EIKOS™: Design, Performance and Results of a Newly Designed Atom Probe Microscope

Larson, D.[1], FRANCOIS-SAINT-CYR, H.[1], Prosa, T.[1], Ulfig, R.[1], Rice, K.[1], Chen, Y.[1], Martin, I.[1], Lenz, D.[1] and Bunton, J.[1]

[1] CAMECA, United States

More than fifty years after the first Atom Probe Tomography (APT) publication [1], approximately half of APT experiments completed around the world still focus on 'core' applications in metallurgy. While the APT community has been steadily growing due to the progress made in specimen preparation, instrumentation, data reconstruction and analysis, [2], the most widely adopted state-of-the-art technology, namely the Local Electrode Atom Probe (LEAP) still requires a relatively high cost of ownership (COO).

We present the newly developed EIKOS™ system which includes a reflectron, a 532-nm wavelength laser, and a fixed counter electrode, in a configuration designed to trade off a moderate reduction in electric field (as compared to the previous local electrode atom probe designs) for simplifications or improvements in ease of use and COO. Although especially suited for metallurgical applications, EIKOS provides also high-quality, scientifically useful 3D subnanometer resolution and compositional information across a wide variety of applications due to its laser option. We will discuss the design of the integrated counter electrode and its effect on the geometric k-factor through electrostatic modeling and experimental results, as in the new design specimen apex protrudes through the electrode opening based on a concept proposed by Nishikawa and Kimoto [3]. EIKOS performance will be illustrated in both voltage pulse and laser pulse experiments. Correlative analysis with transmission electron backscatter diffraction for grain boundary chemistry as a function of grain boundary energy in Inconel 718 will be presented [4].

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