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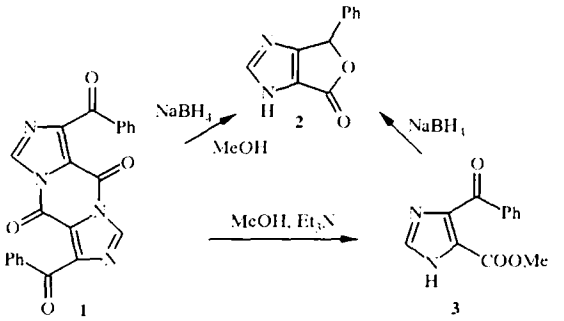
4,6-DIHYDROFURO[3,4-*d*]IMIDAZOLE: A NEW HETEROCYCLIC SYSTEM

Yu. E. Ivanov, A. A. Yavolovskii, and R. Yu. Ivanova

Keywords: diimidazo[3,4-*a*:3',4'-*c*]pyrazine-4,9-dione, reduction.

Diimidazo[3,4-*a*:3',4'-*c*]pyrazine-4,9-diones of type **1** (R = Cl, OAlk, NHAr) are convenient synthons for obtaining derivatives of imidazole-4,5-dicarboxylic acid [1, 2], imidazo[4,5-*d*]pyridazines [3], and imidazo[5,1-*c*]oxazoles [4].

We have observed that the tricycle **1** (R = Ph) when treated with $NaBH_4$ in methanol is converted to 4,6-dihydrofuro[3,4-*d*]imidazol-4-one (**2**).



The fact that compound **1** is poorly soluble in methanol and lactone **2** is easily formed on reduction of the keto ester **3** by $NaBH_4$ allows us to say that conversion of compound **1** to compound **2** occurs in two steps, *via* intermediate formation of keto ester **3**. Additional evidence in favor of this claim is formation of compound **3** in high yield when the starting compound **1** is heated in dry methanol in the presence of sodium methoxide or triethylamine.

1,6-Dibenzoyldi(imidazo[3,4-*a*;3',4'-*c*]pyrazine)-4,9-dione (1) [3]; mp > 300°C, M^+ 396. IR spectrum (nujol): 2950, 2870, 1720, 1615, 1450, 1380 cm^{-1}. Found, %: C 66.91; H 3.16; N 13.96. $C_{22}H_{12}N_4O_4$. Calculated, %: C 66.67; H 3.05; N 14.14.

6-Phenyl-4,6-dihydrofuro[3,4-*d*]imidazol-4-one (2). Keto ester **3** (2.3 g, 0.01 mol) was added to a solution of sodium borohydride (0.608 g, 0.016 mol) in methanol (150 ml) at ~20°C with stirring. The mixture was stirred for 6 h, treated with diluted hydrochloric acid until complete decomposition of the excess sodium borohydride. The solution obtained (pH 7) was evaporated under vacuum. Compound **2** (1.74 g, 87%) was obtained; mp 184°C (ethanol–water, 1:10), M^+ 200. IR spectrum (nujol): 2970, 2815, 1693, 1570, 1443-1457, 1372, 1157, 935, 714 cm^{-1}. Found, %: C 66.12; H 3.89; N 14.16. $C_{11}H_8N_2O_2$. Calculated, %: C 66.00; H 4.00; N 14.00.

A. V. Bogatsky Physical Chemistry Institute, National Academy of Sciences of Ukraine, Odessa 65080.
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4-Benzoyl-5-methoxycarbonylimidazole (3). A mixture of compound **1** (3.96 g, 0.01 mol), dry methanol (100 ml), and catalytic amounts of triethylamine was boiled for 40 min, then evaporated under vacuum. Compound **3** (3.77 g, 82%) was obtained; mp 200°C (DMF–water). IR spectrum (nujol): 2985, 2785, 1705, 1657, 1470, 1430, 1340, 1186, 1157, 1070, 900 cm^{-1}. Found, %: C 62.46; H 4.49; N 12.32. $C_{12}H_{10}N_2O_3$. Calculated, %: C 62.61; H 4.38; N 12.17.

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