Metrology informatics for electron microscopy

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Recent advancements in measurement and analysis technology, coupled with significant improvements in computing power, have made it possible to collect vast quantities of complex data. To derive new insights from the data, informatics techniques are being applied with increasing frequency. We define the integration of metrology and informatics as metrology informatics, and we employ this approach to analyze semiconductor materials and devices, with a particular focus on the structure of measurement data.

In this presentation, we present a case study in which spectral imaging was performed using scanning electron microscopy-cathodoluminescence (SEM-CL) on GaInN quantum well layers used in gallium nitride semiconductor optical devices. Emission modes were then analyzed using statistical methods, specifically one-sided orthogonal nonnegative matrix factorization.

As nano-semiconductors continue to evolve towards miniaturization and complexity, advanced techniques such as three-dimensional atom probe (3DAP) and electron tomography (ET) are becoming essential for their analysis. However, these methods produce data with different structures. To overcome this challenge, we propose a multimodal analysis approach that integrates data from different modalities.