Ultrafast studies of photoreaction dynamics by complementary usage between SACLA and SR, and their use in artificial photosynthesis systems

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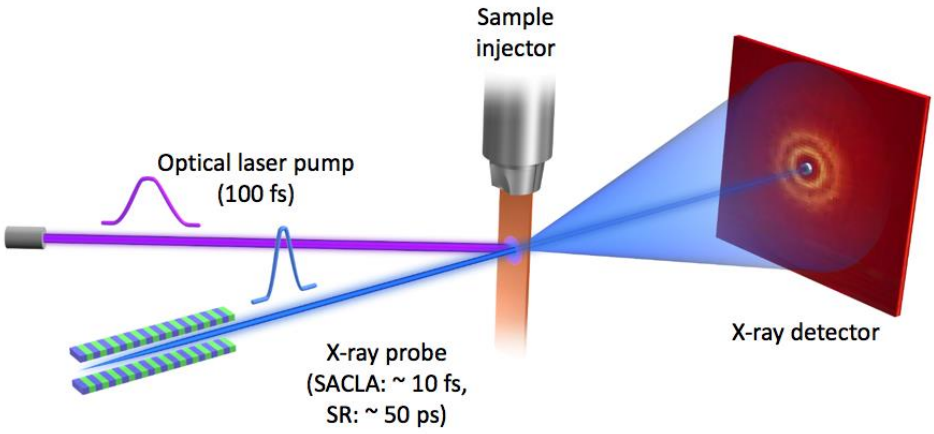
Studies on photoreactions in molecular using time-resolved x-ray measurements at a storage ring (SR) has achieved successfully in investigating the structural dynamics of excited states [1,2], however its time-resolution has been limited to about 100 picoseconds. To understand the whole photochemical reaction, it is essential to observe not only relatively long-lived pico- and nanosecond excited states which play an optical functional role including the photocatalytic activity but also the growth process of the function on earlier timescale. For example, in artificial photosynthesis systems, the molecular deformations in the early photoreaction path attributed to the electronic excitation finally have a great influence on its final efficiency of the optical functionality. Therefore, chasing the molecular structural dynamics in femtosecond time scale using x-ray free electron laser (XFEL) is crucial to unravel the reaction mechanism and rate of the transition state.

To obtain the entire pictures of photoreaction related to the artificial photosynthesis systems, the time-resolved solution scattering and time-resolved XAFS experiments, which are a powerful tool for studying the local structural dynamics in molecules, were performed using the XFEL beam at SACLA [3] and the synchrotron x-ray beam at SR [4]. In the poster session, the result of the measurements, the complementary usage [5] will be discussed in detail.



Bibliography

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