E0072

The Role of Detectors in Time-Resolved Crystallography. Vukica Srajer, Consortium for Advanced Radiation Sources, Univ. of Chicago, Chicago, IL.

Time-resolved crystallography is a unique tool for studies of structures of intermediates and the reaction mechanism in reactions involving macromolecules. The technique reached its mature stage with the development of the third-generation synchrotron X-ray sources and the advances in processing and analysis of time-resolved crystallographic data based on the Laue technique (Ren *et al*., 1999; Schmidt *et al*., 2003). A time resolution of 100 ps has been achieved (Schotte *et al*, 2003) and detection of relatively small structural changes (0.2-0.4 Å) has been demonstrated even with only partial (15-40%) reaction initiation (Srajer *et al*., 2001; Schmidt *et al*., 2004). In time-resolved experiments a reaction is triggered rapidly and uniformly in the crystal and X-ray pulses are used to probe structural changes at a series of time delays following the start of the reaction. The readout speed of present large area X-ray detectors used for macromolecular crystallography does not permit to follow the sub-second reactions in real time. Improvements in the detector readout time will greatly reduce the need for repeated pump-probe cycles. This is becoming increasingly important as the time-resolved technique is applied to studies of irreversible bio-molecular reactions. Other aspects of the time-resolved technique related to the detector development will be discussed.

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