

Contributions of Atom Probe Microscopy within the Geosciences

David W. Saxey^{1,2}, Steven M. Reddy^{1,2}, Denis Fougereuse^{1,2}, and William D. A. Rickard^{1,2}

Corresponding Author: david.saxey@curtin.edu.au

¹ Geoscience Atom Probe, Advanced Resource Characterisation Facility, John de Laeter Centre, Curtin University, Perth, Australia.

² School of Earth and Planetary Sciences, Curtin University, Perth, Australia.

In recent years atom probe microscopy (APM) has made inroads into the chemical and isotopic analysis of geological samples. Steady progress has been made in applying atom probe techniques across a growing collection of minerals, with several research groups active in the field, addressing long-standing questions in planetary science, geochronology, and fundamental processes within geological materials [1-7].

Conventional geoanalytical techniques have remarkable chemical and isotopic sensitivity, down to parts-per-trillion or lower. However, their spatial resolution is typically at micron length-scales, with a few secondary ion mass spectrometry techniques capable of sub-micron resolution (e.g. NanoSIMS). The chemical and isotopic landscape at nm length scales is therefore largely unexplored within geological materials – though it is expected to contain a wealth of information on past geological, biochemical and planetary processes. APM allows these variations to be studied at much smaller scales, providing access to new information of geological significance.

This presentation will show-case a selection of work across several geoscience applications, highlighting the significant role that APM is playing within the nascent field of nanoscale geochemistry. Examples include the analysis of silicates, oxides, sulphides, and phosphates, with applications in mineral processing, waste management, extra-terrestrial materials, isotope geochemistry, and geochronology. Future prospects for geoscience applications will also be discussed [8].

References:

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