With a spatial resolution of 200 nm in the 5-30 keV energy regime, the 2-ID-D x-ray fluorescence microprobe at the APS has been serving the life science community for over 15 years. Recent instrumentation enhancements have further increased its capabilities for biological applications. Most noticeably is the implementation of cryogenic sample environment with a cryojet to maintain the sample temperature near 100 K, enabling frozen hydrated biological samples to be examined at their native state. A double multi-layer monochromator has been installed at the beamline, increasing the focus intensity by more than an order of magnitude, while still achieving a spatial resolution of 300-400 nm. For high energy applications above 20 keV, we have commissioned a stack zone plate apparatus where up to six zone plates can be aligned (and stay aligned for 24 hrs) in intermediate field, and has demonstrated efficiency up to 28%. In addition, a new silicon drift detector was installed which has a faster preamp to enable considerably higher counting rate and a 1-mm thick sensor to boost the capturing efficiency for high energy XRF photons. At the same time fly scanning is routinely used, significantly increased the sample throughput. These instrumentation developments and micro-XANES capability of the microprobe have enabled novel applications in biological and environmental science.

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Fig. 1 Sample environmental chamber with a cryojet (top) for maintaining the sample temperature at 100K.