Molecular Light-Driven Water Oxidation in Liposomal Assemblies

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Photocatalytic water oxidation is vital for sustainable energy, crucial in water splitting and electron transfer for reduction reactions. Inspired by Photosystem II in natural photosynthesis, our study develops liposomal assemblies to enhance the efficiency and stability of light-driven water oxidation. We integrate molecular photosensitizers and catalysts with long alkyl tails, including an established Ru(II)-tris-bipyridine-based[1] amphiphilic photosensitizer, and introduce earth-abundant Cu-based alternatives. Similarly, traditionally used hydrophobically functionalized Ru catalysts are substituted with Cu-based catalysts. Using liposomes, we optimize the reaction environment by adjusting lipid types and the balance of photosensitizers and catalysts. Liposomes are prepared using standard protocols, and their sizes are measured via dynamic light scattering (DLS). Oxygen levels are monitored in both aqueous and gas phases with a FireStingO_2 meter under blue light. Our findings emphasize the crucial role of lipid bilayers in boosting photocatalytic activity, providing insights for advancing light-driven catalysis in biomimetic interfaces.

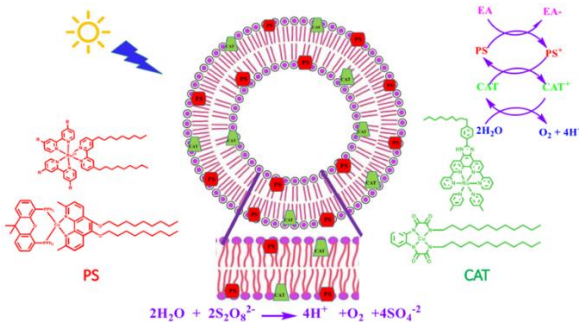

Figure 1: water oxidation catalysis in liposomes

[1] Jacobi, Richard, *et al*., Phy Chem A, 2022, **126(43)**, 8070-8081, doi:10.1021/acs.jpca.2c04524