Hybrid Photon Counting takes X-ray spectroscopy to the next level

Nicolas Pilet

DECTRIS, Taefernweg 1, 5405 Baden-Daettwil, Switzerland
nicolas.pilet@dectris.com

In the last decade, Hybrid Photon Counting (HPC) technology has transformed almost all X-ray based analytical methods in basic research and industry. X-ray diffraction techniques benefited the most from the advantages of HPC detectors. Noise-free detection, energy discrimination, a single-pixel point spread function, high frame rates and a high dynamic range are critical for highest data quality.

Although equally promising, HPC technology has made slower headway in X-ray spectroscopy. Early papers showed that HPC detectors were well suited for wavelength-dispersive emission and absorption spectroscopy. Here we present how MYTHEN, PILATUS and EIGER detectors have advanced static and time-resolved spectroscopy studies in recent years. Our focus is on X-ray absorption fine structure (XAFS) studies under challenging conditions: short exposure times, sample heterogeneity, high background signal. We also explore new possibilities offered by depth profiling and single-shot pattern acquisition. We will examine remaining challenges and show how new detector generations (PILATUS3, MYTHEN2 and EIGER2) will help spectroscopists overcome them.

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