

## Photoredox Catalysis by Transition Metal Complexes: Photon-to-Chemical Energy Conversion

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Photoredox catalysis is the promising alternatives to traditional protocols for conventional catalysis, as they execute thermodynamically challenging reactions under mild conditions. The catalysis require photoactive compounds with high stability and large driving force for photoinduced intermolecular electron transfer. Cyclometalated complexes of Ir(III) and Pt(II) can meet these criteria, because strong cyclometalation in the complexes permits wide structural and electronic tailoring. We have investigated the ability of a series of Ir(III) complexes for mediating photoredox catalysis of molecular chromism and production of industrially useful compounds. We also explored catalytic utility of cyclometalated Pt(II) complexes in trifluoromethylation of pharmaceuticals. Excited-state behaviors, including the forward electron transfer, have been investigated using transient spectroscopic and electrochemical techniques. These mechanistic studies provide novel insight into designing of photoactive cyclometalated complexes with enhanced catalytic properties.