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SYNTHESIS OF A NEW TETRACYCLIC CONDENSED SYSTEM: 7,8-DIHYDRO-6H-FURO[2',3':1,2]CYCLOHEPTA-[*c*]ISOQUINOLIN-8-ONE

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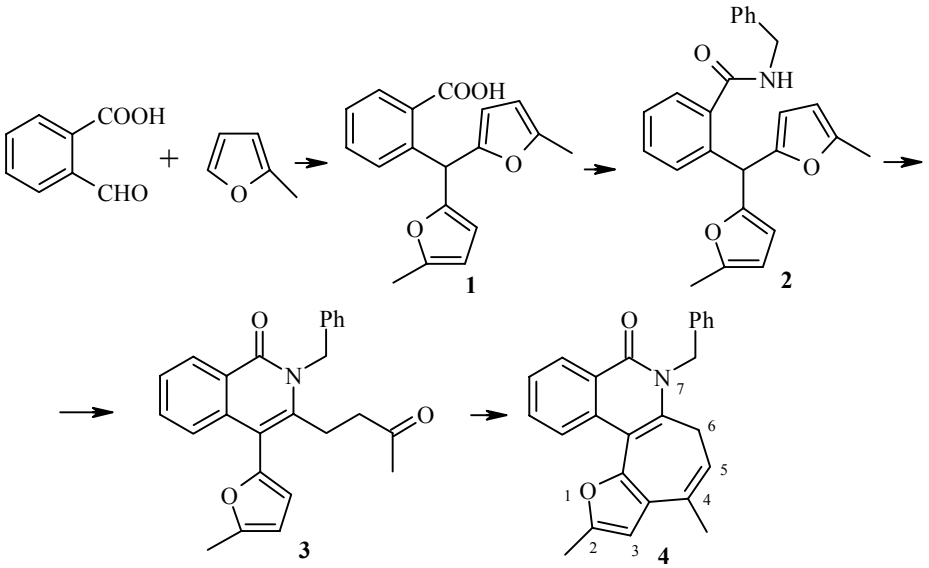
Furyl(aryl)methanes, containing a functional group in the *ortho* position of the aromatic ring, are an excellent source of benzannelated heterocycles. Thus carbazoles [1], indoles [2, 3], benzofurans [4], and cinnolines [5] have been obtained as a result of recyclization of the furan ring from the corresponding furyl(aryl)methanes.

Continuing our studies in this direction, by acid condensation of *ortho*-formylbenzoic acid and sylvan we obtained difuryl(aryl)methane (**1**), which was converted to the amide **2** on reaction with benzylamine.



When boiled in an ethanol solution of hydrogen chloride, the 2-hydroxyarylfurylmethanes and 2-(tosylamino)arylfurylmethanes undergo recyclization and are converted respectively to benzofurans [6, 7] and indoles [3]. With the goal of obtaining the ketone **3**, we treated compound **2** under similar conditions but did not

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achieve the desired result. The reaction does not stop in the stage of formation of isoquinoline **3**, but rather is accompanied by intramolecular cyclization and leads to the tetracyclic condensed system **4**, the structure of which has been confirmed by X-ray diffraction.

2-Bis(2-furyl-5-methyl)methylbenzoic Acid (1). 70% Perchloric acid (2 ml) was added to a solution of *o*-formylbenzoic acid (25 g, 0.17 mol) and sylvan (33 ml, 0.37 mol) in dioxane (50 ml), and allowed to stand overnight. The reaction mixture was poured into water (300 ml), the crystallized oil was fitered out, washed with water, and dried in air. Yield 27 g (54.8%); mp 145-146°C (benzene). IR spectrum (KBr), ν, cm^{-1}: 2900 (OH), 1700 (C=O). ^{1}H NMR spectrum (200 MHz, $CDCl_3$), δ, ppm, *J* (Hz): 2.22 (6H, s, Me); 5.86 (2H, d, *J* = 3.2, 3-H_{Fur}); 5.89 (2H, d, *J* = 3.2, 4-H_{Fur}); 6.68 (1H, s, CH); 7.30-7.39 (2H, m, H_{Ar}); 7.47-7.58 (1H, m, H_{Ar}); 8.03-8.12 (1H, m, H_{Ar}). Found, %: C 73.15; H 5.79; *m*/*z* = 296 $[M]^+$. $C_{18}H_{16}O_4$. Calculated, %: C 72.96; H 5.44.

N-Benzyl-2-[bis(2-furyl-5-methyl)methyl]benzamide (2). A solution of compound **1** (3.0 g, 10 mmol) in benzylamine (10 ml) was boiled under an air condenser for 24 h, cooled, and poured into a solution of 10% hydrochloric acid. The oily layer was extracted with benzene. The benzene layer was dried with anhydrous $CaCl_2$, filtered through a layer of silica gel, evaporated down, and allowed to stand to crystallize. Yield 3.0 g (76.9%); mp 97-98°C (benzene). IR spectrum (KBr), ν, cm^{-1}: 3260 (NH), 1680 (C=O). ^{1}H NMR spectrum (200 MHz, $CDCl_3$), δ, ppm, *J* (Hz): 2.20 (6H, s, Me); 4.57 (2H, d, *J* = 5.4, CH_2); 5.83 (4H, s, H_{Fur}); 5.97 (1H, s, CH); 6.14 (1H, t, *J* = 5.4, NH); 7.20-7.51 (9H, m, HAr). Found, %: C 78.13; H 6.24; N 3.51; *m*/*z* = 385 $[M]^+$. $C_{25}H_{23}NO_3$. Calculated, %: C 77.90; H 6.01; N 3.63.

7-Benzyl-2,4-dimethyl-7,8-dihydro-6H-furo[2',3':1,2]cyclohepta[*c*]isoquinolin-8-one (4). A solution of compound **2** (3.0 g, 7.8 mmol) in a 10 N solution of hydrogen chloride in ethanol (10 ml) was boiled for 30 min until a precipitate fell out of solution. The reaction mixture was cooled, the product was filtered off and recrystallized from 2-propanol. Yield 2 g (70%); mp 197-198°C. IR spectrum (KBr), ν, cm^{-1}: 1680 (C=O). ^{1}H NMR spectrum (200 MHz, $CDCl_3$), δ, ppm, *J* (Hz): 1.95 (3H, s, Me); 2.23-2.38 (1H, br. m, CH_2); 2.50 (3H, s, Me); 3.47-3.52 (1H, br. m, CH_2); 4.82-4.96 (1H, br. m, CH); 5.42-5.81 (1H, br. m, CH_2Ph); 6.26 (1H, s, H_{Fur}); 7.18-7.48 (5H, m, H_{Ph}); 7.44-7.55 (1H, m, H_{Ar}); 7.66-7.78 (1H, m, H_{Ar}); 8.42-8.49 (1H, m, H_{Ar}); 8.51-8.58 (1H, m, H_{Ar}). Found, %: C 81.53; H 5.89; N 4.01; *m*/*z* = 367 $[M]^+$. $C_{25}H_{21}NO_2$. Calculated, %: C 81.72; H 5.76; N 3.81.

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