Atom probe tomography is a powerful microscopy technique that provides atomic-resolution 3D maps that show the precise location of the atoms within a volume of material [1]. It has seen widespread use for the characterisation of bulk metals and alloys, but new developments in specimen preparation and the use of lasers have now made it applicable to the study of a much wider range of material types. This presentation will provide an overview of a range of different studies involving ‘non-traditional’ functional and nanoscale materials. This includes bulk Pt/ZrO2-multilayers, which are model systems for applications like the newest generation of micro solid oxide fuel cells and sensors metallic glass nanowires. In these samples, which consist of nanocrystalline layers 10-40 nm thick, we are interested in the solubility and diffusion of oxygen in the noble metal layers. However, the study of such layers in atoms probe is subject to limitations due to the large difference in the field evaporation behaviour between the metal and the oxide. We will discuss how these issues have been addressed in our study, and the observed location of the oxygen atoms. We will also show recent results from the study of bimetallic Au@Ag core-shell nanoparticles. The catalytic performance of these particles greatly influenced by the distribution of the atoms of each element within the particle and on the particle’s surface. However, almost no quantitative, experimental data is currently available on the precise location of the individual atoms within particles less than 100 nm in size. We will demonstrate atom probe can be used to quantitatively determine the distribution of the individual chemical elements in 3D both inside and on the surface of nanoparticles extracted directly from a suspension. Other examples will include ion-irradiated bulk metallic glass nanowires, in which the distribution of embedded Ga ions is being investigated in order to understand their influence on the plasticity of the nanowires. In each case we will discuss how challenges around the specimen preparation have been overcome, any artifacts that are expected to arise in the data (and how these have been addressed), and the new analysis methods applied. References [1] B. Gault, S.P. Ringer, M.P. Moody, J.M. Cairney, Atom Probe Microscopy, Springer, 2012.

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