

# TWO-ELECTRON CATALYSIS COUPLED TO EXCITONIC SEMICONDUCTORS: NANOSTRUCTURED PHOTOELECTROCATALYTIC SYSTEMS

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Efficient photo-production of fuels requires multielectron transfer reactions. These are common in biological enzymes but rare in more robust man-made catalysts. In this research we aim to attach bio-like catalysts to organic semiconductors, thus incorporating, and stabilizing, the catalysts in a semiconducting electrode film. Figure 1 shows the proposed architecture for such a "photoelectrocatalytic" fuel forming device. The figure also includes a possible molecular structure to form this type of PECat device consisting of a perylene semiconductor bound to a biomimetic iron sulfur reduction catalyst.

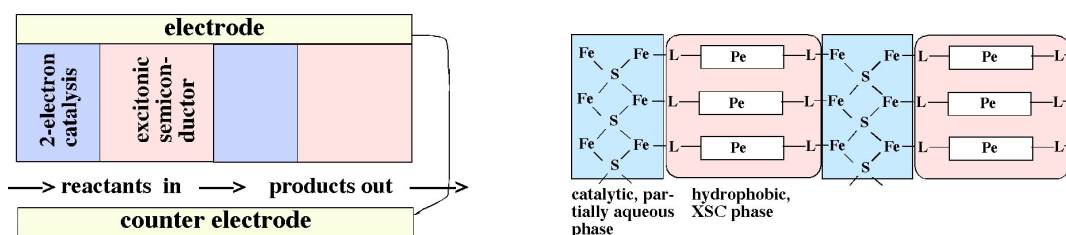


Figure 1

Present research efforts focus on the fundamental characterization of the interaction of the multielectron catalyst with the photoexcited excitonic semiconductor species. The structure shown in Figure 2 has been synthesized and is currently the subject of photophysical studies including emission quenching and transient absorption spectroscopy. Also, efforts are underway to create the proposed solid state devices out of this and related species.

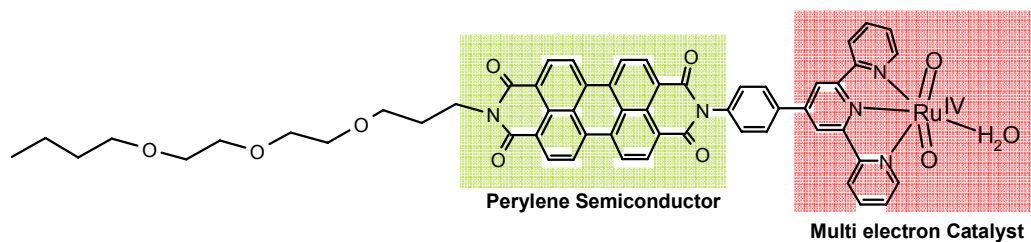


Figure 2