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## “Growing” Sulfur and Phosphorus X-ray Absorption Spectroscopy and Imaging Capabilities at the Canadian Light Source

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The Canadian Light Source (CLS) has four beamlines capable of measuring sulfur and phosphorus X-ray absorption spectroscopy (XAS): the Industry, Development, Education, Applications, Students (IDEAS) beamline, the Soft X-Ray Microcharacterization Beamline (SXRMB), the Soft X-ray Spectromicroscopy (SM) beamline and the Variable Line Spacing Plane Grating Monochromator (VLS-PGM) beamline. Sulfur and phosphorus K-edge X-ray absorption spectra can be obtained using the SXRMB and the IDEAS beamline, K-edge and L-edge using the SM beamline, while the VLS-PGM beamline has the energy range for L-edge spectroscopy.

In this contribution, we show the detection limits for these beamlines using sulfur and phosphorus standards, including NIST standards such as peach leaves and New Jersey soil. In addition to bulk XAS, the SXRMB is equipped with a microprobe endstation that can provide imaging at a resolution of 10  $\mu\text{m}$ . In this work we present X-ray Fluorescence (XRF) mapping of canola seeds with varying phytate levels. These maps show elemental distribution, allowing for insight into locations of micronutrients and their correlations with each other. This endstation can also be used to collect micro-XAS data at specific locations of interest, providing insight into speciation. Here, we present phosphorus micro-XAS data.

Overall, the CLS can provide great value to agriculture and environmental researchers due to its complementary K- and L-edge spectroscopy and imaging capabilities.

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