X-ray Fluorescence Computed Tomography at SSRF

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Microbeam X-ray fluorescence computed tomography（μ-XFCT）can obtain the element distribution on an arbitrary virtual section. μ-XFCT has been applied in many fields. In μ-XFCT studies, the sample is scanned line by line with a pencil beam of synchrotron X-rays, which takes an enormous amount of acquisition time to acquire a 3D tomographic image. A full-field X-ray fluorescence computed tomography is to be developed at SSRF to improve the test efficiency. The object is illuminated with a whole-volume incident beam. And X-ray fluorescence photons are collected by an X-ray detector with a polycappillary collimator. Combining subset expectation maximization and total variation(OSEM-TV) to reconstruct the information of samples with high image quality from undersampled data. Another X-ray camera is used for detecting the transmission x-rays for transmission CT(TCT). Base image fusion from XFCT image and TCT image,the resulting image will be more informative: from structural imaging to functional imaging.

in order to meet many user requirements for XFCT, the laboratory XFCT system was designed and constructed at SSRF. The XFCT system is based on polycapillary and W target micro-focus X-ray source. The focusing spot is 82um with 7mm depth of focus. The maximum likelihood expectation maximization (MLEM) algorithm was used to reconstruct the imaging. The experimental results demonstrated that it can be used for element imaging and a measured element sensitivity of 1000pm was achieved.

References:

[1] **Biao Deng**，Guohao Du Guangzhao Zhou et al，3D elemental sensitive imaging by full-field XFCT，***Analyst***,，2015.3.19，140(1)：3521-3525

[2] **Deng Biao**，Yang, Qun，Du, Guohao，Tong, Yajun，Xie, Honglan，Xiao, Tiqiao，The progress of X-ray fluorescence computed tomography at SSRF，***Nuclear Instruments and Methods in Physics Research Section B***，2013.6.15，305：5-8

[3] Yang, Qun ，**Deng Biao***，Du, Guohao，Xie, Honglan，Zhou, Guangzhao，Xiao, Tiqiao，Xu, Hongjie，X-ray fluorescence computed tomography with absorption correction for biomedical samples，***X-Ray Spectrometry***，2014.10.01，43(5)：278-285

[4] Pengfei Sun，**Biao Deng***，Guohao Du et al，Nondestructive rare earth element imaging of fish teeth from deep-sea sediments,，***X-Ray Spectrometry***，2015.3.25，44(1)：442-446