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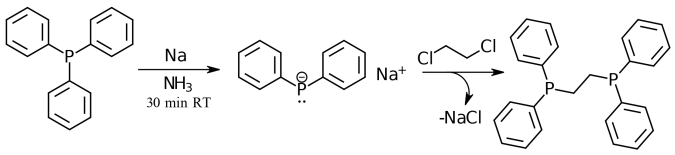
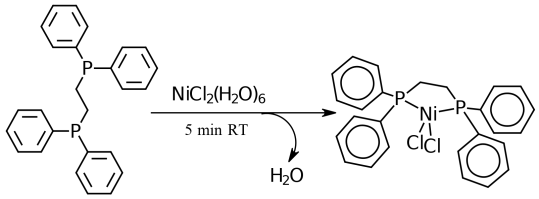
Abstract

Introduction



Scheme 1: Synthesis of dppe via reduction of triphenylphosphine.

Ammonia is a versatile inorganic solvent with the unique property of dissolving alkali metals to form solvated electrons, which act as extremely strong reducing agents in solution. In this experiment, $Na \cdot NH_3$ was used to reduce a solution of triphenylphosphine to yield the bidentate ligand 1,2-bis(diphenylphosphino)ethane (dppe). The newly-synthesized dppe ligand was then used to perform ligand substitution to generate its corresponding nickel complex. This experiment demonstrates the efficacy of using cheap, readily-available reagents to synthesize inorganic ligands for use in industry.



Scheme 2: Synthesis of $Ni(dppe)Cl_2$ via direct ligand substitution of $NiCl_2 \cdot 6\,H_2O$.

Experimental Procedures

To a 500 mL three-necked round bottom flask was charged 200 mL of NH_3, a glass-coated stir bar, and a dry ice condenser. Remaining necks were sealed with stoppers, and 2.379 g of Na was added slowly over the course of 3 minutes. A dark blue solution was allowed to form over the course of 10 minutes, and then 13.55 g of triphenylphosphine was added in small 1 g portions. This solution then reacted for 30 minutes, after which 5.068 g of NH_4Br was added. Finally, 2.555 g of 1,2-dichloroethane was poured in and was allowed to react for 10 minutes. The flask was left open to air for 1 week to dry.

The dried