

Photosynthesis utilises light energy to oxidizing water molecules into molecular oxygen at the oxygen-evolving center (OEC) of photosystem II (PSII). We will report the crystal structure of PSII of the cyanobacterium *Thermosynechococcus elongatus* at 3.5 angstrom resolution. We completed and refined the structure model of this 650 kDa dimeric multisubunit complex. The structure revealed details of the cofactor environment including the structure of the OEC. Anomalous difference Fourier maps, calculated using long wavelength data, were used to identify the metal ions within the OEC, which contains a Mn_3CaO_4 cluster linked to a fourth Mn ion. The details of the surrounding coordination sphere of the metal cluster and the possible oxygen-evolving mechanism will be discussed.