Catalytic transformations of trialkylsilanes have hardly been studied. Boiling of \((\text{C}_3\text{H}_7\text{O})_2\text{SiH}\) with 60 mole% of \(\text{AlCl}_3\) is reported [1] to give \((\text{C}_3\text{H}_7\text{O})_4\text{Si}\) in 20% yield. It has also been suggested [2] that \((\text{CH}_3)_3\text{SiCl}\) is reduced by aluminum borohydride according to the scheme:

\[
6(\text{CH}_3)_2\text{SiCl} + 2\text{Al}(\text{EH}_4)_3 \rightarrow 6(\text{CH}_3)_3\text{SiH} + 3\text{B}_2\text{H}_6 + 2\text{AlCl}_3.
\]

Nevertheless, the product, originally assumed to be trimethylsilane, was a three-component mixture due, in the authors' opinion, to a secondary reaction:

\[
\text{MeCl},
2(\text{C}_3\text{H}_7\text{Si})_2\text{Cl} \rightarrow (\text{C}_3\text{H}_7\text{Si})_2\text{Cl} + \text{MeCl}.
\]

Fractional distillation curve of products of reaction of \(n\)-\(\text{C}_4\text{H}_9\text{SiCl}_3\) with methylidemethylsilane in presence of 1.3 mole% of \(\text{AlCl}_3\).

Nevertheless, the product, originally assumed to be trimethylsilane, was a three-component mixture due, in the authors' opinion, to a secondary reaction:

\[
2(\text{CH}_3)_3\text{SiH} \rightarrow (\text{CH}_3)_2\text{SiH}_2 + (\text{CH}_3)_4\text{Si}.
\]

Reaction of \((\text{CH}_3)_3\text{SiH}\) with \(\text{AlCl}_3\) was not, however, studied separately.

We recently described the reduction of alkylhalosilanes by triethylsilanes [3]:
Starting from butyltrichlorosilane we obtained a nearly quantitative yield of \( n\text{-}C_4H_9SiH_4 + (4 - n) (C_2H_5)_3SiX \), \( n\text{-}C_4H_9SiH_4 + (4 - n) (C_2H_5)_3SiX \). It was expected that the replacement of triethylsilane by other trialkylsilanes would lead to similar reactions. A more complex process took place, however, on reacting \( n\text{-}C_4H_9SiCl_3 \) with \( CH_3(CH_2)_2SiH \) in presence of 1.3 mole% of anhydrous \( AlCl_3 \) (see diagram); the products, apart from \( n\text{-}butylsilane \) and methylidyethyltrichlorosilane, were \( C_2H_5(CH_2)_2SiH \) and \( (C_2H_5)_3SiCl \) (in considerable quantities), as well as \( C_4H_9(CH_2)_3SiCl \). This led us to the conclusion that the starting methylidyethylsilane only partially enters into the reduction reaction and to a greater extent disproportionates under the influence of \( AlCl_3 \):

\[
2 CH_3(CH_2)_2SiH \rightarrow C_2H_5(CH_2)_3SiH + (C_2H_5)_3SiH.
\]

Such a transformation is presumably facilitated by the low boiling point of \( C_2H_5(CH_2)_3SiH \) (46°), due to which it is removed from the reaction zone, whereas the triethylsilane (b. p. 108°) enters into a reaction of conjugated hydrogenation-halogenation and is converted into \( (C_2H_5)_3SiCl \) (b. p. 147°). In the present case, therefore, rearrangement does not affect the Si-H bond. At the same time pure methylidyethylsilane unexpectedly reacted differently:

\[
4 CH_3(CH_2)_3SiH \xrightarrow{4\text{mole }% AlCl_3} 2C_2H_5(CH_2)_3SiH + (C_2H_5)_3Si.
\]

It was natural to assume that di- and tetraethylsilanes were formed by disproportionation of the triethylsilane originally formed according to Eq. (2) during prolonged action on it of \( AlCl_3 \), whose relative proportion in the reaction mixture steadily increased with progressive distillation of the \( C_2H_5(CH_2)_2SiH \). Actually, on distillation over 10 mole% of \( AlCl_3 \), \( (C_2H_5)_3SiCl \) quantitatively undergoes disproportionation-symmetrization:

\[
2 (C_2H_5)_3SiH \xrightarrow{AlCl_3} (C_2H_5)_3SiH_2 + (C_2H_5)_4Si.
\]

The Raman spectrum of the isolated diethylsilane contained frequencies of the \( C_2H_5 \) group at the Si atom (971, 1020, 1233 and 1462 cm\(^{-1}\)) and of the > SiH group - 2130 cm\(^{-1}\) (\( \nu Si-H \)) and 941 cm\(^{-1}\) (\( \delta H-Si-H \)) [4].

Spectroscopic examination of the butylsilanes obtained according to Eq. (1) showed that they are substantially free of traces of diethylsilane. Consequently, triethylsilane evidently does not disproportionate under the conditions of hydrogenation.

**EXPERIMENTAL**

Methyldiethyl- and triethylsilanes were prepared by reaction of \( CH_3MgBr \) with \( CH_3SiHCl_3 \) and \( CH_3SiHCl_2 \), respectively (2:1 molar ratio of reactants). \( CH_3(CH_2)_3SiH \) has b. p. 78.4°; \( nD_20 \) 1.3979; \( dD_20 \) 0.7054; yield 40%; \( (C_2H_5)_3SiH \) has b. p. 108.3°; \( nD_20 \) 1.4123; \( dD_20 \) 0.7316; yield 60%.

Butyltrichlorosilane was prepared by reaction of \( n\text{-}C_4H_9MgBr \) with \( SiCl_4 \) in 1:2 molar ratio. \( n\text{-}C_4H_9SiCl_3 \) has b. p. 145.5°; \( nD_20 \) 1.4359; \( dD_20 \) 1.1610 yield 44.5%.

Aluminum chloride (anhydrous) was the purified separation from the Umformer works.

**Reaction of butyltrichlorosilane with methyldiethylsilane.** A mixture of 28.2 g of \( n\text{-}C_4H_9SiCl_3 \), 45.2 g of \( CH_3(CH_2)_3SiH \) (1:3 molar ratio) and 1 g (1.3 mole% of \( AlCl_3 \) was boiled in the still of a rectifying column with an efficiency of 20 theoretical plates for 1.5 hr, the reflux temperature falling during this period from 75 to 44°. The following fractions were collected (see diagram): I - b. p. 45-49°, 6.4 g; ethylmethyldiethylsilane [b. p. 45.7°; \( nD_20 \) 1.3783; \( dD_20 \) 0.6681; found H(Si-H) 0.99; 1.05%; calculated H 1.14%; II - b. p. 52-58°, 8.8 g; n-butyldimethylsilane [b. p. 54.1°; \( nD_20 \) 1.3912; \( dD_20 \) 0.6756; found H(Si-H) 3.23; calculated H 3.43%; III - 74-94°; 8.4 g \( nD_20 \) 1.4707; Cl 16.4% - mixture of methyldiethylsilane and ethylmethyldiethylsilane]; IV - b. p. 116-128°; 6.4 g \( nD_20 \) 1.4190; Cl 20.8% - impure methyldiethylchlorosilane; V - 126-143°; 7.3 g; VI - 143-147°; 27.6 g \( nD_20 \) 1.4326; \( dD_20 \) 0.9624; Cl 32.9% - mixture containing 70.6% of \( (C_2H_5)_3SiCl \) and 29.4% of \( C_4H_9SiCl_3 \).