

Semiconductor & Nanomaterial Testing Services

Applied Research & Photonics, Inc. (ARP) provides terahertz nano-scanning material characterization and testing services that helps semiconductor and nanomaterial researchers and manufacturers, easily visualize and identify in 3-Dimensional images, surface, sub-layer defects and failures. ARP testing is non-contact, non-destructive and performed at ambient temperatures.

New Innovative Imaging Technology

ARP's Terahertz Scanning Spectrometer (TeraSpectra) is a Terahertz Nano-Scanning Spectrometer/3D Imaging system that has two key technology innovations:

- 1) it breaks the spatial resolution limit of current generation optical inspection technologies, and
- 2) it uniquely identifies location and depth where defects exist.

Currently, there is no measurement technology that has the capability to provide an equivalent richness of information that ARP's *TeraSpectra* system can deliver *without* damage or destruction of the test sample.

Current Inspection Technology have Limitations

Atomic Force Microscopes (AFM) are one of the go-to technologies for wafer inspection, but require surface contact which can damage nanometer scale circuits. *X-Ray* inspection technology imparts high energies which can damage substrate lattice structure. *IR* inspection technologies at wavelengths of 1.5 microns and *UV* inspection at 256 nanometers, which are the current state of the art, but are limited to surface inspection only. *Electron Microscopes* are very expensive, require sample destruction and tedious sample preparation.

Materials

- Semiconductor Wafers
- Nanomaterials
- Soft materials
- Nano-composites

Key Features

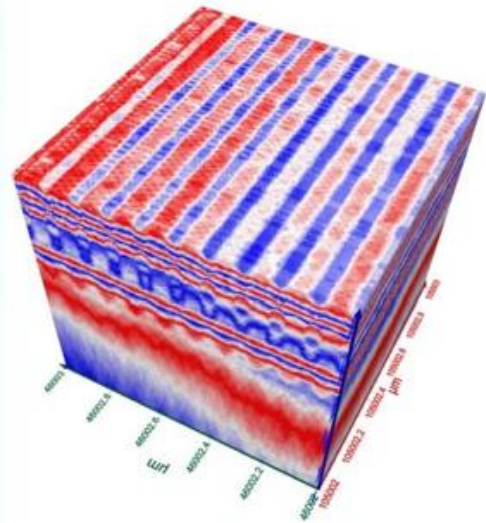
- 3-Dimensional Imaging
- Sub-Surface Inspection
- Non-Contact
- Non-Destructive
- Layer-by-Layer Analysis
- Material Characterization:
 - Lattice Image
 - Stacking Fault
 - Dislocations
 - Nanovoids
 - Delamination

Fast Turnaround Testing

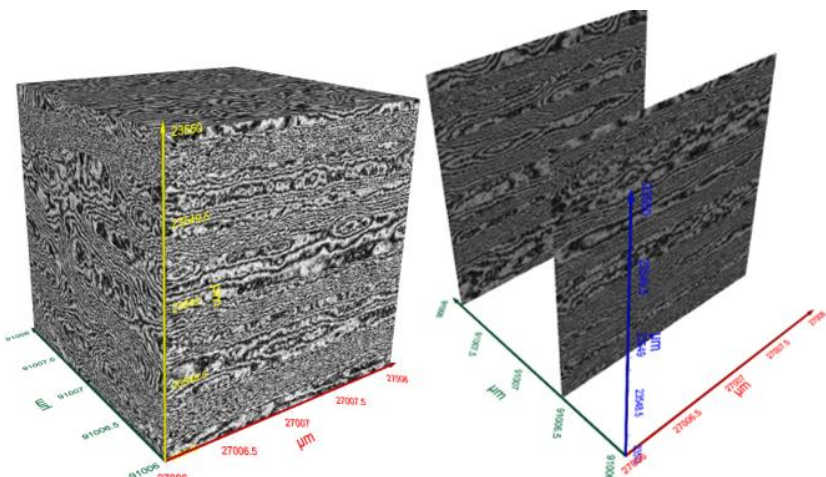
Once material samples are received test duration is typically between 1 and 3 days per sample. Test duration, as always, are subject to the test criteria and characterization requirements of our customers. ARP consultants provide a comprehensive test report and assist in interpretation of results.

KEY FEATURE & BENEFITS

- Non-Contact & Non-Destructive Testing
- Sub-Surface Layer by Layer Inspection
- Sub-Nanometer Resolution
- 3-D Imaging
- Fast Turnaround Testing



Carbon nanotube film on Si wafer: 60° aligned



(a) Three-dimensional image of 1 cubic micron volume of a "GaN on Si" wafer. (b) Two slices of one square micron surfaces image of the same (XZ) plane. Distorted lattice patterns are visible indicating damages of the GaN layer.

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Measuring the world one nano-particle at a time.