(Triphenylphosphine)gold(I) Chloride

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Annika Heinrich studied chemistry at the University of Kiel and there she obtained her diploma degree in 2011. At the moment, she is working as a Ph.D. student in the group of Professor Dr. Anne Staubitz at the Institute of Organic Chemistry in Kiel. Her research focuses on highly selective cross-coupling reactions and on the synthesis of semiconducting polymers. 

(Triphenylphosphine)gold(I) chloride is a frequently used reagent in her research: It is used for the synthesis of aromatic organogold compounds that can be used in cross-coupling reactions and polymerization reactions.

This precursor complex is dissolved in dichloromethane together with triphenylphosphine to form immediately the desired complex in a very good yield of 92% after precipitation by adding methanol. ClAuPPh3 is a useful reagent in various types of reactions. It is often used in gold catalysis where it can act as co-catalyst or catalyst itself, or it can be used for the formation of more complex catalytic systems. ClAuPPh3 can also be used for the synthesis of organogold compounds, which can perform cross-coupling reactions in a generally mild manner and with high tolerance towards functional groups. Herein, some applications of ClAuPPh3 as reactant will be presented.

Scheme 1 Preparation of (triphenylphosphine)gold(I) chloride

Table 1 Use of (Triphenylphosphine)gold(I) Chloride

(A) ClAuPPh3 can be used for the generation of gold nanoparticles. In the first step, gold chloride reacts with an ethylene glycol silver carbamate in a transmetallation reaction. The resulting gold(I) complex generates the gold nanoparticle by thermal induction. The resulting nanoparticles do not need any further stabilizing or reducing reagents and have size diameters of 3–6 nm with narrow size distribution.

(B) Zhang et al. used ClAuPPh3 as catalytic species for the formation of various saturated substituted O- and N-heterocycles. The homogeneous oxidative functionalization of terminal alkenes leads to a cyclization reaction that proceeds within short reaction times and under mild reaction conditions. In mechanistic studies they found that a conversion of C(sp2)-Au bonds into C(sp3)-C(sp2) bonds is catalyzed by an Au(I)/Au(III) system in a cross-coupling manner when using boronic acids as nucleophiles with Selectfluor as oxidant.

(C) Pérez-Sestelo and co-workers prepared different aryl-, alkynyl-, alkenyl-, and alkylgold(I) compounds in very high yields using the corresponding lithiated organic species and ClAuPPh3 as reagent. The organogold(I) compounds are used as nucleophiles in palladium-catalyzed cross-coupling reactions with various electrophiles under mild reaction conditions and in short reaction times.
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References


