LICENSING OPPORTUNITY: DYNAMIC MULTI-WAVELENGTH AND SAMPLE VOLTAGE ATOM PROBE TOMOGRAPH FEEDBACK CONTROL SYSTEM

DESCRIPTION

Problem

Modern nanomaterials are often composed of many different elements, materials, and phases. Traditional atom probe tomography (APT) uses a single laser wavelength to trigger the field-assisted evaporation of ions from a specimen. However, the "ideal" wavelength for a metal might be completely ineffective for an insulator or a semiconductor. Using only one wavelength often results in poor data quality or the inability to analyze multiphase materials effectively during a single data collection run.

Invention

This invention is a high-precision atomic-scale analysis system designed to map the atomic-scale chemical structure of materials with improved accuracy and precision. By integrating a multi-wavelength pulsed radiation source with a high-voltage power supply, the system identifies and locates individual atoms in 3D. Its primary value proposition is a dynamic feedback control system: as the detector receives ion signals, the system instantly and automatically adjusts laser timing, pulse intensity, and voltage levels in real-time. This self-optimizing capability eliminates the need for manual laser tuning, ensuring the system consistently delivers high-quality data at a faster rate, making it an essential tool for industrial R&D in semiconductors and energy storage.

BENEFITS

Potential Commercial Applications

- Semiconductor Manufacturing: Optimization for complex, multi-layer semiconductor-related specimens.
- Advanced Metallurgy: Analyzing multi-phase alloys where different elements require different trigger energies.
- Nanotechnology Research: Characterizing novel engineered nanomaterials and nanostructures.
- Aerospace: Developing new super-alloys that can withstand extreme heat.
- Nuclear Power: Analyzing how radiation affects materials at an atomic level over time.

Competitive Advantage

- Superior Data Accuracy: Tailoring wavelengths to specific phases yields improved three-dimensional tomographic reconstructions compared to single-wavelength systems.
- Versatility: Solves the long-standing challenge of running metallic specimens and insulators together by providing different triggering mechanisms (e.g., heating for metals, photoionization for insulators) in one instrument.

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