

The Totalcrystal Approach for Ultrafast Time-resolved X-ray Diffraction Applications: Status and Perspectives

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In this contribution we will report on the progress made with the Totalcryst approach for photo-crystallographic applications. The test systems investigated were of organic type with the potential to be used for optoelectronics or in holographic devices (tetrathiafulvalene-p-chloranil (TTFCA), 2-benzyl-5-benzylidene-cyclopentanone (BBCP) and α -styrylpyrylium (tri-fluoromethanesulfonate) (Stypy)). The structural reaction mechanism underlying the holographic process of the last two systems is an ultrafast [2+2] photocycloaddition reaction which - depending on the external condition - is of reversible or irreversible character. TTF-CA is a 1-dimensional organic conductor system undergoing an ultrafast photo-induced phase transition.

The results obtained in the Totalcryst time-resolved studies will be compared to time-resolved monochromatic single crystal, time-resolved polychromatic Laue and time-resolved powder diffraction experiments.

Its implementation to laboratory based time-resolved photocrystallographic x-ray sources will be sketched and potential applications in Free Electron Laser science – including first demonstration experiments – will be given.