

Photo, Electro, Photoredox, and Bio-Catalysis by Corrole Metal Complexes

Professor Zeev Gross

Schulich Faculty of Chemistry, Technion - Israel Institute of Technology, Haifa 32,000, Israel

Cobalt and iron complexes of corroles with very different macrocycle substituents are efficient electrocatalysts for conversion of protons to hydrogen, halide to halogen, oxygen to water, and other processes of relevance to clean energy. Electron-richness of the corroles affects the reaction mechanism by which the nickel and cobalt complexes perform the hydrogen evolution reaction (HER);^{1,2} and some post-transition metal complexes catalyze HER by relying on redox processes that are ligand- rather than metal-based.³ Utilization of phosphorus and antimony corroles as photoredox catalysts for decarboxylative fluorination revealed that their outstandingly long triplet lifetime contributes to superior performance relative to the classical photoredox catalyst $\text{Ru}(\text{bpy})_3^{2+}$ in terms of larger catalytic turnover frequencies (TOF) and much lower catalyst loading. Nanoparticulate phosphorous corroles with a basic moiety internalizes into malignant cells within minutes and selectively accumulates within lysosomes, upon which they become molecular and induce nanomolar cytotoxic effects upon illumination.