

Improvement of Crystal Quality by Time Controlled Annealing

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Poorly diffracting crystals is one of many bottlenecks affecting bio-molecular X-ray crystallography. Different groups have reported on the development of procedures and techniques to improve the diffraction quality of bio-molecular crystals. These procedures, generally labeled as “annealing”, remain mostly subjective and anecdotal. To systematically determine the effect of flash-cooling on mosaicity and intensity a small device was developed at the NIGMS facility at the NSLS that allows time controlled annealing. Repeated annealing of glycerol kinase crystals revealed significant changes in the diffraction pattern: position and intensity distribution of individual reflections. The results showed that repeated flash-annealing cycles cause a significant decrease in the overall averaged mosaicity together with an increase in the measured maximum intensity and an enhanced signal to noise ratio. Changes in individual reflection profiles will be discussed in light of domain structures and defect analysis.

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