SHORT
COMMUNICATIONS**[4+2]-Cycloaddition of Alkyl Vinyl Ethers to 3-Aroylpyrrolo-[2,1-*c*][1,4]benzoxazine-1,2,4-triones****E. E. Stepanova, A. V. Babenysheva, and A. N. Maslivets***Perm State University, ul. Bukireva 15, Perm, 614990 Russia**e-mail: koh2@psu.ru*

Received December 15, 2009

DOI: 10.1134/S107042801006031X

Reactions of 3-aryolpyrrolo[2,1-*c*][1,4]benzoxazine-1,2,4-triones with activated alkenes were not reported previously. We examined the reaction of 3-aryolpyrrolo[2,1-*c*][1,4]benzoxazine-1,2,4-triones **Ia** and **Ib** with alkyl vinyl ethers **IIa** and **IIb** at a ratio of 1:5 in boiling benzene (reaction time 30–60 min) and obtained representatives of a novel difficultly accessible bridged heterocyclic system, 16-alkoxy-14-aryl-3,15-dioxa-10-azatetracyclo[8.7.0.0^{1,13}.0^{4,9}]heptadeca-4,6,8,13-tetraene-2,11,12-triones **IIIa** and **IIIb**.

Ar = 4-BrC₆H₄ (**a**), Ph (**b**); Alk = Et (**a**), Bu (**b**).

Presumably, compounds **IIIa** and **IIIb** were formed via thermally induced [4+2]-cycloaddition involving the O=C–C³=C^{3a} conjugated bond system in 3-aryolpyrrolo[2,1-*c*][1,4]benzoxazine-1,2,4-triones **I** and polarized C=C bond in alkyl vinyl ethers **II**.

14-(4-Bromophenyl)-16-ethoxy-3,15-dioxa-10-azatetracyclo[8.7.0.0^{1,13}.0^{4,9}]heptadeca-4,6,8,13-tetraene-2,11,12-trione (IIIa**).** A solution of 5.0 mmol of ethyl vinyl ether (**IIa**) in 5 ml of anhydrous benzene was added to a solution of 1.0 mmol of compound **Ia**

in 60 ml of anhydrous benzene, and the mixture was heated under reflux until the original violet color disappeared (40 min). The mixture was then cooled, the solvent was removed, and the residue was recrystallized from toluene. Yield 74%, mp 238–240°C. IR spectrum, ν , cm^{–1}: 1794 (C²=O), 1728 (C¹¹=O, C¹²=O). ¹H NMR spectrum, δ , ppm: 1.11 t (3H, CH₃, *J* = 7.2 Hz), 2.38 m (2H, 17-H), 3.71 m (1H, OCH₂), 3.82 m (1H, OCH₂), 5.78 m (1H, CH), 7.32–7.87 m (8H, H_{arom}). Found, %: C 55.98; H 3.48; N 3.01. C₂₂H₁₆BrNO₆. Calculated, %: C 56.19; H 3.43; N 2.98.

16-Butoxy-14-phenyl-3,15-dioxa-10-azatetracyclo[8.7.0.0^{1,13}.0^{4,9}]heptadeca-4,6,8,13-tetraene-2,11,12-trione (IIIb**).** Yield 78%, mp 203–204°C. IR spectrum, ν , cm^{–1}: 1788 (C²=O), 1725 (C¹¹=O, C¹²=O). ¹H NMR spectrum, δ , ppm: 0.83 t (3H, CH₃, *J* = 7.3 Hz), 1.29 m (2H, CH₂Me), 1.46 m (2H, OCH₂CH₂), 2.40 t (2H, 17-H, *J* = 3.22 Hz), 3.67 m and 3.78 m (1H each, OCH₂), 5.77 m (1H, CH), 7.33–7.93 m (9H, H_{arom}). ¹³C NMR spectrum, δ , ppm: 13.57 (Me), 18.37 (CH₂Me), 30.92 (OCH₂CH₂), 38.88 (C¹⁷), 54.46 (OCH₂), 69.05 (C¹), 100.67 (C¹⁶), 102.81 (C¹³), 116.68–143.13 (C_{arom}), 159.17 (C¹¹), 160.72 (C²), 166.54 (C¹⁴), 175.91 (C¹²). Found, %: C 68.75; H 5.11; N 3.22. C₂₄H₂₁NO₆. Calculated, %: C 68.73; H 5.05; N 3.34.

The IR spectra were recorded on an FSM-1201 spectrometer from samples dispersed in mineral oil. The ¹H and ¹³C NMR spectra were measured on a Bruker AM-400 instrument at 400 and 100 MHz, respectively, using DMSO-*d*₆ as solvent and tetramethylsilane as internal reference. The purity of the products was checked by TLC on Silufol plates using benzene–ethyl acetate (5:1) as eluent.

This study was performed under financial support by the Russian Foundation for Basic Research (project no. 08-03-01032).