The discovery of new catalysts is central to the pursuit of more efficient and sustainable processes in organic synthesis. While mononuclear transition metal complexes have been widely utilized in reaction methodology, the scope of both stoichiometric and catalytic processes for complexes of higher nuclearity is comparatively limited. In principle, multinuclear complexes might engage in unprecedented modes of reactivity by binding substrates or engaging in redox processes that span multiple metal centers. New classes of catalysts that can capitalize on these cooperativity effects have the potential to exhibit activity or selectivity profiles that complement or surpass existing mononuclear systems.

Researchers in Professor Uyeda’s group have been developing new platforms that support coordinatively unsaturated and reactive metal–metal bonds. In pursuit of this goal, they have developed a naphthyridine–diimine ligand that was used to prepare dinuclear complexes of mid-to-late first-row transition metals. The redox-active nature of these ligands imparts rich redox chemistry to these complexes, enabling an array of multielectron oxidation and reduction reactions. The applications of these complexes to catalytic processes relevant to organic synthesis will be presented.