

Atom Probe Tomography

Stephan Gerstl
ScopeM, ETH Zurich

Abstract

There are few characterization techniques to visualize individual atoms that make up materials. Atom Probe Tomography is the distinctive technique, which results in 'atom maps': displaying a particular volume of material in 3-dimensions, atom-by-atom. By chemically identifying and localizing atom positions in 3-dimensions, myriad nanostructures, dopants, and clustering phenomena can readily be quantified.

After an introduction with a brief historical perspective, an overview of this characterization technique will be given. The description of how specimens are prepared for their analysis, the raw data reconstruction, and evaluation methods of the data will be discussed. The predominant applications of Atom Probe Tomography are to hard & dense materials such as metals, semiconductors, oxides, and minerals. Specific examples will be provided of grain boundaries and nanometer scale precipitates in alloys, quantum wells and other semiconducting structures.

The application space of material types that Atom Probe analyzes, however, is still expanding and with recent cryo-transfer developments completed at ETH, the ability to measure dynamic materials – such as hydrogen or other solutes in alloys and ultimately liquids – enables softer materials to be interrogated. Examples of these cutting edge results will also be presented to demonstrate the up-and-coming capabilities of APT.

Contact details

ScopeM-Scientific Center of Optical & Electron Microscopy
Auguste-Piccard-Hof 1, 8093 Zurich, Switzerland
E-mail: stephan.gerstl@scopem.ethz.ch
Phone: +41 44 633 6954
Web: www.scopem.ethz.ch