

*Presents*

## **Atom Probe Tomography – Technology and Applications**

**by Peter H Clifton**

**Date: 23 October 2019 (Wednesday)**

**Time: 9.30am – 10.30am**

**Venue: EA-02-11**

### **Abstract**

Over the past 15 years, the number of peer reviewed publications referencing the use of atom probe tomography (APT) each year has grown by nearly a factor of five [1]. Modern local electrode atom probe (LEAP) systems, can identify subnanometer, spatially resolved, 3D information of any element or isotope with up to 80% detection efficiency at millions of atoms per minute with a field of view that can exceed 250 nm and an achievable sensitivity limit in the low parts per million range.

New atom probe instrumentation will be discussed, such the EIKOS system from CAMECA [2], giving dramatic improvements in the simplicity of design and operation. It is now also possible to complete a specimen transfer under ultra-high vacuum, with the ability to keep the specimen at cryogenic temperatures to enable new applications such as water-based systems. New sample preparation techniques and software applications will be discussed as well, such as the combination of APT with transmission electron backscatter diffraction (t-EBSD) [3].

Although the most common APT applications remain metallurgical in nature, these hardware and software improvements continue to open new applications by enabling sufficiently high yields and data quality. Recent new applications include: failure analysis of FinFET devices, 3D printed alloys, high entropy materials, rapid oxidizers, zeolites, cryogenically preserved biomolecules, H/D distribution in materials as well as traditional analysis of metals, metal oxides and protective coatings.

[1] D.J. Larson et al., “Local Electrode Atom Probe Tomography”, Springer, New York, (2013).

[2] D.J. Larson et al., Microstructural Investigations in Metals Using Atom Probe Tomography with a Novel Specimen-Electrode Geometry, Journal of Metals (2018).

[3] K.P. Rice et al., “Crystallographic Identification of Atom Probe Desorption Maps”, Microscopy and Microanalysis 22(3) (2016) p.583.

### **Speaker**

Dr Peter Clifton joined Oxford Nanoscience Ltd – the UK-based supplier of Atom Probe instruments – as a senior atom probe scientist in 2004. His responsibilities included establishing and running the applications lab, providing customer training and the development of new applications. He also participated in the development of key new instrument technologies such as the large angle reflectron and laser-assisted atom probe tomography. These activities continued after the merger of ONS with Imago Scientific Instruments (2006) and the consolidation of Imago into CAMECA (2010).

Peter has been working with the atom probe technique for nearly 20 years. This has included time as a research assistant within the Oxford Materials Department Atom Probe Group (working with Profs. Alfred Cerezo and George Smith) as well as a variety of engineering and scientific roles with Seagate Technology, ONS, Imago and CAMECA. He was a key contributor to the pioneering development of APT applications with wafer-deposited thin film structures, including GMR and TMR stacks for data storage applications and his research interests have remained concentrated on removing the barriers to widespread adoption of this exciting technique. He has published more than 45 APT-related papers.

**ALL ARE WELCOME!**

*Host: A/Prof Michel Bosman*