

Hydrogen-exchange between Triphenylgermane and Alcohols

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Summary Triphenylgermane readily undergoes hydrogen-exchange (at the Ge-H bond) with alcohols in the presence of base.

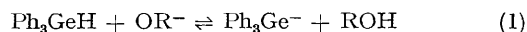
TRIORGANO-SILANES and -STANNANES readily evolve hydrogen when treated with alcoholic alkali, but trialkylgermanes enter much less readily, if at all, into this type of solvolysis.¹ However, triphenylgermane has been reported to evolve hydrogen rapidly when treated with dilute alcoholic alkali, although tri-n-hexylgermane is unreactive under similar conditions.² We have found that triphenylgermane does not, in fact, undergo significant solvolysis during 48 h at room temperature (*ca.* 21°) in MeOH containing 2.3M MeONa (98% was recovered unchanged after such treatment), but does undergo hydrogen exchange fairly readily with alcoholic alkali.

A solution of triphenyldeuteriogermane (containing *ca.* 5% of Ph₃GeH), m.p. 41°, (20 mg) in EtOH (3.0 ml) containing 1.7M KOH was kept at *ca.* 21° for 15 min then added to ice-water. Pentane extraction, followed by drying of the extract and removal of the solvent left an oil (20 mg, 100%), which crystallized on standing, and gave an

i.r. spectrum (liquid film) identical with that of the starting material except that both $\nu(\text{Ge-H})$ and $\nu(\text{Ge-D})$ bands were present (at 2030 and 1470 cm⁻¹, respectively), in intensities consistent with a Ph₃GeD/Ph₃GeH ratio of *ca.* 1.5:1. Thus the exchange was about one-third complete.

Again, when a solution of triphenylgermane (20 mg) in methan[²H]ol (20 ml, >99% MeOD) containing MeONa (0.25 g) was kept for 2 h at *ca.* 21°, work-up as before gave triphenyldeuteriogermane (19.5 mg, 97%), the i.r. spectrum of which indicated that <5% of Ph₃GeH was present.

In view of the ease of formation of triphenylgermyl-lithium from triphenylgermane and n-butyl-lithium in ether³ and of the considerable stability of the optically active ethyl-(1-naphthyl)phenylgermyl-lithium,⁴ it is probable that the exchange arises from the reversible reaction (1).



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