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## Rearrangement of unactivated N-t-amyl-O-benzoyl hydroxamic acid derivatives with P-2-t-Bu phosphazene base

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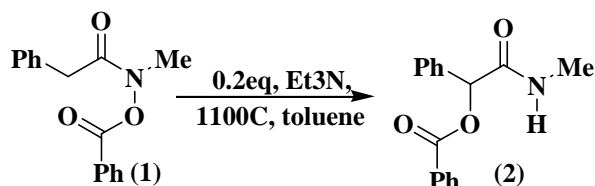
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### INTRODUCTION

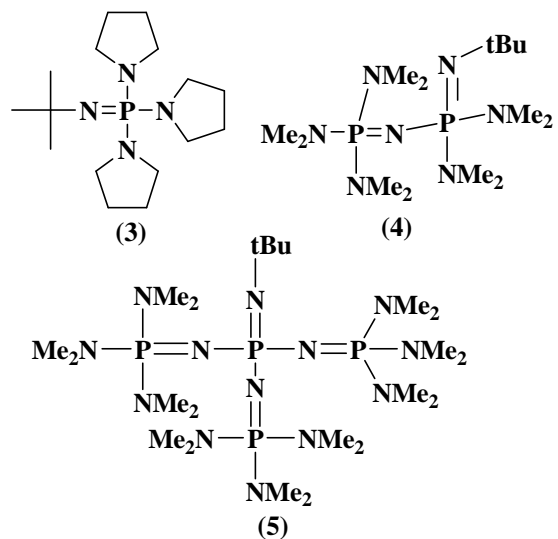
The phosphazene super base P-2-tBu (**4**) mediates the rearrangement of unactivated N-t-amyl-O-benzoyl hydroxamic acid derivatives (**6a-c**) to give 2-benzoyloxy amides (**7a-c**) and byproducts (**8a-c**) in good yields.

N-alkyl-O-acyl hydroxamic acid derivatives **1** containing suitably acidic  $\alpha$ -protons undergo smooth rearrangement to give 2-acyloxyamides (**2**) upon heating with catalytic organic bases, such as Et<sub>3</sub>N (SCHEME 1)<sup>[1-3]</sup>.



The product of this reaction (**2**) furnishes secondary 2-hydroxyamides after deprotection of the acyl protecting group, which are versatile synthetic intermediates<sup>[3,5]</sup>.

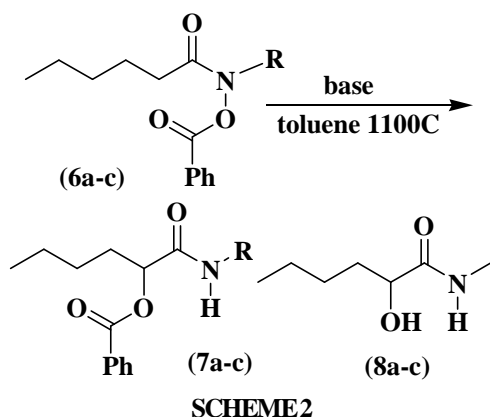
When there is no activating group (e.g., Ph) the reaction fails<sup>[3]</sup>, even when strong inorganic bases such as KHMDS or LDA are used<sup>[3,6]</sup>. Organic phosphazene super bases such as 5-7, however, furnish this rearrangement of unactivated precursors in good to moderate yields<sup>[4]</sup>.



The P-2-tBu super phosphazene bases [1-tert-butyl-2,2,4,4,4-pentakis-(dimethylamino)-λ5,4λ5-catenadi(phosphazene)] (**4**) was the most successful base. Thus, the yields and rates of these reactions are dependent upon the steric nature of the N-alkyl substituent<sup>[4]</sup>. For example, the reaction of the t-Bu derived precursor (**6a**) (R = t-Bu) was facile, giving (**7a**) in 75% yield in only 18 h, while the reaction with the less sterically hindered s-Bu (**6b**) (R = s-Bu) and i-Pr derivatives (**6c**) (R = i-Pr) gave 30% yields of (**7b-c**) in 72 h and 18 h, respectively. (SCHEME 2)<sup>[4]</sup>.

Based on the previous results, our efforts focused on the investigation of this rearrangement under the ef-

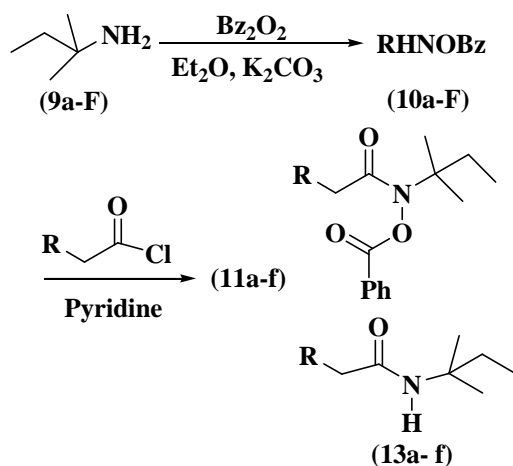
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fect of bulkier N-alkyl groups, which might lead to a rearrangement under less drastic conditions and in a shorter time. Hence, a range of N-t-amyl-O-benzoyloxy hydroxamic acid derivatives of type (**11**) were prepared via standard methods<sup>[3]</sup>. N-alkyl hydroxamic acids derivatives (**11a-f**) were prepared via benzoylation of alkyl amines (**9a-f**) with dibenzoyl peroxide to furnish O-benzoylhydroxylamines (**10a-f**). Acylation of (**11a-f**) gave the desired hydroxamic acids (SCHEME 3). The yields of these precursors are shown in (TABLE 1)

TABLE 1: Yields of hydroxamic derivatives (11a-f)

Entry	Compound	R	Yield (%)
1	11a	Me(CH <sub>2</sub> ) <sub>4</sub>	40
2	11b	Allyl (CH <sub>2</sub> )	50
3	11c	PhCH <sub>2</sub>	55
4	11d	Me	48
5	11e	Et	40
6	11f	2-Thienyl(CH <sub>2</sub> )	35



With precursors (**11a-f**) in hand, the rearrangement reactions were then investigated.

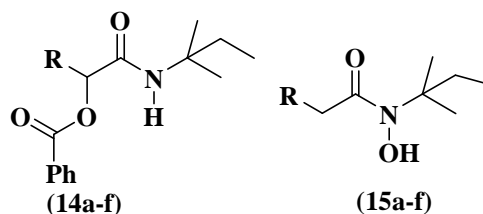
All attempts to rearrange these precursors using 1 eq or 0.2 eq of Et<sub>3</sub>N or in refluxing toluene failed. The use of organic phosphazene super base P-2-tBu (**4**), however, was more successful. Thus, treatment of the sterically hindered precursors (**11a-f**) with 0.2eq of P-2-tBu (**4**) for 1 2h in dry toluene at 120°C furnished the desired rearranged products (**14a-f**) and the deprotected product of the secondary hydroxyl (**15a-f**).

These results are summarized in (TABLE 2)

TABLE 2 : Yields of rearranged products (14a-f) and (15a-f)

Precursor	Yield of (14a-f) (%)	Yields (15a-f) (%)
11a	80	-
11b	50	30
11c	60	30
11d	85	
11e	80	20
11f	60	30

\*A typical procedure involved heating 0.45 mmol of the substrate in 3 ml of refluxing toluene with P2-tBu in dry toluene at 120°C



Use of the phosphazene super base P-2-tBu(**4**) facilitated the rearrangement of more sterically hindered unactivated N-alkyl-O-benzoyl hydroxamic acid derivatives, such as (**11a-f**), in a shorter time (12h) and under less drastic conditions than previously reported unactivated N-alkyl-O-benzoyl hydroxamic acid derivatives, such as (**6a-c**). These results support the previous findings that the yields and rates of these reactions are dependent upon the steric nature of the N-alkyl substituent

Work is ongoing in our laboratory to investigate the effect of other super phosphazene bases, such as P-2-Et.

In conclusion, modification of the previously reported unactivated N-alkyl-O-benzoyl hydroxamic acid derivatives of type 6a-c to more sterically hindered derivatives of type (**11a-f**) led to smooth rearrangement to 2-hydroxy amide derivatives in (50-80%) yield via treatment with super phosphazene bases P-2-tBu (**4**), but this modification does not adequately facilitate

this rearrangement under treatment with Et<sub>3</sub>N.

### ACKNOWLEDGMENTS

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### REFERENCES

- [1] A.J.Clark, J.L.Peacock; Tetrahedron Lett., **39**, 1265 (1998).
- [2] Y.S.S.Al-Faiyz, A.J.Clark, R.P.Filik, J.L.Peacock, G.H.Thomas; Tetrahedron Lett., **39**, 1269 (1998).
- [3] A.J.Clark, Y.S.S.Al-Faiyz, M.J.Broadhurst, D.Patel, J.L.Peacock; J.Chem.Soc.Perkin Trans, **1**, 1117 (2000).
- [4] A.J.Clark, Al-Faiyz, Y.S.S.D.Patel, M.J.Broadhurst; Tetrahedron Lett., **2001**, 42 (2007-2009).
- [5] R.V.Hoffmann, N.K.Nayyar, W.Chen; J.Org. Chem., **57**, 5700 (1992).
- [6] Y.Endo, T.Uchida, S.Hizatate, K.Shudo; Synthesis, 1096 (1994).
- [7] All new compounds exhibited satisfactory spectroscopic and analytical characteristics.