

## Advanced Metrologies and In-Depth Interpretation



### Materials Analysis

### Why Work with Us?



#### Affordable Price

Up to 40% lower than industry pricing



#### Free Consultation

Before and after service



#### In-Depth Data Interpretation

As a second opinion to yours



#### Quality Assurance Program

Free remeasurement if not satisfied

### Advanced Applications



#### Objective

Identify defect type & density

Map dopant type & distribution

Detect surface (< 3 nm) chemical bonds

Image individual atoms



#### Solution

PALS

SCM/SSRM

Nano-FTIR

Cs-TEM

### Metrology Services

#### Microscopy

##### Visualization from macroscopic to atomic level:

3D-CT, AFM, C-SAM, Dual Beam FIB/SEM, SQUID, SEM, SCM, SSRM, TEM, Cs-TEM

#### Scattering

##### Analysis of material structure and composition:

DBS, PALS, RBS, HFS, NRA, ToF SIMS, XRR, XRD, XRF

#### Chemical Analysis

##### Identification of elements and chemical bonding states:

d-AES, d-XPS, ICP, NMR, MALDI ToF, EDS, EELS

#### Spectroscopy

##### Characterization of materials based on their interaction with light:

Fluorescence, FTIR, Nano-FTIR, Raman, UV-VIS

#### Chromatography

##### Analysis of composition including trace impurities in liquids and gases:

GC-MS, TGA-GC-MS, IC-MS, HPLC-MS, UPLC

#### Thermal & Mechanical

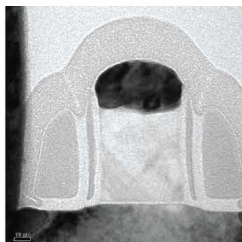
##### Qualification of physical properties of materials:

Porosimetry, TMA, DSC, TGA, Nano-indentor, Nano particle tracking

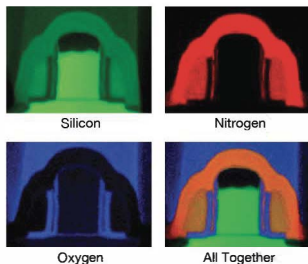


## High Resolution (HR) TEM/EELS

Image of Gate Oxide

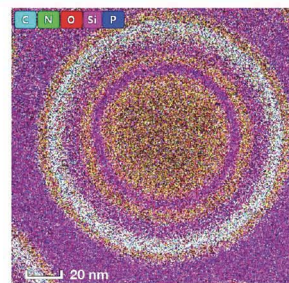
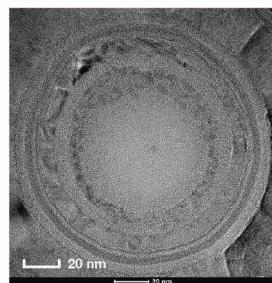


EELS Aerial Mapping



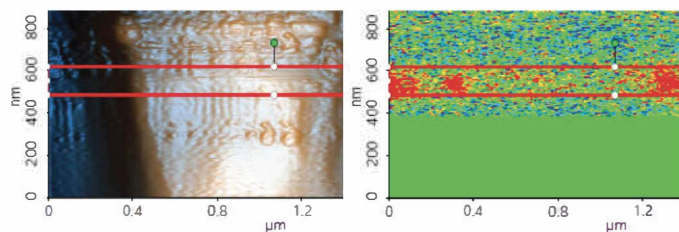
Structure and Compositional Analysis of Gate Structure

## Aberration (Cs)-Corrected TEM/EDS



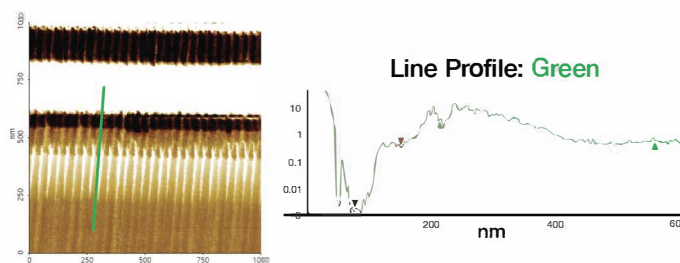
Plan View TEM and EDS from a 3D NAND Chip

## Scanning Capacitance Microscope (SCM)



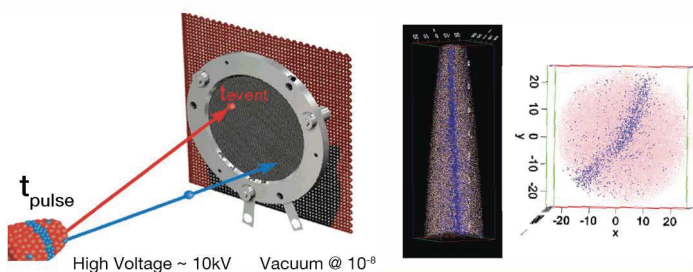
Dopant Type Identification in a 15 nm NAND Contact Gate

## Scanning Spreading Resistance Microscope (SSRM)



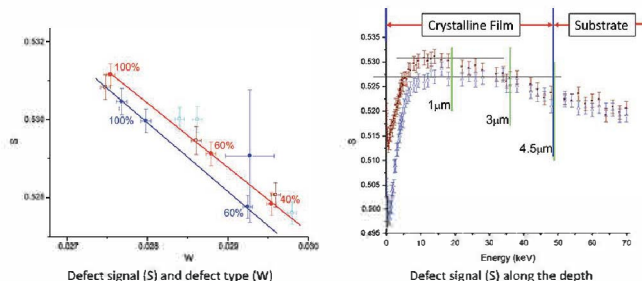
Dopant Profile from a 15 nm Memory Array

## Atomic Probe Tomography (APT)



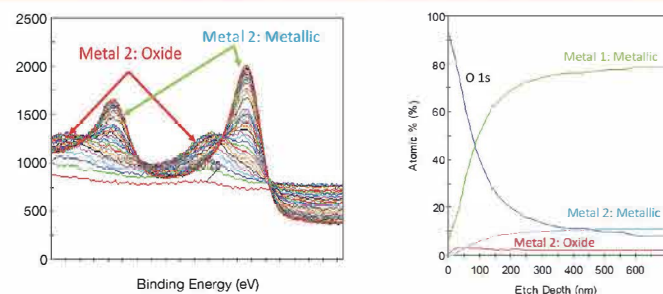
Boron Doping Concentration - 0.024%

## Positron Annihilation Lifetime Spectroscopy (PALS)



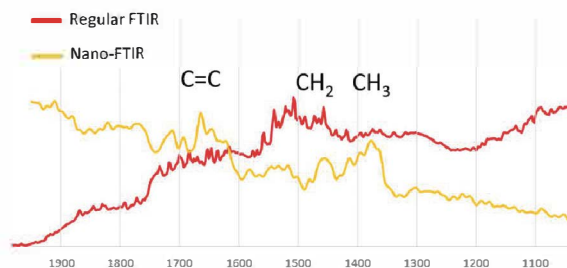
Defect Type, Density, and Distribution within a Single Crystal Film

## X-ray Photoelectron Spectroscopy (XPS)



Metal Peak Deconvolution with Depth Profiling

## Nano-Fourier Transform Infrared (Nano-FTIR)



Comparison of Nano-FTIR and FTIR Spectra from a Treated Surface