations in imaging, spectroscopy, optics and photonics sensing
- Expertise in sensor systems integration, data fusion, machine learning, and in thin film technology-design to manufacture

DigiVac
- Engineering and manufacturing Vacuum Measurement and Control Instrumentation for nearly 40 years
- Sells direct through digivac.com and through reseller partners under DigiVac branding and private label
- Manufacture OEM control technology and calibrations service annuity chancel.
- Expertise in vacuum gauges, vacuum control, OEM & Engineering NRE, Vacuum system accessories & turn key bundles, as well as calibration services

Partners
AtOMS

Monitoring deposition rate of multiple elements simultaneously & chemical composition of film

Optical metrology tool for real-time monitoring and control of vacuum thin film deposition processes and dry etching.

- A single system can monitor up to 4 chemical elements simultaneously
- Displays each individual element deposition rate and the composition of the compound film as it is deposited/etched.
- Over 60 elements available.
SYSTEM APPROACH

Unique Metrology
- Perform broadband optical monitoring of plasma emission (OES)
- Perform atomic absorption (AAS) of specific elements simultaneously with AES and OES

Process Monitoring
- For any PVD process (E-beam, sputtering, etc.)
- Monitor presence, concentration and state of gases and radical
- Monitor in the proximity to the wafer surface

Advanced Algorithms
- Correlate to film thickness and rate of deposition/etching during process
- Predict the process endpoint using the broadband spectra
- Correlate atomic concentration of elements to chemical composition

The Advantage
- Correlate data with the process parameters for film deposition
- Improve product yield through dynamic process control

- PCT 2016/018225;
- US Pat: 10,408,744;
- EU Pat: 3,417,478;

System and Method for Monitoring Atomic Absorption During a Surface Modification Process;
COMPLETE FIBER OPTICS SOLUTION

Measure Where it Matters
- Measure processes from within or outside the chamber
- Measure only the region where process is occurring
- Measure independent of substrate shape, orientation, and motion

Complete Installation Customization
- Can install on chambers without retrofitting
- Measure up to 4 individual elements simultaneously
- Configure up to 3 probing beams in a single AtOMS system

Flexibility
- Over 60 single element and multi-element light sources
- Suitable for both deposition and etch processes
- Configures in multi-bounce geometry for even greater sensitivity
Software:

AA and OE for various elements, accuracy and stability

Time domain page

AA and AE for Gold

Accuracy for Aluminum

Spectral domain page

Accuracy for Gold – 0.6%

AtOMS stability
INSTALLATION

External to Chamber

- Seamless, no chamber modification
- Fast, good for demo
- Exchange the original flanges with AtOMS sensor flanges

Internal to Chamber

- Reconfigurable inside chamber
- Unprecedented accuracy for elements with low absorption
- Allows installation of multiple probe beams for control of uniformity
AtOMS in action

AtOMS Installation in 3-compartment magnetron sputtering chamber – closed chamber view

3-compartment chamber with 3 probe beams inside - open chamber view

AtOMS sensor installation in periscopic setup on bottom of high-temp vacuum chamber

AtOMS sensor installation outside chamber

AtOMS sensor installation inside chamber
WHY USE PROCESS CONTROL?

Limits of: Post-Deposition Control
- Cannot correct during process
- Limited usefulness for future processes

Limits of: Optical Monitoring
- Requires flat substrates or witness
- Difficult to retrofit
- Complicated data interpretation

Limits of: In Situ Crystal Monitor
- Requires line of sight
- Difficult to retrofit
- Single element detection

AtOMS Reduces Product Cost
- Improve Product Yield
- Improve Production Reliability
- Decrease Production Time
- Reduce Waste
- Process Traceability

Where does AtOMS Excel?
- Optically Opaque Films / Metals, Alloys
- Complex Substrates / Substrate Motions
- Compounds / Complex Compositions
- Complex Multilayers / Patterned Films
- Extremely Thin Films / Engineered Interfaces
- Extremely Thick Films / High Dep. Rates
- Extremely Small Etching Areas
- Critical Compositions, i.e. Bandgaps, Conductivity
- Highly Unstable Processes
- Large Processing Chambers
SUMMARY

• Strong Partnerships to build upon
• Flexible monitoring capabilities that can grow with your customer needs with continued support

ATOMS PERFORMS IN REAL TIME

BASE ATOMS SYSTEM RENTALS
The Base system can be rented for process validation

BASE ATOMS SYSTEM PURCHASE
The Base system can be purchased for constant process improvement

CUSTOM INSTALLATION
AccuStrata Engineers work with customers to optimize system installation on any PVD system

PRODUCT SUPPORT
AccuStrata engineers continue to support through:
New element validation
New chamber configuration
Software feature updates
IMPROVE the way you do Thin Film