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Reduction of rhenium^{V} oxo Schiff base complexes with triethylphosphine

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Pioneering techniques for therapeutic treatment of cancers involve targeting cancer sites with strong beta-emitting radionuclides, thereby destroying the cancer cells. This is achieved by coordinating the radioisotope to a very chemically stable environment and linking it to a specific biologically active targeting molecule, which interacts with particular cancer cells. Radioactive isotopes of rhenium possess characteristics of such a nuclide. The focus of our research is to investigate two possible pathways for the reaction of [ReOX(Schiff base)] with phosphine ligands, one a mono-substituted Re^{V} complex and one a di-substituted Re^{III} complex. The preferred Re^{III} complex is lower in oxidation state and more kinetically inert or stable relative to Re^{V}. For practical applications it is necessary to have an extremely stable *in vivo* radionuclide complex which can be conjugated to a suitable biological targeting agent.

The rigid sal_2phen ligand, where Sal_2phen is a tetradentate Schiff base ligand, was investigated to determine if the Re^{III} could be synthesized from the Re^{V} starting complex $[Re^{V}OCl(Sal_2phen)]$. $[Re^{V}OCl(Sal_2phen)]$ was reacted with triethylphosphine (PEt_3) in attempts to yield the Re^{III} complex *trans*-$[Re^{III}(PEt_3)_2(Sal_2phen)][X]$. Previous work indicated that the strongly reducing and strongly nucleophilic PEt_3 might yield the Re^{V} product from $[Re^{V}OCl(Sal_2phen)]$. The synthesized coordinated complex was reacted with an quaternary ammonium salt, ammonium hexaflurophosphate (NH_4PF_6), to induce crystallization of target compound $[Re^{III}(PEt_3)_2(Sal_2phen)][PF_6]$.

Preliminary ^{1}H-NMR, ^{31}P-NMR, and infrared spectroscopy spectra indicate the formation of *cis*-$[Re^{V}O(PPh_3)(Sal_2phen)][X]$. FTIR shows the presence of the Rhenium oxo group; ^{31}P-NMR and ^{1}H-NMR indicate the presence of Re^{V} and a 1:1 PEt_3 : Sal_2phen complex. Single crystal x-ray diffraction, mass spectroscopy, and elemental analysis are additional methods of characterization.