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

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

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

1-Phenylpyrazole derivatives are known to have a broad spectrum of biological activities [1–6]. Recently, 1-phenyl-1H-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-1H-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 K2CO3 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-1H-pyrazol-3-ol 1 with TGC 2 was carried out in DMF in the presence of K2CO3 and gave chemoselectively 4-{{[(1-phenyl-1H-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 (1H NMR, 13C and 15N NMR, IR, MS) as well as by elemental analysis.

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\textsubscript{3} solutions on a Bruker Avance 500 instrument with a ‘directly’ detecting broadband observe probe (BBFO) at 298 K (500.13 MHz for \textsuperscript{1}H, 125.76 MHz for \textsuperscript{13}C, 50.68 MHz for \textsuperscript{15}N). The centre of the solvent signal was used as an internal standard which was related to TMS with \( \delta = 7.26 \text{ ppm} \) (\textsuperscript{1}H in CDCl\textsubscript{3}) and \( \delta = 77.0 \text{ ppm} \) (\textsuperscript{13}C in CDCl\textsubscript{3}). The digital resolutions were 0.2 Hz/data point in the \textsuperscript{1}H and 0.4 Hz/data point in the \textsuperscript{1}H-coupled \textsuperscript{13}C-NMR spectra (gated decoupling). The \textsuperscript{15}N-NMR spectrum (gradient-selected \textsuperscript{15}N, \textsuperscript{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-1H-pyrazol-3-ol (1) (1.6 g, 1.0 mmol) in DMF (15 mL) K\textsubscript{2}CO\textsubscript{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–\textit{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 \textit{Na}_2\textit{SO}_4 and filtered. The solvent was evaporated under reduced pressure and the residue was purified by column chromatography (silica gel, eluent: ethyl acetate–\textit{n}-hexane, 1:2) to give pure 3 as yellowish crystals, m.p. 95–96 °C. Yield: 1.86 g (71%).

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

MS (EI, 70 eV): (\textit{m}/\textit{z}, %) 260 (M\textsuperscript{+}, 29), 160 (93), 77 (100), 51 (35), 43 (20).

\(^{1}\text{H}-\text{NMR} \) (CDCl\textsubscript{3}): \( \delta \) (ppm) 4.48 (dd, 1H, \( ^{2}J(H_{1A},H_{2A}) = 11.9 \) Hz, \( ^{3}J(H_{1A},H_{B}) = 4.0 \) Hz, \( H_{1A} \)), 4.51 (dd, 1H, \( ^{2}J(H_{1C},H_{2C}) = 8.5 \) Hz, \( ^{3}J(H_{B},H_{1C}) = 6.1 \) Hz, \( H_{1C} \)), 4.54 (dd, 1H, \( ^{2}J(H_{1A},H_{2A}) = 11.9 \) Hz, \( ^{3}J(H_{2A},H_{B}) = 3.9 \) Hz, \( H_{2A} \)), 4.60 (t, 1H, \( ^{2}J(H_{1C},H_{2C}) = 8.5 \) Hz, \( ^{3}J(H_{B},H_{2C}) = 8.5 \) Hz, \( H_{2C} \)), 5.07 (ddddd, 1H, \( ^{3}J(H_{B},H_{2C}) = 8.5 \) Hz, \( ^{3}J(H_{B},H_{1C}) = 6.1 \) Hz, \( ^{3}J(H_{1A},H_{B}) = 4.0 \) Hz, \( ^{3}J(H_{2A},H_{B}) = 3.9 \) Hz, \( H_{B} \)), 5.92 (d, 1H,
$^{3}J(4\text{-}H,5\text{-}H) = 2.6\text{ Hz}, 4\text{-}H), 7.22 (m, 1H, Ph 4\text{-}H), 7.41 (m, 2H, Ph 3,5\text{-}H), 7.57 (m, 2H, Ph 2,6\text{-}H), 7.74 (d, 1H, $^{3}J(4\text{-}H,5\text{-}H) = 2.6\text{ Hz}, 5\text{-}H)$.

$^{13}$C-NMR (CDCl$_3$): $\delta$ (ppm) 66.1 (CC), 67.4 (CA), 74.2 (CB), 93.9 (C-4, $^{1}J(C\text{-}4,C\text{-}4) = 180.6\text{ Hz}, ^{2}J(C\text{-}4,C\text{-}5) = 8.1\text{ Hz}$), 117.8 (Ph C-2,6), 125.6 (Ph C-4), 128.2 (C-5, $^{1}J(C\text{-}5,C\text{-}5) = 187.0\text{ Hz}, ^{2}J(C\text{-}5,C\text{-}4) = 8.3\text{ Hz}$), 129.4 (Ph C-3,5), 139.8 (Ph C-1), 154.7 (C=O), 163.3 (C-3, $^{2}J(C\text{-}3,C\text{-}4) = 2.2\text{ Hz}, ^{3}J(C\text{-}3,C\text{-}5) = 10.5\text{ Hz}, ^{3}J(C\text{-}3,OCH$_2$) = 2.2\text{ Hz}$).

$^{15}$N-NMR (CDCl$_3$): $\delta$ (ppm) $-185.5$ (N-1), N-2 was not found.

Anal. Calcd for C$_{13}$H$_{12}$N$_2$O$_4$: C, 60.00%; H, 4.65%; N, 10.76%. Found: C, 59.78%; H, 4.50%; N, 10.74%.

References and Notes


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