Molbank **2012**, M786; doi:10.3390/M786

OPEN ACCESS

molbank

ISSN 1422-8599

www.mdpi.com/journal/molbank

Short Note

4-{[(1-Phenyl-1*H*-pyrazol-3-yl)oxy]methyl}-1,3-dioxolan-2-one

Gytė Vilkauskaitė [1,2,*], Wolfgang Holzer [2] and Algirdas Šačkus [1]

[1] Institute of Synthetic Chemistry, Kaunas University of Technology, Radvilenu pl. 19, LT-50254 Kaunas, Lithuania

[2] Department of Drug and Natural Product Synthesis, Faculty of Life Sciences, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria

***** Author to whom correspondence should be addressed; E-Mail: gyte.vilkauskaite@ktu.lt

Received: 8 October 2012 / Accepted: 9 November 2012 / Published: 20 November 2012

Abstract: The title compound was obtained by the reaction of tosylated glycerol carbonate with 1-phenyl-1*H*-pyrazol-3-ol in a good 71% yield. Detailed spectroscopic data (^{1}H-NMR, ^{13}C-NMR, ^{15}N-NMR, IR, MS) are presented.

Keywords: 1*H*-pyrazol-3-ol; glycerol; tosylated glycerol 1,2-carbonate; alkylation

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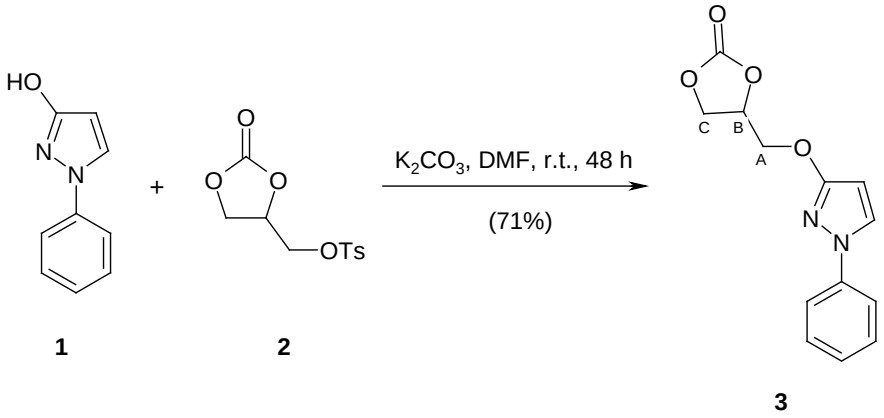
1-Phenylpyrazole derivatives are known to have a broad spectrum of biological activities [1–6]. Recently, 1-phenyl-1*H*-pyrazol-3-ol was used as a versatile synthon for the preparation of various (het)aryl- and carbo-functionally substituted pyrazole derivatives employing Pd-catalyzed cross-coupling reactions [7,8]. In the present work, functionalization of 1-phenyl-1*H*-pyrazol-3-ol with tosylated glycerol 1,2-carbonate (TGC) was investigated. TGC is relatively new and efficient reagent, which have found application as an initiator of cationic ring-opening polymerization [9] and as a versatile bis-electrophile to access new functionalized glycidol derivatives [10,11]. TGC can be easily obtained by tosylation of glycerol carbonate (4-(hydroxymethyl)-1,3-dioxan-2-one) [10], the latter is an industrial product of glycerol valorization [12].

It is known that TGC reacts with 4-methoxyphenol in DMF in the presence of K_2CO_3 to afford *O*-alkylated product, 4-(3-methoxyphenoxy)methyl-1,3-dioxolan-2-one, in only 41% yield [11], while 55% of the arylsulfanyl analogue is obtained in analogous conditions from *m*-methoxythiophenol [10]. The reaction of 1-phenyl-1*H*-pyrazol-3-ol **1** with TGC **2** was carried out in DMF in the presence of K_2CO_3 and gave chemoselectively 4-{[(1-phenyl-1*H*-pyrazol-3-yl)oxy]methyl}-1,3-dioxolan-2-one **3** in 71% isolated yield. The structure of compound **3** was confirmed by its spectroscopic data (^{1}H NMR, ^{13}C and ^{15}N NMR, IR, MS) as well as by elemental analysis.

Scheme 1. Synthesis of the title compound **3**.



Experimental

The melting point was determined on a Reichert–Kofler hot-stage microscope and is uncorrected. Mass spectrum: Shimadzu QP 1000 instrument (EI, 70 eV). IR spectrum: Perkin-Elmer FTIR Spectrum 1605 spectrophotometer (KBr-disc). The elemental analysis was performed at the Microanalytical Laboratory, University of Vienna. NMR spectra were recorded from $CDCl_3$ solutions on a Bruker Avance 500 instrument with a 'directly' detecting broadband observe probe (BBFO) at 298 K (500.13 MHz for ^{1}H, 125.76 MHz for ^{13}C, 50.68 MHz for ^{15}N). The centre of the solvent signal was used as an internal standard which was related to TMS with δ = 7.26 ppm (^{1}H in $CDCl_3$) and δ = 77.0 ppm (^{13}C in $CDCl_3$). The digital resolutions were 0.2 Hz/data point in the ^{1}H and 0.4 Hz/data point in the ^{1}H-coupled ^{13}C-NMR spectra (gated decoupling). The ^{15}N-NMR spectrum (gradient-selected ^{15}N, ^{1}H-HMBC) was referenced against external nitromethane.

4-{[(1-Phenyl-1H-pyrazol-3-yl)oxy]methyl}-1,3-dioxolan-2-one (**3**)

To a solution of 1-phenyl-1*H*-pyrazol-3-ol (**1**) (1.6 g, 1.0 mmol) in DMF (15 mL) K_2CO_3 (2.76 g, 2.0 mmol) and tosylate (**2**) (2.72 g, 1.0 mmol) were added. The mixture was stirred at r.t. for 48 h (TLC control, eluent: ethyl acetate–*n*-hexane, 1:2; R_f 0.25). Then, 50 mL of water were added and the mixture was extracted with 3 × 60 mL of ethyl acetate. The organic layers were combined, washed with brine, dried over anhydrous Na_2SO_4 and filtered. The solvent was evaporated under reduced pressure and the residue was purified by column chromatography (silica gel, eluent: ethyl acetate–*n*-hexane, 1:2) to give pure **3** as yellowish crystals, m.p. 95–96 °C. Yield: 1.86 g (71%).

IR (KBr) ν (cm^{-1}): 1786 (C=O), 1600, 1546, 1475, 1396, 1315, 1186, 1094, 989, 774, 751, 682.

MS (EI, 70 eV): (*m/z*, %) 260 (M^+, 29), 160 (93), 77 (100), 51 (35), 43 (20).

^{1}H-NMR ($CDCl_3$): δ (ppm) 4.48 (dd, 1H, $^2J(H_{1A},H_{2A})$ = 11.9 Hz, $^3J(H_{1A},H_B)$ = 4.0 Hz, H_{1A}), 4.51 (dd, 1H, $^2J(H_{1C},H_{2C})$ = 8.5 Hz, $^3J(H_B,H_{1C})$ = 6.1 Hz, H_{1C}), 4.54 (dd, 1H, $^2J(H_{1A},H_{2A})$ = 11.9 Hz, $^3J(H_{2A},H_B)$ = 3.9 Hz, H_{2A}), 4.60 (t, 1H, $^2J(H_{1C},H_{2C})$ = 8.5 Hz, $^3J(H_B,H_{2C})$ = 8.5 Hz, H_{2C}), 5.07 (dddd, 1H, $^3J(H_B,H_{2C})$ = 8.5 Hz, $^3J(H_B,H_{1C})$ = 6.1 Hz, $^3J(H_{1A},H_B)$ = 4.0 Hz, $^3J(H_{2A},H_B)$ = 3.9 Hz, H_B), 5.92 (d, 1H,

^{3}J(4-H,5-H) = 2.6 Hz, 4-H), 7.22 (m, 1H, Ph 4-H), 7.41 (m, 2H, Ph 3,5-H), 7.57 (m, 2H, Ph 2,6-H), 7.74 (d, 1H, ^{3}J(4-H,5-H) = 2.6 Hz, 5-H).

^{13}C-NMR ($CDCl_3$): δ (ppm) 66.1 (C_C), 67.4 (C_A), 74.2 (C_B), 93.9 (C-4, ^{1}J(C-4,4-H) = 180.6 Hz, ^{2}J(C-4,5-H) = 8.1 Hz), 117.8 (Ph C-2,6), 125.6 (Ph C-4), 128.2 (C-5, ^{1}J(C-5,5-H) = 187.0 Hz, ^{2}J(C-5,4-H) = 8.3 Hz), 129.4 (Ph C-3,5), 139.8 (Ph C-1), 154.7 (C=O), 163.3 (C-3, ^{2}J(C-3,4-H) = 2.2 Hz, ^{3}J(C-3,5-H) = 10.5 Hz, ^{3}J(C-3,OCH_2) = 2.2 Hz).

^{15}N-NMR ($CDCl_3$): δ (ppm) −185.5 (N-1), N-2 was not found.

Anal. Calcd for $C_{13}H_{12}N_2O_4$: C, 60.00%; H, 4.65%; N, 10.76%. Found: C, 59.78%; H, 4.50%; N, 10.74%.

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