Nano-imaging with high-throughput x-ray ptychography

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Ptychography has become a very popular and successful imaging technique which is able to produce quantitative reconstruction of the sample's complex transmission function with diffraction-limited resolution that is not limited by the numerical aperture of the focusing optics. X-ray ptychography has been demonstrated to obtain sub-10nm spatial resolution and provides a promising microscopy tool in material science [1,2] and biology [3,4]. By acquiring ptychographic projections for a set of rotation angles, ptychography also finds valuable applications in 3D X-ray imaging [5-7].

As a combination of coherent diffraction imaging and scanning microscopy techniques, ptychography allows imaging for extended sample region with a customizable field-of-view (FOV). This comes at a cost of the increasing data acquisition time and data volume, resulting in a trade-off between the large FOV and high spatial resolution in ptychographic imaging. Here I will introduce the progress we made at the Advanced Photon Source (APS) to achieve high-throughput, high-resolution ptychographic imaging and present some examples of scientific applications.

References

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