**Abstract:** Photosynthesis is an essential biochemical process which converts light energy from the sun into useful chemical energy. Successional reactions in photosynthesis are initiated by the water splitting and oxygen-evolving reaction in Photosystem II by utilizing light energy. In this article, I will review the structural biology of Photosystem II focusing on our crystal structural analysis of Photosystem II using X-ray and X-ray free electron laser, and briefly mention possible artificial photosynthesis in the future.