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SYNTHESIS OF THE PYRIMIDINE-1,3-DIOXIDES AND THEIR TRANSFORMATION INTO ISOMERIC PYRIMIDINE MONO-N-OXIDES

A. Ya. Tikhonov, L. B. Volodarsky

Institute of Organic Chemistry, Siberian Division of
the Academy of Sciences, USSR, Novosibirsk, 90

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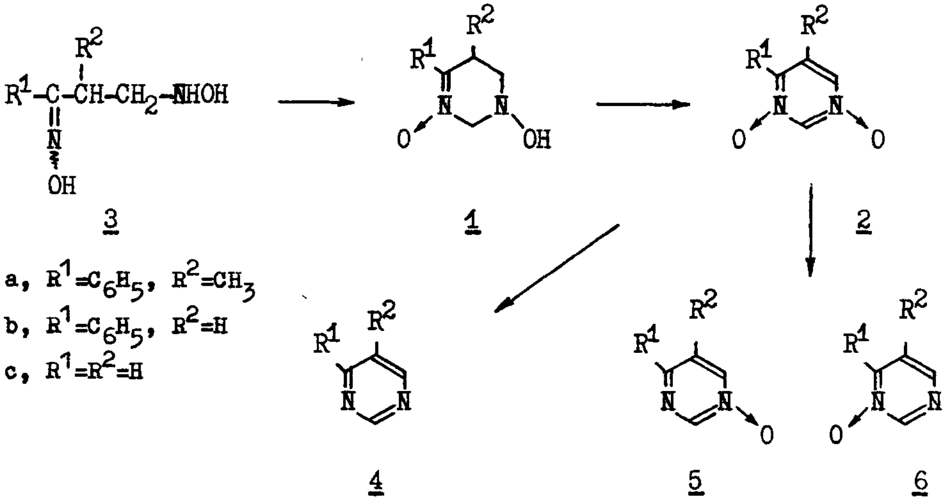
The pyrimidine-1,3-dioxides are very unusual compounds. They are not available by direct oxidation of the pyrimidines, this reaction results in the formation of the pyrimidine mono-N-oxides[1] or of the rearrangement's products.[2] 5-nitro-2,4,6-triaminopyrimidine-1,3-dioxide is the only example of the pyrimidine-1,3-dioxides.[1,3]

We wish to report that oxidation of the 1-hydroxy-1,2,5,6-tetrahydropyrimidine-3-oxides 1 results in the formation of the pyrimidine-1,3-dioxides 2.[4] 1-hydroxy-1,2,5,6-tetrahydropyrimidine-3-oxides 1 are formed by treatment of the 1,3-hydroxylaminooximes[5] 3 with the formaldehyde in ethanolic solution.[6] The catalytic amounts of acid are required in the formation of 1a,b. 1a,[7] 60%, m.p. 149-151°, ir (KBr) 1595 cm^{-1} (C=N), uv (EtOH) 267 nm (log ε 3.87); 1b, 60%, m.p. 160-162°, ir (KBr) 1608 cm^{-1} (C=N), uv (EtOH) 282 nm (log ε 3.97); 1c,[8] 80%, m.p. 114-116°, ir (KBr) 1639 cm^{-1} (C=N), uv (EtOH) 237 nm (log ε 4.06).

The activated manganese dioxide in dioxane-pyridine (15:1) have been found to oxidise the compounds 1 at ambient temperature to the pyrimidine-1,3-dioxides 2.



a, $R^1=C_6H_5$, $R^2=CH_3$

b, $R^1=C_6H_5$, $R^2=H$

c, $R^1=R^2=H$

5-Methyl-4-phenylpyrimidine-1,3-dioxide 2a, 56%, m.p. 225-227°, ir[9] (KBr) 1460, 1397, 1338, 1190, 1180 cm^{-1}, uv (EtOH) nm (log ε): 269 (4.42), 293-sh (4.06), nmr[10] (DMSO-d_6) δ 2.01 (s, CH_3), 7.47 (s, C_6H_5), 8.36 (d, J=1.5 Hz, H-6), 9.34 (d, J=1.5 Hz, H-2).

4-Phenylpyrimidine-1,3-dioxide 2b, 40%, m.p. 216-218°, ir (KBr) 1464, 1406, 1283, 1222, 1209 cm^{-1}, uv (EtOH) nm (log ε): 275 (4.44), 316 (4.23), nmr[10] (DMSO-d_6, saturated solution) δ 7.1-8.0 (m, C_6H_5 and H-5), 8.10 (d, J=7.0 Hz, H-6), 9.22 (br s, H-2).

Pyrimidine-1,3-dioxide 2c, 6%, m.p. 226-228°, ir (KBr) 1456, 1438, 1315, 1310, 1208, 1184, 1163, 1009 cm^{-1}, uv (EtOH) 266 nm (log ε 4.36), nmr[10] (DMSO-d_6, saturated solution) δ 7.65 (t, J=6.5 Hz, H-5), 8.30 (dd, J=6.5 and 1.5 Hz, H-4,6), 9.42 (t, J=1.5 Hz, H-2).

In our studies of the properties of the pyrimidine-1,3-dioxides 2 we carried out the deoxygenation of these compounds. The pyrimidine-1,3-dioxides 2 are converted into the pyrimidines 4 by heating in excess of triethyl phosphite (4a, 81%, m.p. 139-140° (pikrate), lit.[11] m.p. 140°; 4b, 76%, m.p. 63-64°, lit.[11] m.p. 66°). By heating of 2 with triethyl phosphite in solvent (dioxane, tetrahydrofuran) they are converted into two isomeric pyrimidine mono-N-oxides[12] 5 and 6.

5-Methyl-4-phenylpyrimidine-1-oxide 5a, 80%, m.p. 151-153°, ir (KBr) 1446, 1432, 1303, 1260, 1170 cm^{-1}, uv (EtOH) nm (log ε): 285 (4.23), 318 (4.08), nmr[13] (CD_3OD) δ 2.39 (dd, J=0.5 and 0.8 Hz, CH_3), 7.4-7.8 (m, C_6H_5), 8.59 (dq, J=0.8 and 2.0 Hz, H-6), 9.01 (dq, J=0.5 and 2.0 Hz, H-2).

5-Methyl-6-phenylpyrimidine-1-oxide 6a, 14%, m.p. 146-148°, ir (KBr) 1383, 1292, 1261 cm^{-1}, uv (EtOH) nm (log ε): 250 (4.14), 266-sh (3.96), nmr[10] (CD_3OD) δ 2.18 (s, CH_3), 7.57 (m, C_6H_5), 8.42 (s, H-6), 9.05 (s, H-2).

4-Phenylpyrimidine-1-oxide 5b, 83%, m.p. 133-135°, lit.[14] 132-134°, uv (EtOH) nm (log ε): 307 (4.31), 322-sh (4.27).

6-Phenylpyrimidine-1-oxide 6b, 10%, m.p. 153-155°, lit.[14] 149.5-150.5°, uv (EtOH) nm (log ε): 253 (4.39), 285 (3.95).

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9. Strong bands are given in region 1000-1700 cm^{-1} of 2, 5a, 6a.
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