Tetrahedron Letters, Vol 32, No 31, pp 3873-3874, 1991
Printed in Great Britain

0040-4039/91 $3 00 +
Pergamon Press plc

DEACETYLATION OF N- ACETYLPIPERDIN-4-ONES BY A NOVEL ELECTROCHEMICAL METHOD

*Arumugam Rajanarayanan and Ramasubbu Jeyaraman**
Department of Chemistry, Bharathidasan University,
Tiruchirapalli - 620024, Tamil Nadu, India.

Abstract: A new electrochemical method for the deacetylation of N-acetylpiperidin-4-ones, in benzene-methanol mixture containg sodium hydroxide, has been developed Carbonyl group in the ring is not affected.

Anodic α-acetoxylation and α-methoxylation of ketones are shown to be powerful tools for the 1,2-transposition of the carbonyl group of ketons In connection with our studies on restricted rotation of N-nitrosopiperidines[2] we attempted to methoxylate the alkyl substituted piperidin -4-ones anticipating the formation of piperidin-3-ones (17-22) Thus, the N-H of the piperidin-4-ones (11-16) were protected by N-acetylation and the N-acetyl-2, 6-diphenylpiperidin-4-ones (1-6) formed[3] were subjected to electrolytic conditions in benzene-methanol mixture The corresponding 2,6 diphenylpiperidin-4-ones[4] (11-16) were obtained as the exclusive products Representative examples of cyclic N-acetylamines that were subjected to deacetylation by this method are shown in Table I

Recently it has been reported[5] that the successful cathodic cleavage of the N-S bonds in the poly-p-toluenesulfonamides and the arenesulfon amides of secondary amines gave the corresponding amines However, there is no report of N-CO bond cleavage by electrolytic methods

Electrolysis of a solution of N-acetypiperidin-4-ones (0 1 g ~ 0 32 mmol) in benzene-methanol mixture (3 7 50 mL) containing 6 25 mmol of sodium hydroxide (supporting electrolyte) was carried out in a single compartment cell using two graphite electrodes (6 5 cm^2) The temperature was maintained between 25-30° C and the solution was magnetically stirred The electrolysis was performed at constant potential (-1 78 V) The reaction was monitored by GC and judged to be 75% complete after 6-8 hours The reaction mixture was evaporated to dryness under reduced pressure Then distilled water (150mL) was added, and the suspension was extracted with ether The extracts were dried over anhydrous Na_2SO_4 and evaporated to dryness under reduced pressure The free amines were isolated in about 65% yield

We found that, in lactam (7,8) the N-CO bond does not break even after 10 hours Electrochemical deacetylation also took place for compounds like, N, O-bisacetylpiperidinols (9,10), in this case the corresponding piperidinols were obtained along with another unidentified product

Amides can be hydrolyzed with acidic or basic catalysts, the products being the free acid and the ammonium salt of the acid when acid is used while the free amine and the salt of the acid are formed, when base is used. Often, prolonged heating is required even with acidic or basic catalysts Usually sulfuric acid or phosphoric acid is used as catalyst In difficult cases, aqueous sodium peroxide can be used[6] Deacetylation can be done by lithium aluminumhydride[7] also. In all these methods it is necessary to maintain either strong acidic or basic conditions and in most cases heating is also required Under these conditions, functional groups such as the carbonyl, nitro and nitrile groups present in the substrate could be affected But the method reported herein is a mild and clean one, separation and purification are simple For instance the carbonyl group present in the ring is not affected In a control reaction, under non-electrolytic conditions, treatment of the N-acetyl derivatives 1-6 with sodium hydroxide solution upto 100 mmol concentrations (3,000 times excess) for 12 hours die not produce the deacetylated product.

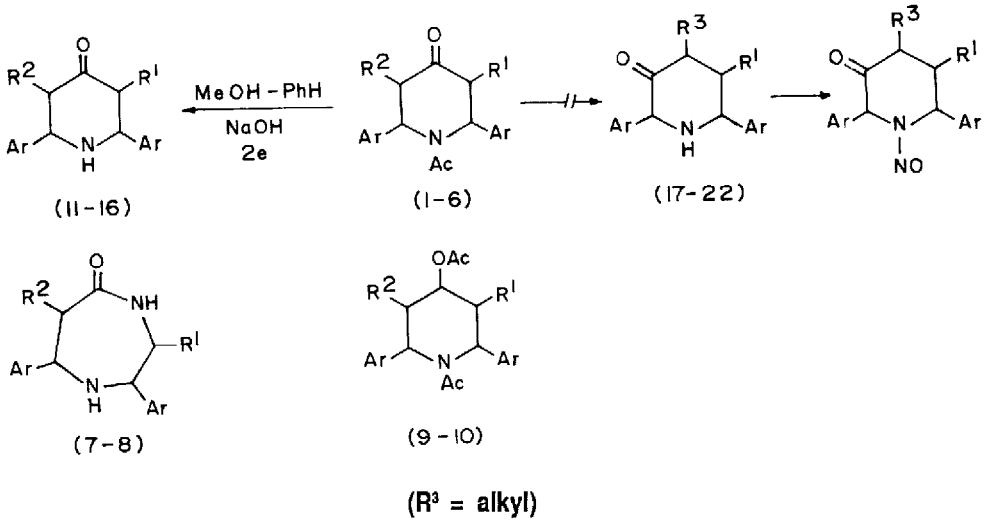

Table I Electrochemical Deacetylation of N-Acetylpiperidin-4-Ones

No	R^1	R^2	Ar	Product Yield (in %)	Current used (C)
1	H	H	C_6H_5	65	2592
2	Me	H	C_6H_5	60	2700
3	Et	H	C_6H_5	69	2520
4	^iPr	H	C_6H_5	62	2880
5	Me	Me	C_6H_5	60	2970
6	Me	Me	p-ClC_6H_4	53	3672
7	H	H	C_6H_5	--	3312
8	Me	H	C_6H_5	--	3888
9	H	H	C_6H_5	50	5240
10	Me	H	C_6H_5	48	4320

This work was supported by the University Grants Commission, New Delhi, India The gas chromatograph was purchased with the funding from Department of Scient and Technology, New Delhi, India.

REFERENCES AND NOTES

1 a) Shono,T, Kashimura, S. *J Org Chem.*, 48, 1939 (1983)
b) Trost, B M; Hiroi, K; Kurozumi, S *J Am Chem Soc.*, 97, 438 (1975).

2 Jeyaraman,R, Ravindran,T. *Tetrahedron Lett*, 2787 (1990)

3 Pillay, M.K, Krishna Kumar, R, unpublished results.

4 The products were identified by comparison with authoentic materials. For preparations see, Noller,C.R, Baliah,V *J Am.Chem.Soc*, 70, 3853 (1948). And references cited in Baliah, V, Jeyaraman, R; Chandrasekaran, L *Chem Rev*, 83, 373 (1983)

5 a) Kossat,R; Simonet,J, Jeminet, G *Tetraheron lett*, 1059 (1979)
b) Quaal,K.S; Sungchul Ji, Kim,Y M; Closson,W D; Zubieta,J A *J Org.Chem.*, 43, 1311 (1978)

6 Vaughan H L, Robbins,M.D, *J Org Chem*, 40, 1187 (1975)

7 Brown,H.C; Tsokamoto, A *J Am Chem Soc*, 83, 2016 (1961).

(Received in UK 21 May 1991)