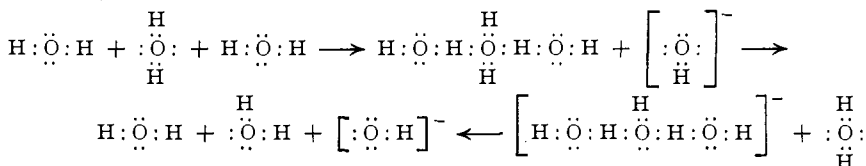


Analogously, an  $\text{OH}^-$  ion can remove a hydrogen from a water molecule if the oxygen in the latter has around it three other hydrogens



Although one might postulate hydrogen bonds between  $\text{NH}_3$  molecules so as to produce nitrogen atoms surrounded by four hydrogens, these hydrogens would be more tightly held than each of four hydrogens surrounding an oxygen ( $\text{NH}_4^+$  is more stable than  $\text{OH}_4^{++}$ ) and apparently they cannot easily be removed by  $\text{NH}_2^-$  ions.

It seems likely, moreover, that  $\text{N} : \text{H} : \text{N}$  bonds are not readily formed. ( $(:\text{F} : \text{H} : \text{F} :)^-$  is quite stable;  $\text{O} : \text{H} : \text{O}$  bonds are weaker but common in crystals and probably in liquid water and temporarily during many reactions, whereas no examples whatever of  $\text{N} : \text{H} : \text{N}$  or  $\text{C} : \text{H} : \text{C}$  bonds are known to me.) If so, this in itself suffices to account for the lack of abnormally large conductances of  $\text{NH}_4^+$  and  $\text{NH}_2^-$  in ammonia.

The conductance data for other solvents also seem to be in agreement with the ideas here expressed, but I shall not now take the space to discuss them.

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### HEXAFLUORODISILANE

*Sir:*

Up to the time of the present writing the only binary fluoride of silicon that has been identified definitely is the tetrafluoride,  $\text{SiF}_4$ . Methods leading to the formation of so-called subfluorides, several of which have been reported, have failed when repeated by later experimenters. Nevertheless, the presumption remained that binary fluorides other than the tetrafluoride should be capable of existence, since certain of the corresponding compounds of carbon have been isolated.

We have now succeeded in preparing hexafluorodisilane,  $\text{Si}_2\text{F}_6$ , by gently warming hexachlorodisilane with anhydrous zinc fluoride, followed by condensation and fractionation of the products. The substance is gaseous under ordinary conditions of temperature and pressure, but may be condensed to a snow white solid, melting at  $-18.5^\circ$  under 780 mm. pressure.

The vapor pressure of the substance has been determined from  $-79$  to  $-4^\circ$ ; the pressure becoming 760 mm. at  $-19^\circ$ . Gas density determinations upon the same product lead to the molecular weight 173.8 (calcd. for  $\text{Si}_2\text{F}_6$ , 170.1). Inasmuch as the product has been shown to be quite pure,

not only by the rectilinear character of the vapor pressure curves when  $\log p$  is plotted against  $1/T$ , but also by the observed sharpness of the melting point, and by the absence of any appreciable amounts of chloride, we feel that there can be little doubt concerning the actual composition of the substance.

When in contact with moist air or water, the substance is instantly hydrolyzed, the products formed including hydrogen, hydrofluoric acid, "silico-oxalic acid"—or 1,2-bis-(oxy-oxo)disilane—silicic and fluosilicic acids, the proportions of the several substances varying with experimental conditions. The quantitative study of this hydrolysis, which will also make possible the analysis of the original substance for silicon and fluorine, is now in progress, and will be described in the detailed account of this investigation in a later issue of *THIS JOURNAL*.

It may be added that the analogous preparation of hexafluoroethane,  $C_2F_6$ , by the interaction of zinc fluoride with hexachloroethane, has failed to give satisfactory results at ordinary pressure.

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#### THE DECOMPOSITION OF PYROSULFURYL CHLORIDE, A HOMOGENEOUS UNIMOLECULAR REACTION

*Sir:*

According to the literature, given to date in Mellor's "Treatise on Inorganic and Theoretical Chemistry," Vol. X, p. 683, pyrosulfuryl chloride,  $S_2O_5Cl_2$ , decomposes at its boiling point and above at a rate which should be convenient for study. The molecule is sufficiently large that one might expect, in accord with present theories, that the decomposition might be unimolecular. The vapor phase decomposition has been investigated, and found to be homogeneous and unimolecular.

The reaction has been followed by the pressure-increase method in a Pyrex bulb, both empty and when filled with glass tubing. The pressure approximately doubles during the reaction, which is considered to be one yielding  $SO_3$  and  $SO_2Cl_2$ , and which, at  $179^\circ$  has a half-time of seven minutes in the empty bulb. When the surface is increased four times by packing, the half-time is approximately fifteen minutes.

Other temperatures are now being used, and the reality of the apparent decrease in rate with increased surface is being studied. The full report of the experiments will be submitted as soon as possible.

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