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Preliminary Note

Reactions of perfluoro-(2,4-dimethyl-3-oxa-2,4-diazapentane) with tris(trifluoromethyl) -phosphine, -arsine and -stibine

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Perfluoro-(2,4-dimethyl-3-oxa-2,4-diazapentane) (I), which has been reported recently, is known to undergo reactions involving the cleavage of the N–O bond [1 - 4]. Hitherto, no report has been recorded of its reactions with inorganic compounds. We have now examined the reactions between compound (I) and $(CF_3)_3M$ (M = P, As and Sb). With equimolar quantities of reactants, tris(trifluoromethyl)phosphine yields $(CF_3)_2NP(CF_3)_2$, $(CF_3)_2NOCF_3$ being eliminated. Tris(trifluoromethyl)arsine undergoes similar reactions to afford $(CF_3)_2NAs(CF_3)_2$ and $(CF_3)_2NOCF_3$. These reactions can be represented by the equation,

$$(CF_3)_2NON(CF_3)_2 + (CF_3)_3M \rightarrow (CF_3)_2NM(CF_3)_2 + (CF_3)_2NOCF_3$$

where M = P or As.

The above reaction involves ready cleavage across the N–O bond. All the products are known and are readily characterized by their infrared spectra and molecular weights. The phosphine and arsine derivatives may be confirmed by their reactions with 20% sodium hydroxide, which leads to the evolution of CF_3H.

The reaction between $(CF_3)_2NON(CF_3)_2$ and $(CF_3)_3Sb$ proceeds differently, the main products isolated being $(CF_3)_2NOCF_3$, $CF_3N{=}CF_2$ and SbF_3.

The above reactions of $(CF_3)_2NON(CF_3)_2$ bear a striking resemblance to those of $(CF_3)_2NX$ (X = Cl, Br) with $(CF_3)_3M$ (M = P, As and Sb) [5, 6]. These reactions not only reflect the weakness of the N–O bond but also the similarity in properties of the $(CF_3)_2NO$ radical to the halogens. It is not unreasonable to suggest that in the above reactions unstable quinquevalent intermediates such as $(CF_3)_3M\begin{smallmatrix}\diagup ON(CF_3)_2\\ \diagdown N(CF_3)_2\end{smallmatrix}$ are formed.

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