

Syntheses of 2,4-functionalized diphosphapentasilanes as precursors for low-valent tin and germanium compounds

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In contrast to diphosphanes with carbon backbones, the number of 1,2-diphosphadisilanes is rather small.^[1] Diphosphasilanes with longer chain lengths do not exist with the exception of three 1,3-diphosphatrisilanes.^[2-3] However, similar to their carbon analogues, diphosphatrisilanes are expected to offer a wide range of uses in organometallic synthesis and as ligands in complex chemistry.

Our main interest is their possible application for the formation of low-valent group 14 compounds, namely diphosphagermylenes and -stannylenes.^[4]

The aim of the presented work is the preparation and characterization of 2,4-diphosphapentasilanes, $\text{SiMe}_2[\text{Si}(\text{SiMe}_3)_2\text{PRR}']_2$ with $\text{R}, \text{R}' = \text{H}, \text{Ph}, \text{SiMe}_3$, and $\text{R} = \text{SiMe}_3, \text{R}' = \text{Si}(\text{SiMe}_3)_3$, and $\text{C}(\text{SiMe}_3)_3$. The formation and characteristics of these silanes is compared to related carbon compounds, namely 1,2-diphosphaethanes and 1,3-diphosphopropanes. Experimental work is accompanied by DFT calculations aiding the characterization of these compounds and supporting a better comprehension of the reaction mechanism depending on the substitution pattern on the phosphorus atoms.

Molecular structures obtained by single crystal X-Ray diffraction, where feasible, and DFT calculations show an optimal preorientation of the diphosphapentasilanes regardless of the size and kind of the substituents. This characteristic qualifies them as ideal candidates for the formation of monomeric cyclic diphosphatetrylenes.

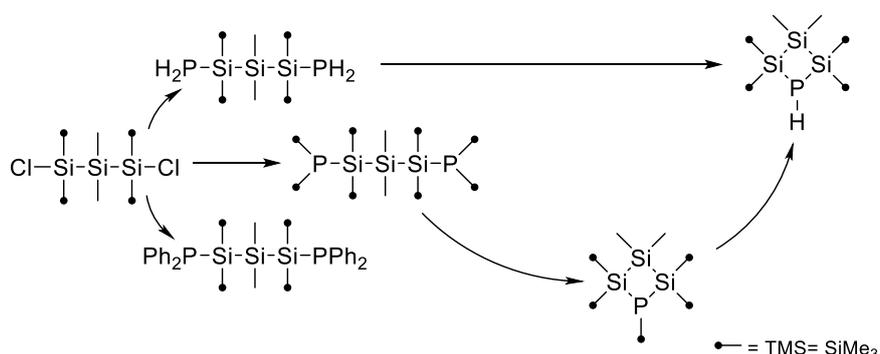


Figure 1: Reaction Pathways

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