Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.20504

Combining synchrotron x-ray fluorescence microprobe imaging with conventional microscopies to obtain multi-modal datasets for the Earth Sciences

SAMUEL WEBB, SHARON BONE AND NICHOLAS P. EDWARDS

Stanford Synchrotron Radiation Lightsource

Presenting Author: samwebb@slac.stanford.edu

X-ray fluorescence (XRF) imaging from synchrotron sources has become a “go-to” technique across the Earth Sciences for the spatial determination of elemental distributions on scales from the nano-scale to the macro-scale. Synchrotrons provide both high brightness and tunability of the incident x-ray energy to provide both unique sensitivities and the ability to perform spectroscopy to obtain chemical species information. With any technique, the ability to expand informational content with other techniques is often highly desired and important for data interpretation. Imaging techniques across different modalities can be difficult to treat in more than a qualitative manner due to the difficulty in the registration of images from different techniques. This is often apparent when the different imaging modalities produce vastly different distributions of data, that provide little in terms of common reference points.

This presentation will show how a multi-modal data collection and analysis approach is being implemented at the Stanford Synchrotron Radiation Lightsource. Imaging data from optical/fluorescence light microscopy, FTIR microscopy and XRF imaging can be collected, with some datasets collect contemporaneously together, and some datasets as separate experiments, and then processed in a data pipeline as a coherent multi-modal set of data, where each pixel of the data image stack contains information from each of the data modalities. Applications of this type of data collection approach to the Earth Sciences will be discussed.