

A model for the water-oxidation and recovery systems of the oxygen-evolving complex

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The oxygen-evolving complex, which is embedded in Photosystem II (PSII), oxidize water efficiently by the sunlight. Under the light irradiation, not only water-oxidation reaction but also photoinhibition, which is the deactivated pathway of water-oxidation ability of OEC, is occurred in PSII. Though considerable progress has been made in elucidating the structure of the OEC, little is known about its dynamic chemical behavior.

We propose a model for the water-oxidation and recovery systems of the OEC of the PSII enzyme. The whole system is constructed from two catalytic cycles, conducted as a tandem reaction (Fig. 1): (i) a water-oxidation cycle uses cerium(IV) ammonium nitrate as an oxidant to activate a dimanganese complex for water-oxidation and thereby liberate a molecule of O₂ and (ii) a recovery cycle begins with photoinhibition of the dimanganese complex but then uses O₂ to reactivate the manganese center. The net result is a catalytic water-oxidation catalyst that can use self-generated O₂ for recovery.

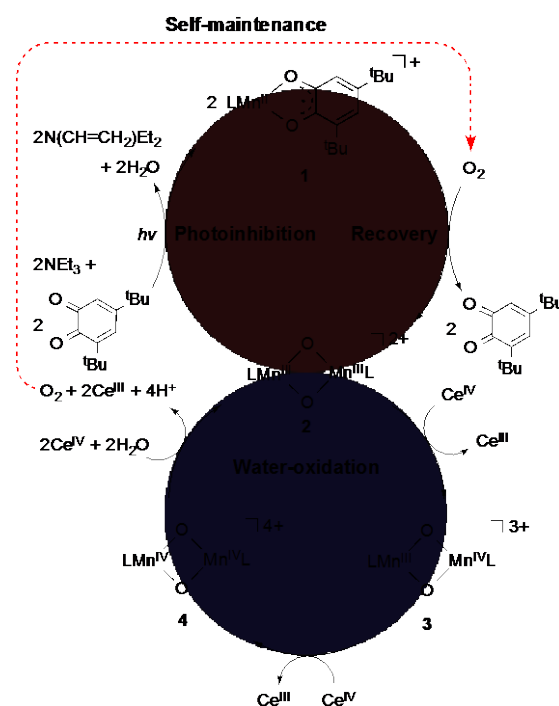


Fig. 1 Proposed reaction mechanism of a tandem reaction.