New Technology of Atom Probe Tomography Instrumentation
The LEAP and Invizo 6000 Instruments from CAMECA

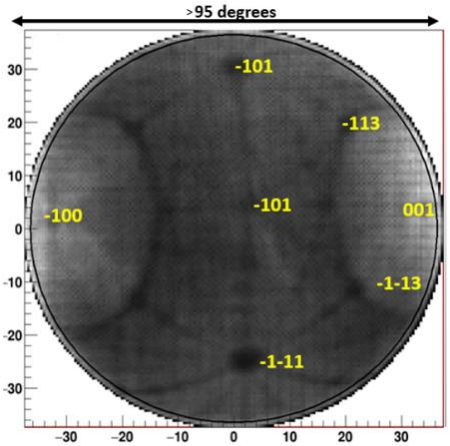
E.Camescasse[1], R.M. Ulfig[2], J.H. Bunton[2], D. Lenz[2], D.A. Reinhard[2], P.H. Clifton[2], and D.J. Larson[2]

[1] *CAMECA Instruments SAS, 29 quai des Gresillons, 92622 Gennevilliers FRANCE*
[2] *CAMECA® Instruments Inc., 5470 Nobel Drive, Madison, WI 53711 USA*

We will present the details about two new atom probe microscopes which comprise CAMECA's 6000 product line. We will briefly introduce the technology and resultant benefits of each over previous generations by presenting three-dimensional compositional information with subnanometer spatial resolution from various metallurgical systems.

The LEAP 6000 XR™ system introduces deep ultraviolet (DUV) laser pulsing to commercial atom probe systems for the first time, improving success rates and data collection rates on key applications. It is completely automated and compatible with the high throughput local electrode and microtip workflow. The microscope also has a hybrid pulsing mode using both voltage and laser pulses simultaneously, providing a higher effective pulse fraction that dramatically improves the signal-to-noise ratio for hydrogen and other low concentration solute elements.[1]

The Invizo 6000® also incorporates the benefits of DUV laser pulsing, but it does so with a novel counter electrode design, allowing high-angle dual laser beam illumination that is thermally coincident and symmetric providing improved data quality and reconstruction fidelity. Ions leave the specimen surface and are electrostatically directed to the detector in a nominally straight flight path using a patented Einzel lens design that captures nearly the entire specimen volume, as much as a doubling of the previously achieved field-of-view.[2] This opens new applications that require a large FOV and makes site-specific specimen preparation easier. The large FOV also allows more careful control of the evaporation as well as more information about the specimen, further improving reconstruction fidelity and success rates.



of an aluminum specimen demonstrating an angular field of view >95º (detector dimensions in mm)

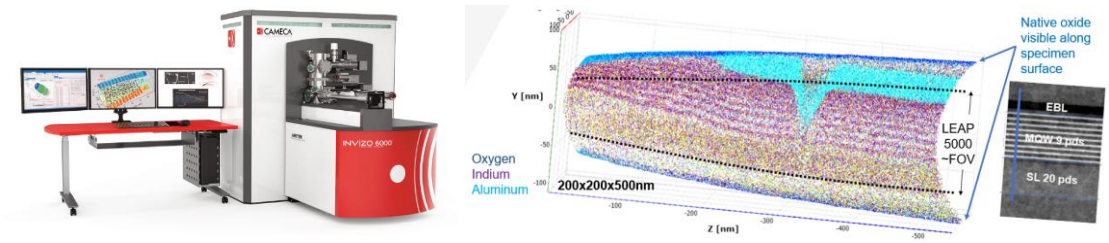


Figure 2. The Invizo 6000 microscope with a slice of the three-dimensional data from a failed InGaN LED device. The entire volume of the specimen is in the field of view capturing the V-growth defect and the oxidation at the edge of the specimen that occurred after FIB-SEM preparation. The equivalent field of view of the previous generation LEAP microscope is shown with dotted lines.

[1] T.F. Kelly, *Microscopy and Microanalysis*, **2011**, *17*, 1–14.
[2] J.H. Bunton & M.S. Van Dyke, *USPTO*, **2020**, *2018013063610*, 1-10.