JOINT MEETING OF POLISH SYNCHROTRON RADIATION SOCIETY MEMBERS
AND SOLARIS CENTRE USERS

THREE-DIMENSIONAL MICROIMAGING WITH ELEMENTAL SENSITIVITY AS A NEW MODALITY OF THE POLYX BEAMLINE AT THE SOLARIS SYNCHROTRON

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X-ray fluorescence computed tomography (μXRF-CT) combines the elemental specificity of μXRF spectroscopy with the three-dimensional reconstruction capabilities of μCT to visualise the distribution of specific elements within a sample. The recent experiment at the PolyX beamline 0 at the SOLARIS synchrotron 0, which was conducted in March this year, enabled commissioning of μXRF-CT by measuring gold microspheres and *Arabidopsis thaliana* seed as tomographic standards. Reconstructed cross-sections of the seed are presented in Figure 1. Self-absorption in the sample limits the possibilities for qualitative analysis of sample composition, especially for light elements, but there are algorithms that can correct this effect or even enable quantitative analysis 0. Moreover, correlating and merging data from μXRF-CT and transmission μCT could extend the possibilities for sample characterisation 0. The following step in the process of sharing a new beamline modality with users is implementing self-absorption correction and optimizing experimental conditions. Single-slice data acquisition requires approximately 2 hours, but limiting number of projections and implementing iterative reconstruction algorithms could reduce it several times. Together with developing a workflow for whole experiment it creates a powerful technique modality, which significantly enhances the beamline's capabilities.

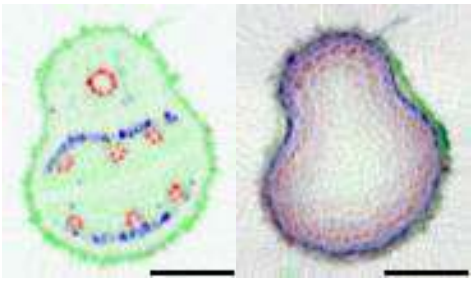

Figure 1. Reconstructed cross-sections of *Arabidopsis thaliana* seed. Left image was constructed with Fe (red), Ca (green), and Mn (blue) signals; right image with P (red), Cl (green), and S (blue) signals. Scale bars length equal to 100 μm.

[1] Sowa et al., Nucl. Instrum. Methods Phys. Res. B: Beam Interact. Mater. At. 538 (2023): 131-137.
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[3] Huang, Limburg, and Rohtla, AIP Advances 7, 055111 (2017).
[4] Lin et al., Commun Biol 7, 280 (2024)