ISSN 1070-4280, Russian Journal of Organic Chemistry, 2010, Vol. 46, No. 7, pp. 1103–1104. © Pleiades Publishing, Ltd., 2010.
Original Russian Text © P.S. Silaichev, N.V. Kudrevatykh, Z.G. Aliev, A.N. Maslivets, 2010, published in Zhurnal Organicheskoi Khimii, 2010, Vol. 46, No. 7, pp. 1101–1102.

SHORT COMMUNICATIONS

Recyclization of 4,5-Bis(aroyl)-2,3-dihydro-1*H*-pyrrole-2,3-diones by the Action of Aromatic Amines

P. S. Silaichev[a], N. V. Kudrevatykh[a], Z. G. Aliev[b], and A. N. Maslivets[a]

[a] *Perm State University, ul. Bukireva 15, Perm, 614990 Russia*
e-mail: koh2@psu.ru

[b] *Institute of Chemical Physics Problems, Russian Academy of Sciences, Chernogolovka, Moscow oblast, Russia*

Received October 27, 2009

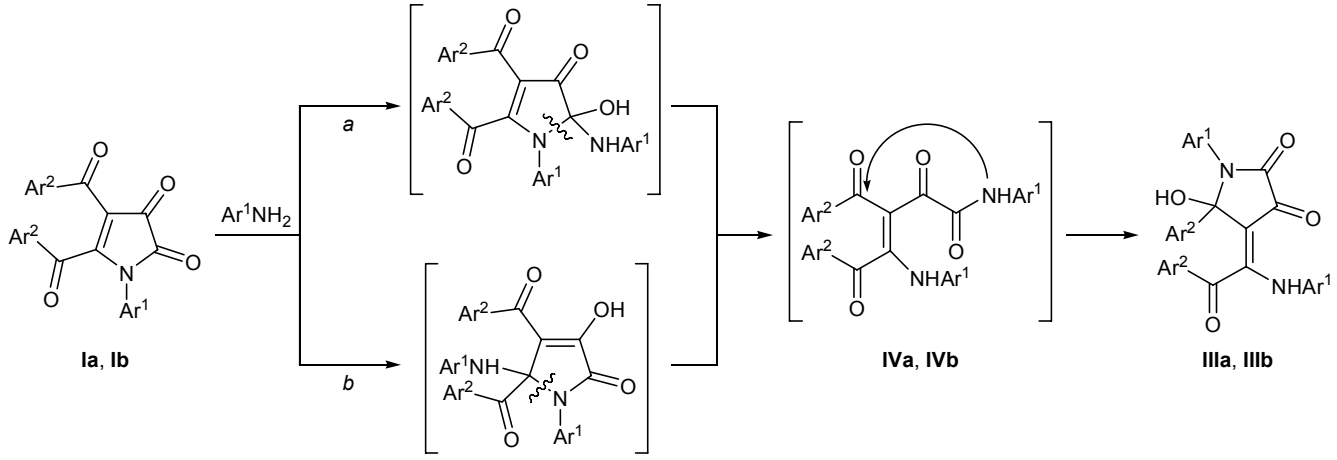
DOI: 10.1134/S1070428010070286

We previously reported on reactions of monocyclic 2,3-dihydro-1*H*-pyrrole-2,3-diones with aromatic amines, which resulted in the formation of addition products at the C^5 atom in the pyrrole ring, 5-arylamino-3-hydroxy-1*H*-pyrrole-2(5*H*)-ones [1–3]. By reaction of 4,5-bis(aroyl)-1-(4-methoxyphenyl)-2,3-dihydro-1*H*-pyrrole-2,3-diones **Ia** and **Ib** with *p*-anisidine at a molar ratio of 1:1 in anhydrous chloroform at room temperature (reaction time 8–10 h) we obtained (4*Z*)-5-aryl-[2-aryl-1-(4-methoxyphenylamino)-2-oxoethylidene]-5-hydroxy-1-(4-methoxyphenyl)pyrrolidine-2,3-diones **IIIa** and **IIIb** in good yields. The product structure was proved by X-ray analysis.

Presumably, compounds **IIIa** and **IIIb** are formed via initial addition of the primary amino group in *p*-anisidine at the carbon atom in position *2* of the pyrrole ring in **Ia** or **Ib** (path *a*), opening of the pyrrole ring at the N^1–C^2 bond with formation of intermediate compound **IVa** or **IVb**, and subsequent closure of new pyrrole ring as a result of intramolecular nucleophilic addition of the NH group at the ketone carbonyl group in the aroyl substituent. An alternative mechanism is also possible (path *b*); it involves initial addition of the amino group at the C^5 atom in the pyrrole ring, followed by opening of the pyrrole ring via cleavage of the N^1–C^5 bond, which also gives intermediate **IV**.

The described reaction is an example of recyclization of pyrrolediones by the action of aromatic amines, i.e., opening of the pyrrole ring and subsequent closure of new pyrrole ring.

(4*Z*)-5-Hydroxy-1-(4-methoxyphenyl)-4-[1-(4-methoxyphenylamino)-2-oxo-2-phenylethylidene]-5-phenylpyrrolidine-2,3-dione (IIIa). A solution of 1.0 mmol of compound **Ia** and 1.0 mmol of *p*-anisidine



Ar^1 = 4-$MeOC_6H_4$, Ar^2 = Ph (**a**), 4-ClC_6H_4 (**b**).

in 15 ml of anhydrous chloroform was kept for 8–10 h at room temperature. The solvent was removed, and the residue was ground with ethanol. Yield 79%, mp 153–154°C (from ethyl acetate–methanol). IR spectrum, ν, cm^{-1}: 3266– 3359 br (OH, NH), 1701 (C^2=O), 1677 (PhCO), 1647 (C^3=O, assoc.). ^{1}H NMR spectrum, δ, ppm: 3.59 s (3H, CH_3O), 3.69 s (3H, CH_3O), 6.88–7.43 m (19H, H_{arom}, OH), 12.29 br.s (1H, NH). Found, %: C 71.83; H 4.85; N 5.18. $C_{32}H_{26}N_2O_6$. Calculated, %: C 71.90; H 4.90; N 5.24.

(*Z*)-5-(4-Chlorophenyl)-4-[2-(4-chlorophenyl)-1-(4-methoxyphenylamino)-2-oxoethylidene]-5-hydroxy-1-(4-methoxyphenyl)pyrrolidine-2,3-dione (IIIb) was synthesized in a similar way. Yield 72%, mp 200–201°C (from ethyl acetate). IR spectrum, ν, cm^{-1}: 3310 br (OH, NH), 1705 (C^2=O), 1680 (4-ClC_6H_4CO), 1650 (C^3=O, assoc.). ^{1}H NMR spectrum, δ, ppm: 3.69 s (3H, CH_3O), 3.75 s (3H, CH_3O), 6.60–7.95 m (17H, H_{arom}, OH), 12.18 br.s (1H, NH). Found, %: C 63.61; H 3.95; N 4.56. $C_{32}H_{24}Cl_2N_2O_6$. Calculated, %: C 63.69; H 4.01; N 4.64.

The IR spectra were recorded on an FSM-1201 spectrometer from samples dispersed in mineral oil. The ^{1}H NMR spectra were obtained on a Bruker AM-400 instrument (400 MHz) from solutions in DMSO-d_6 using tetramethylsilane as internal reference. The purity of the products was checked by TLC on Silufol plates using benzene–ethyl acetate (5:1) or ethyl acetate as eluent.

This study was performed under financial support by the Russian Foundation for Basic Research (project nos. 07-03-96036, 08-03-01032).

REFERENCES

1. Maslivets, A.N., Smirnova, L.I., and Andreichikov, Yu.S., *Zh. Org. Khim*., 1989, vol. 25, p. 1748.
2. Maslivets, A.N., Smirnova, L.I., and Andreichikov, Yu.S., *Zh. Org. Khim*., 1992, vol. 28, p. 2141.
3. Maslivets, A.N. and Mashevskaya, I.V., *2,3-Digidro-2,3-pirroldiony* (2,3-Dihydropyrrole-2,3-diones), Perm: Perm. Gos. Univ., 2005.