Reactions of Thiourea Derivatives with Some Transition Metals

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Abstract

Reactions of mono-, di- and tri-substituted thiourea with chlorides of palladium, platinum, rhodium and iridium, and with chloro carbonyls of rhodium and iridium of the formula \([\text{M(CO)}_2\text{Cl}_2]^-(\text{M=Rh and Ir})\) were carried out.

The used thiourea derivatives were phenylthiourea (PTU), \(\text{N,N\'-diphenylthiourea (PPTU)}, \text{N-methyl-N\'-phenylthiourea (MPTU)}, \text{N,N\'-pentamethylene-N\'-phenylthiourea (PMPTU)}, \text{N-benzyl-N\'-phenylthiourea (BPTU)}, \text{N-(1-naphthyl)-N\'-phenylthiourea (1-NPTU)}, \text{N-(n-butyl)-N\'-phenylthiourea (n-BPTU)}, \text{N-cyclohexyl-N\'-phenylthiourea (CPTU)}, \text{N,N\'-dimethyl-N\'-phenylthiourea (DMPTU)}\).

Palladium and platinum complexes are formulated as \([\text{Pd(BPTU)Cl}_2]_2\), \([\text{Pd(DMPTU)Cl}_2]_2\cdot\text{C}_2\text{H}_5\text{OH}\), \([\text{Pd(PMPTU)Cl}_2]_2\), \([\text{Pd(MPTU)}_3\text{Cl}]\cdot\text{Cl}_2\cdot\text{H}_2\text{O}\), \([\text{Pd(n-BPTU)}_3\text{Cl}]\cdot\text{Cl}_2\cdot\text{H}_2\text{O}\), \([\text{Pd(BPTU)}_4\text{Cl}_2]_2\cdot\text{H}_2\text{O}\), \([\text{Pd(PPTU)}_4\text{Cl}_2]_2\cdot\text{H}_2\text{O}\), \([\text{Pd(1-NPTU)}_4\text{Cl}_2]_2\cdot\text{H}_2\text{O}\), \([\text{Pt(PPTU)}_2\text{Cl}]_2\), \([\text{Pt(PMPTU)}_2\text{Cl}_2]_2\) and \([\text{Pt(BPTU)}_2\text{Cl}_2]_2\).

Rhodium complexes are formulated as \([\text{Rh(H}_2\text{O)}_2\text{Cl}_3(\text{CPTU})]\cdot\text{H}_2\text{O}\), \([\text{Rh(CO)}_2(\text{DMPTU})_2]\cdot\text{Cl}_2\cdot\text{H}_2\text{O}\), \([\text{Rh(CO)}_2(\text{BPTU})_2]\cdot\text{Cl}\), \([\text{Rh(CO)}_2(\text{1-NPTU})_2]\cdot\text{Cl}_2\cdot\text{H}_2\text{O}\) and \([\text{Rh(CO)}_2(\text{PMPTUAT})]\cdot\text{H}_2\text{O}\).
Iridium complexes are formulated as \([\text{Ir(H}_2\text{O)}_2\text{Cl}_3(\text{PMPTU})] \),
\([\text{Ir(H}_2\text{O)}_2\text{Cl}_3(\text{1-NPTU})] \),
\([\text{Ir(H}_2\text{O)}_2\text{Cl}_3(\text{CPTU})].2\text{H}_2\text{O} \),
\([\text{Ir(H}_2\text{O)}_2\text{Cl}_3(\text{PPTU})] \),
\([\text{Ir(CO)}\text{Cl}(\text{MPTU})].2\text{H}_2\text{O} \),
\([\text{Ir(CO)}\text{Cl}(\text{CPTU})].2\text{H}_2\text{O} \),
\([\text{Ir(CO)}\text{Cl}(\text{BPTU})].3\text{H}_2\text{O} \),
\([\text{Ir(CO)}\text{Cl}(\text{DMPTU})].2\text{H}_2\text{O} \),
\([\text{Ir(CO)}\text{Cl}(\text{PMPTU})].3\text{H}_2\text{O} \),
\([\text{Ir(CO)}\text{Cl}(\text{PTU})].2\text{H}_2\text{O} \) and \([\text{Ir(CO)}\text{Cl}(\text{PPTU})].4\text{H}_2\text{O} \).

The complexes were characterized by elemental analysis, infrared, U.V-Visible spectroscopy and electrical conductivity measurements. Infrared spectral data indicate that the thiourea derivatives ligands are sulfur bonded to the metal in all of the above mentioned complexes.