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X-ray structural studies of ba3-type cytochrome c oxidase

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Cytochrome c oxidase (CcO) catalyses the reduction of molecular oxygen to water while the energy released in this process is used to pump protons across a biological membrane. Even though many members of the CcO superfamily have been structurally characterized in detail, there is no detailed structural understanding of how unidirectional proton translocation takes place. A billion-fold jump in the peak X-ray brilliance delivered by X-ray free electron laser (XFEL) and the development of serial femtosecond crystallography (SFX) allowed the determination of protein structures at room temperature, opening up the opportunities for time-resolved (TR) experiments in measuring ultrafast reactions in proteins. In this project, we track structural changes at the active site of ba3-type cytochrome c oxidase upon photoinitiated release of oxygen molecule from cobal-based cage compound. Additionally, we use X-ray absorption spectroscopy (XAS) to investigate the detailed atomic structures of the metal co-factors in different redox states.

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