CHEMISTRY LETTERS, pp. 1501-1502, 1980.

ACYL AZIDES AS ACYLATING AGENTS. A FACILE SYNTHESIS OF SUBSTITUTED TETRALONES

I. H. SANCHEZ,* M. T. MENDOZA, M. A. AGUILAR, E. A. MARTELL, M. E. GONZALEZ, and C. LEMINI
Departamento de Química Orgánica, División de Estudios de Posgrado, Facultad de Química,
Universidad Nacional Autónoma de México, México 20, D.F., MEXICO

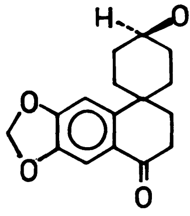
Treatment of 4-aryl butyryl azides or the intermediate mixed carbonic anhydrides with excess polyphosphoric acid or aluminum trichloride, respectively, provide a versatile method of synthesis of substituted tetralones, applicable to those cases where the necessary acid chlorides are unstable or difficult to prepare.

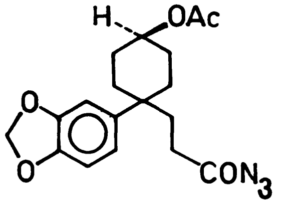
Acyl azides[1] are a well-known class of organic compounds normally used for the preparation of substituted isocyanates *via* the Curtius rearrangement.[2] However, under certain conditions, they behave as equivalents of acylium ion (acyl cation) and can thus function as versatile acylating agents. Their synthetic utility arises mainly from those instances where difficulties are encountered during the preparation and/or subsequent handling of the corresponding acid chlorides.

During our studies directed towards the total synthesis of the *Amaryllidaceae* alcaloids[3] we came upon the preparation of tetralone 1.[4] Whilst in our hands the precursor acid chloride proved unstable, it was found that the corresponding acyl azide 2, prepared *via* the mixed-anhydride method,[5] was rather stable and afforded a 61% yield of 1, mp 219-222° (lit[6] mp 219-222°), upon treatment with excess polyphosphoric acid (PPA) at room temperature for 0.5 h.

Furthermore, the method seems to be of wide applicability and we have extended it to the synthesis of various substituted tetralones. In this manner, the (crude) butyryl azides 3, 4, and 5, prepared as before, *via* the mixed-anhydride method,[5] afforded the known tetralones 6, 7, and 8, respectively, in good overall yields from the corresponding 4-aryl butyric acids (Table). In the case of tetralone 6 we have found that direct cyclization of the 4-(2-methoxyphenyl)butyric acid[6] with PPA (93°, 15 min., 9% yield) or with phosphorus oxytrichloride in tetrachloroethane[6] (reflux, 2.5 h., 43% yield) furnish lower yields of the desired material. Moreover, the intermediate mixed-anhydride 9, prepared by treating 3 with ethyl chloroformate and triethylamine in moist acetone,[5] can also be used as an acylating agent, and affords tetralone 6 in 52% yield upon treatment with a slight excess of aluminum trichloride ($AlCl_3$) in dry dichloromethane at 0°.

On the other hand, we also required the 6,7-methylenedioxy-1-tetralone 13 as a model compound for our studies. Since the corresponding 4-(3,4-methylenedioxyphenyl)butyric acid 11 was not known, we readily prepared it in 63% yield by the terminal metalation of safrole 10 by a titanium tetrachloride-catalyzed Grignard transfer reaction[7] using n-propylmagnesium iodide in dry ether at -20°, followed by immediate carboxylation (CO_2 gas) of the organometallic intermediate. It was isolated as colorless prisms, mp 67-69° (ether-hexane).[8] Finally, the PPA-catalyzed cyclization of its corresponding acyl azide 12 afforded tetralone 13, mp 73-74°,[8] in 52% yield. Likewise, the intermediate mixed-anhydride 14 provided 13 in 55% yield upon treatment with $AlCl_3$ (*vide supra*) .


1


2

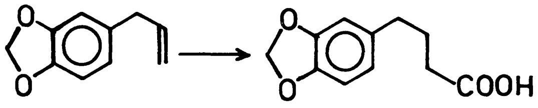
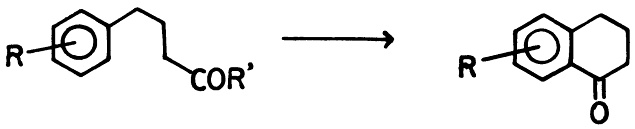

10 11

Table. Preparation of Substituted Tetralones.



Compound	R	R'	Yield, %	Compound	R	mp or bp/torr (lit mp or bp/torr)
3	2-OCH_3	N_3	60	6	5-OCH_3	90-91° (lit[6] mp 90-91°)
4	4-OCH_3	N_3	64	7	7-OCH_3	60-62° (lit[9] mp 61-62.5°)
5	H	N_3	67	8	H	114-116°/6 (lit[10] bp 105-107°/2)
9	2-OCH_3	OCO_2Et	52	6	5-OCH_3	90-91° (lit[6] mp 90-91°)
12	3,4-OCH_2O-	N_3	52	13	6,7-OCH_2O-	73-74°[8]
14	3,4-OCH_2O-	OCO_2Et	55	13	6,7-OCH_2O-	73-74°[8]

References.

1. J. A. Boyer and F. C. Canter, Chem. Revs., 54, 1 (1954).
2. P. A. S. Smith, Org. Reactions, 3, 337 (1946).
3. I. H. Sânchez and M. T. Mendoza, Tetrahedron Lett., in the press (1980).
4. S. Uyeo, H. Irie, A. Yoshitake and A. Ito, Chem. Pharm. Bull., 13, 427 (1965).
5. J. Weinstock, J. Org. Chem., 26, 3511 (1961).
6. V. Hach and M. Protiva, Chem. Listy, 51, 2099 (1959); Chem. Abstr., 52, 5310h (1958).
7. G. D. Cooper and H. L. Finkbeiner, J. Org. Chem., 27, 1493 (1962); H. L. Finkbeiner and G. D. Cooper, ibid, 27, 3395 (1962).
8. All new compounds were adequately characterized by spectral methods (IR, NMR and MS), and gave satisfactory high resolution mass spectral and/or combustion analytical data.
9. W. E. Bachmann and W. J. Horton, J. Am. Chem. Soc., 69, 58 (1947).
10. E. L. Martin and L. F. Fieser, Org. Syn., Coll. Vol. 2, 569 (1943).

(Received July 7, 1980)