

Synthesis and Characterization of Novel Phosphinimine Ligand Systems for Potential Applications in Radiopharmaceuticals

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ABSTRACT

Multidentate phosphinimine ligands, $C_{25}H_{49}N_2P_2Si_2$ (**2**), $C_{34}H_{38}N_2P_2Si_2$ (**3**), and $C_{50}H_{66}N_3P_3Si_3$ (**4**), were synthesized in near quantitative yields by Staudinger reaction using appropriate phosphines. Coordination chemistry of **2** and **3** with Re was performed and the X-ray crystallographic study of the Re ion-pair complex of ligand **2** is reported. Radiolabeling of ligands **2**, **3** and **4** with ^{99m}Tc was performed. Simple mixing of ligand solutions with aqueous $^{99m}\text{TcO}_4^-$ in saline solution produced ion-pairs with more than 95% yields. All three ion-pairs produced are stable for more than 24 h in organic media and in alcohols. The ion-pair produced with ligand **3** ($[(NH_2)_2PPh_2CH_2PPh_2NH_2 \text{ or } O]^+ (^{99m}\text{TcO}_4^-)$), upon heating has resulted in the neutral complex $[(NH_2)_2PPh_2CH_2PPh_2NH_2 \text{ or } O]^+ (^{99m}\text{TcO}_3^-)$. Upon heating the ion-pair ($[(NH_2)_2PPh_2CH_2PPh_2NH_2]^+ (\text{ReO}_4^-)$) in the presence of Verkade's superbases led to the rearrangement of the ligand via cleavage of the P-C-P bridge to produce P-N-P bridged compound.