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Micro Materials Characterisation (MMC) Beamline: Scope and Focus

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Crystalline phase determination, polycrystallinity, strain, grain orientation as well as defect structure, migration and organisation are fundamental to the understanding of materials' properties. The MMC beamline is the only facility planned for the Australian Synchrotron that will enable these properties to be spatially resolved at the micron scale.

We present the current design and capabilities of the MMC beamline. In particular we highlight its extensive potential application to both the scientific and to the industrial R&D communities and to the contributions that can be made to Australia's strategic scientific and research priorities. The MMC beamline has enormous potential to provide a highly sophisticated tool that brings together industry and research.

The MMC beamline will be able to be used to address critical issues with respect to solar, high-temperature and nuclear energy materials, can enable novel studies of pollutants in the environment, can help understand geological processes, mining and mineral recovery and can even provide new information on biological materials. The reality is that the world is heterogeneous and that the micron scale is an important length scale where heterogeneities start to resolve themselves into homogeneous crystals and structures.

Synchrotron X-ray microprobes have commonly used a monochromatic X-ray beam. When the crystallite size is smaller than the incident beam size, monochromatic diffraction measurements yield either complete or fragmented Debye-Scherrer diffraction rings. These rings can provide considerable information. However, monochromatic radiation has the important disadvantage that where the crystallite size is of the order of or larger than the beam size, few or no diffraction peaks may be measurable for a given sample and detector geometry, and hence vital information may be simply overlooked. To overcome this increasingly common circumstance a broad bandpass incident X-ray beam may be used.

The MMC beamline's key capability will be the provision of both monochromatic and Laue microdiffraction (< 1 micron) with rapid interchange between the two. This will be coupled to subsidiary capabilities of X-ray fluorescence mapping and selected area XAS. The breadth of potential application of this facility, as well as its world-class capabilities, have already been acknowledged by its international Specialist Design Committee and its very significant potential user base.

Keywords or phrases (comma separated)

microdiffraction, microprobe, Laue, materials science, earth science, industry

Are you a student?

No

Do you wish to take part in</br>the Student Poster Slam?

No

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

No

What is your gender?

Female

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