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Ansto



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Quantified, multi-scale element mapping of geological samples using the Maia detector array

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Studies of ore systems require microanalysis of samples to gather information on mineral chemistry. Information from in-situ microcharacterisation studies can be used both to recognise mineral zonations and chemical relationships among mineral phases that provide a record of hydrothermal activity, fluid chemistry and fluid-rock reactions. Such information is vital in constraining the physio-chemical conditions during ore genesis and mineral alteration.

The Maia large solid-angle detector array on the X-ray Fluorescence Microscopy (XFM) beamline at the Australian Synchrotron is capable of collecting high-resolution images of up to ~100 M pixels in size with dwell times of less than 0.2ms per pixel. Thus it is possible to document variation in mineral textures associated with trace element chemistry by collecting quantified elemental maps of geological samples on the scale of entire thin sections (5x2.5 cm) in a short time frame (6-8 hours). The analysis is non-destructive and allows variation to be recognised on centimetre scale while also recognising zonations at the micron scale.

The large area scanning capability and the geometry of the Maia Detector array have also led to this technique becoming an effective tool for rare phase detection; a result of the penetrating power of synchrotron X-ray radiation and the consequent ability to image small grains within a sample volume (Ryan et al. 2014). The use of synchrotron radiation increases by ~70 times the chance of intersecting rare phases compared to conventional 2D techniques such as SEM (Godel 2013).

Two case studies show-casing these different applications of the Maia imaging approach to geological materials are presented: (1) an investigation of the microstructural and microchemical changes characteristic of large-scale fluid pressure cycling in vein-hosted high grade gold mineralisation; (2) a study of primary cumulus platinum minerals to understand magmatic microenvironments.

Keywords or phrases (comma separated)

Maia, XFM, imaging, geology, hydrothermal, magmatic

Are you a student?

No

Do you wish to take part in the Student Poster Slam?

No

Are you an ECR? (<5 yrs since PhD/Masters)

No

What is your gender?

Female

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