The Energy Problem and Two-Electron Reagents

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Growing energy demand, dwindling fossil fuel reserves and concern for the environment are driving energy research. One attractive approach to the energy problem is the efficient conversion of solar energy to chemical energy. However, realization of this goal remains elusive. A central problem is that absorption of light by a molecule is an intrinsically one-electron process. Consequently, traditional solar energy conversion strategies are limited to one-photon/one-electron chemistry. However, the activation of most important target substrates (*e.g.*, H_2O, CO_2, N_2) requires multiple redox equivalents. In an effort to overcome this problem and gain insight into the factors that govern multi-electron reactions that are critical to chemical catalysis, we are designing platinum complexes that will transfer two electrons when excited by a single photon. In this presentation, we will survey the energy problem, and then turn our attention to efforts in our laboratory aimed at designing two-electron reagents. These metal complexes are capable of undergoing cooperative two-electron transfer reactions.