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# BIS(1-TRIFLUOROMETHYL-2,2,2-TRIFLUOROETHOXY)TRIPHENYLPHOSPHORANE. A NEW ROUTE TO TRIFLUOROMETHYLATED HETEROCYCLES

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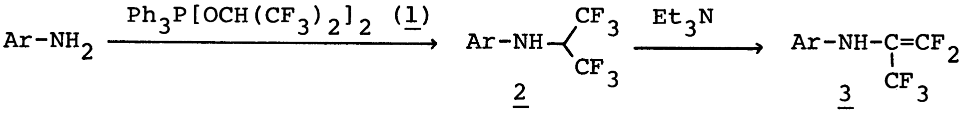
Bis(1-trifluoromethyl-2,2,2-trifluoroethoxy)triphenylphosphorane(1) readily reacted with anilines to form N-hexafluoroisopropylated products(2). By the dehydrofluorination of 2, 2-arylamino-1,1,3,3,3-pentafluoropropenes(3) were obtained. Furthermore, when anilines with *o*-functional group were used as nucleophile, benzo-1,4-dihetero-six membered rings that have $CF_3$ group at N-α-position were obtained.

Phosphoranes with fluoroalkoxy group as ligand are known to be remarkable compounds as to the stereochemistry for phosphorus atom.$^{1)}$ However, little other utilities of these compounds in the synthesis of organofluorine compounds have been studied.$^{2)}$

On the other hand, heterocyclic compounds with trifluoromethyl group are attracting attention owing to their biological unique properties in these days.$^{3)}$

In our continuing study of phosphoranes,$^{4-6)}$ we have found a new route to introduce the trifluoromethyl group into a desired position of heterocycles.

Bis(1-trifluoromethyl-2,2,2-trifluoroethoxy)triphenylphosphorane(1) was readily reacted with anilines to produce the corresponding N-hexafluoroisopropylated derivertives(2). This fact shows the remarkable contrast to analogous phosphorane, i.e., bis(2,2,2-trifluoroethoxy)triphenylphosphorane, which was inert to N-nucleophiles.$^{6)}$ Resulting N-hexafluoroisopropylanilines were dehydrofluorinated to form very interesting 2-arylamino-1,1,3,3,3-pentafluoropropenes(3) by base, e.g., triethylamine, potassium tert-buthoxide, etc. However, it is impossible to obtain these compounds(3) directly from the reaction of hexafluoropropene(HFP) with anilines, because HFP is attacked on the terminal $CF_2$ group by the nucleophiles.$^{7)}$



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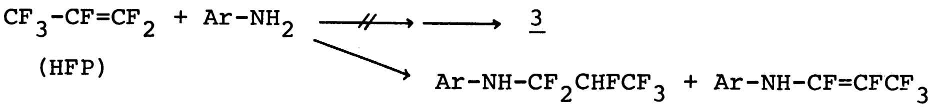
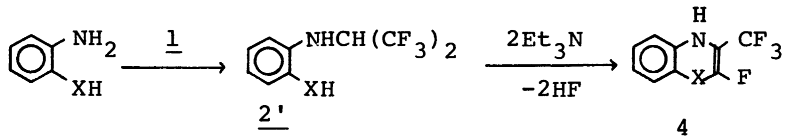
|---|---|---|---|
| 2a(Ar = Ph) | 46% | 3a | 76% |
| 2b(Ar=tolyl) | 58% | 3b | 81% |



We also found that wider variety of anilines with $o$-functional group underwent the addition-elimination reaction to afford the trifluoromethylated heterocycles(4).

In conclusion, we believe that bis(1-trifluoromethyl-2,2,2-trifluoroethoxy)-triphenylphosphorane is useful intermediate to introduce the trifluoromehtyl group into a desired position of heterocycles, and that this procedure provides a practical and convenient route to heterocycles.



2'    4

| | |
|---|---|
| 2'a(X = NH) 62% | 4a 73% |
| 2'b(X = O ) 64% | 4b 69% |
| 2'c(X = S ) 66% | 4c 60% |

In a typical procedure, $o$-phenylenediamine(1.80g, 10mmol) was added into a solution of 1 in dichloromethane(40ml)-diethyl ether(10ml) which was prepared from triphenylphosphine dibromide(4.22g, 10mmol) and sodium 1-trifluoromethyl-2,2,2-trifluoroethoxide(3.80g, 20mmol) in situ.[6)] After 1h of stirring, precipitates(NaBr) were centrifuged from the reaction mixture, and the solvent was removed. then distillation gave N-hexafluoroisopropylated product(2'a, 1.51g) in a yield of 62%, b.p.84.0-85.0°C/7mmHg. $^1$H nmr(CDCl$_3$) : $\delta$4.40(NH), 4.50(NH$_2$), 5.40(sep, $J_{H-F}$=6.1Hz, 1H), 6.20-6.75(4H). $^{19}$F nmr(CDCl$_3$) : $\delta$+1.22(d, CF$_3$) from CF$_3$COOH as an ext. standard. MS : m/e 258(M$^+$).

The mixture of 2'a(1.22g, 5mmol), triethylamine(1.50g, 15mmol) and tetrahydrofuran(30ml) was refluxed for 1h, and then worked-up as usual. 2-Fluoro-3-trifluoromethyl-1,4-dihydroquinoxaline(4a, 0.80g) was obtained by column chromatography on silica gel using chloroform as eluent in 73% yield, m.p.89.5-91.0°C. $^1$H nmr(CDCl$_3$) : $\delta$4.40(2H), 6.10-6.90(4H). $^{19}$F nmr(CDCl$_3$) : $\delta$-15.9(d, $J_{CF_3-F}$=16.2Hz, CF$_3$), -19.1(q, CF) from CF$_3$COOH as an ext. standard. MS : m/e 238(M$^+$).

## References

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