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Oxidation chemistry of group 10 metals-di(phenolate) complexes (Ni, Pd and Pt) with Schiff base ligands

Oxidation chemistry of redox-active transition metal complexes with pro-radical ligands and their detailed electronic structures have been actively pursued in recent years. Many efforts for determination of the experimental oxidation number have been close to the goal of the “truth oxidation state” in various oxidized metal complexes with non-innocent ligands. Depending on the relative energies of the redox-active orbitals, metal complexes with non-innocent ligands exist in two limiting descriptions, either a metal-ligand radical ($M^{n+}(L\cdot)$) or a high valent metal ($M^{(n+1)+}(L\cdot)$) complex. In order to understand what factors affect the oxidation locus of the oxidized metal(II)-salen-type complexes, we have investigated isolation and X-ray crystal structure determination of the one-electron oxidized metal(II)-salen-type complexes, and characterization of their electronic structures by various spectroscopic methods. Oxidized Ni^{II}-salen complexes, which have a diphenolate ligand with square planar geometry, are known to exist in either form, and the factors that control the locus of oxidation in these complexes are being pursued currently. One-electron oxidation of Ni-salen-type complexes forms the Ni^{II}-phenoxy radical species, while the addition of exogenous ligands to the Ni^{II}-phenoxy radical solution gives the metal-centered oxidation, Ni^{III}-phenolate species. On the other hand, Pd and Pt complexes show a different oxidation behavior and electronic structure. The one-electron oxidized Pt complex is preferable for the delocalization of the radical electron on the two phenolate moieties while the unpaired electron in the oxidized Pd complexes are more localized on the one-side of the phenolate moiety. In this presentation oxidation behavior of the Group 10 metal(II)-di(phenolate) complexes will be focused, especially detailed electronic structures of oxidized Group 10 metal(II)-di(phenolate) complexes.

Biography

Yuichi Shimazaki was born in 1970 in Toyama prefecture, Japan. He received his Doctor's degree in science from Nagoya University in 2000 under the supervision of Professor Osamu Yamauchi. He joined Professor Yoshinori Naruta's group at Kyushu University as Assistant Professor and worked on the redox behavior of various metal porphyrin complexes as models of the active site of metalloenzymes. In 2008 he was promoted to Associate Professor at the College of Science, Ibaraki University. His research interests include the oxidation chemistry of the complexes of various metal ions, model studies of metalloenzymes, bioorganometallic chemistry, and weak interactions in metal-organic molecule systems.

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