Multi-model X-ray microtomography for in-situ structure quantification and analysis

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BL13W at SSRF, an X-ray imaging beamline has been built and opened to users since May 6, 2009. More than 70 user proposals per year are granted and implemented at the beamline, with about 500 user visits/year. Up to now, X-ray microtomography (XMCT) is the dominated method for BL13W user operation, more than 70% user experiments were carried out with XMCT, covering the research fields in material science, biomedicine, physics, environmental science, archaeology and paleontology. To meet the user requirements, micro-CT imaging methods based on a variety of contrast mechanisms have been developed. Quantitative analysis to the three-dimensional microstructures is highly emphasized. A robust method for high-precision quantification of the complex 3D vasculatures is developed and used for the investigation on angiogenesis of liver fibrosis and hepatic alveolar echinococcosis [1,2,3]. Dynamic microtomography based on monochromatic SR beam was developed and employed to reveal in vivo the anisotropic shrinkage of the insect's air sacs [4,5]. Diffraction CT which could resolve the crystal orientation and location in alloys was developed and the second phase of the alloy has been revealed [6]. A nano-CT system was designed and built at BL13W to push its spatial resolution from 0.8 micron to 100nm with an FOV of 50 microns [7]. Full field X-ray fluorescence CT was proposed and demonstrated [8]. New imaging modality based on 2nd order photon correlation, called X-ray Fourier-Transform Ghost Imaging, was realized at the beamline [9]. SAXS CT for the nanostructure analysis of heterogeneous materials has also been developed.

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