[MS10-P09] Energy-dispersive in-house Laue diffraction experiments with a Pilatus detector.

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Traditional Laue diffraction studies are performed with white x-ray radiation and conventional two-dimensional detectors without energy resolution. Quantitative structure determination from such experiments is only possible if the unit-cell parameters are known in advance and if overlapping of high harmonics is not too serious [1]. The use of position sensitive detectors with capability of energy resolution measurements (e.g. hybrid pixel Pilatus detector [2], frame store pnCCD [3] etc.) allows overcoming such problems as the energy-dispersive analysis of Bragg peaks enables a unique determination of the lattice and resolution of higher harmonics without any a priory information [3]. Energy-dispersive Laue diffraction (EDLD) experiments are usually done at synchrotron sources with high intense x-ray irradiation. In the presented work EDLD studies are performed with a conventional x-ray source (Mo anode tube) using a 300 K Pilatus detector [2]. As an advantage of this combination, a direct measurement of the primary beam spectrum of the x-ray tube and subsequent estimate of sample/air absorptions are becoming possible. Additionally, one can vary the x-ray spectra by applying different voltage/current settings for x-ray excitation. As a main disadvantage, the maximum intensity of the primary beam is around 10^6 photons/sec, which is some orders of magnitude lower compared to synchrotron sources [3]. Therefore, longer exposure times are required in our experiments, but the total experimental time is still in the order of conventional angle dispersive in-house experiments or even faster, which can be an advantage for the structural studies at extreme conditions. Several crystalline materials (silicon, urea inclusion compounds etc.) were investigated with in-house EDLD. A sufficient energy resolution (<0.12 keV) over the obtained Laue pattern is achieved under direct analysis of detector S-curves gathered within the 4-25 keV calibration range. Possible applications of the method and details about required correction procedures will be discussed.

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