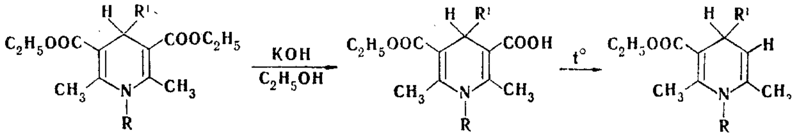
HYDROLYSIS OF 1,4-DIHYDROPYRIDINE-3,5-DICARBOXYLIC ACID ESTERS

A. É. Sausin', V. K. Lusis,
B. S. Chekavichus, and G. Ya. Dubur

UDC 547.827:542.938

Despite the established opinion that 1,4-dihydropyridine-3,5-dicarboxylic acid esters (I) cannot be hydrolyzed without decomposition, we have achieved the hydrolysis of some esters of this series in high yield and have observed that a considerable difference in the reactivities of the ester groups in I is displayed, depending on the other substituents in the dihydropyridine ring. A necessary condition for the hydrolysis is the presence of substituents attached to the nitrogen atom and in the 4 position. In an attempt to hydrolyze diester I ($R{=}CH_3$, $R^1{=}H$) the corresponding II was not obtained, and acid II was formed in 4% yield from diester I ($R{=}H$, $R^1{=}C_6H_5$); a large amount of the starting compound was isolated in both cases.



I a–d   II a–d   III a–d

I–III a $R = CH_3$, $R^1 = CH_3$; b $R = CH_3$, $R^1 = C_6H_5$; c $R = CH_3$, $R^1 = C_6H_4OCH_3$-*p*; d $R = C_6H_5$, $R^1 = C_6H_5$

When N-substituted (alkyl and aryl) 4-substituted 1,4-dihydropyridine-3,5-dicarboxylic acid esters (I) are refluxed in alcohol solution for 15-18 h with an equimolar amount of potassium hydroxide, monocarboxylic acids II are formed in 65-90% yields: IIa, mp 152-154°C; IIb, mp 178-179°C; IIc, mp 154-156°C (all from acetonitrile); IId, mp 168-169°C (from alcohol). An absorption band of an OH group at 3535-3540 cm^{-1} is observed in the IR spectra of acids II (in $CHCl_3$), and the band of a C=O group at 1660-1685 cm^{-1} is broadened or split into two bands. The PMR spectra of acids II provide evidence for the presence of only one ester group: 1.04-1.23 (t, 3H, CH_3) and 3.79-4.12 ppm (q, 2H, CH_2). Phenacyl esters were obtained by the action of phenacyl bromide on II.

When acids II are heated without a solvent at 10°C above their melting points for 10 min, they are decarboxylated to give IIIb, with mp 83-85°C, and IIIc, with mp 68-69°C (both from alcohol).

A hypsochromic shift of the long-wave maximum (341-344 nm) as compared with I and II is observed in the UV spectrum of III. Nonequivalence of the CH_3 groups in the 2 (s, 2.36-2.39 ppm) and 6 (s, 1.81-1.83 ppm) positions is observed in the PMR spectra, and the signal of the proton in the 5 position (d, 4.76-4.78 ppm) and the 4-H signal (4.32-4.42 ppm) are split into doublets.

Institute of Organic Synthesis, Academy of Sciences of the Latvian SSR, Riga 226006. Translated from Khimiya Geterotsiklicheskikh Soedinenii, No. 2, p. 272, February, 1978. Original article submitted July 14, 1977.