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# Dual sample analysis on the XFM beamline: a new approach to increase the throughput of analysis of large samples

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X-ray fluorescence microscopy (XFM) is a powerful mapping technique that can be used to determine the distribution of elements and chemical species at a range of spatial resolutions. Synchrotron radiation is commonly used as the X-ray source over conventional benchtop XFM as the photon flux is orders of magnitude greater, meaning that speed of analysis is also orders of magnitude faster.1 However, there is extremely high demand for synchrotron-based X-ray fluorescence mapping due to its wide range of applications including biomedical, geological, environmental, agricultural and cultural heritage fields of reserach.2 Therefore, user access to the Australian Synchrotron XFM beamline is very competitive and the beamline is oversubscribed. In this study, we developed a dual scanning approach that allows for simultaneous data collection from two samples. More specifically, we performed milliprobe analysis of an upstream sample concurrently with microprobe analysis of a downstream sample. The motivation behind this work was driven by the need to map large samples (>100 cm2) without sacrificing the throughput of the XFM beamline. For this study, our upstream samples were large (10 cm x 17 cm) diffusive gradient in thin-film devices (DGT); a DGT is a hydrogel embedded with a binding agent that acts as a sink for labile soil nutrients. After deployment on the soil surface, the DGT can then be mapped to visualise the distribution of available soil nutrients. We investigated the effect of DGT composition on the quality of analysis of two contrasting highly heterogeneous downstream samples (mineral and wheat thin-sections). Overall, gel composition did not affect the quality of analysis of highly heterogeneous downstream. For the first time, we demonstrated that data collection from large DGT devices can be performed in the background of other experiments on the Kirkpatrick Baez mirror (KB) end-station. This dual-scanning approach has the potential to translate to an increased throughput of analysis for XFM, as large DGTs (or other gels e.g. those used for metalloprotein separation) can be scanned at virtually no beamtime cost.

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