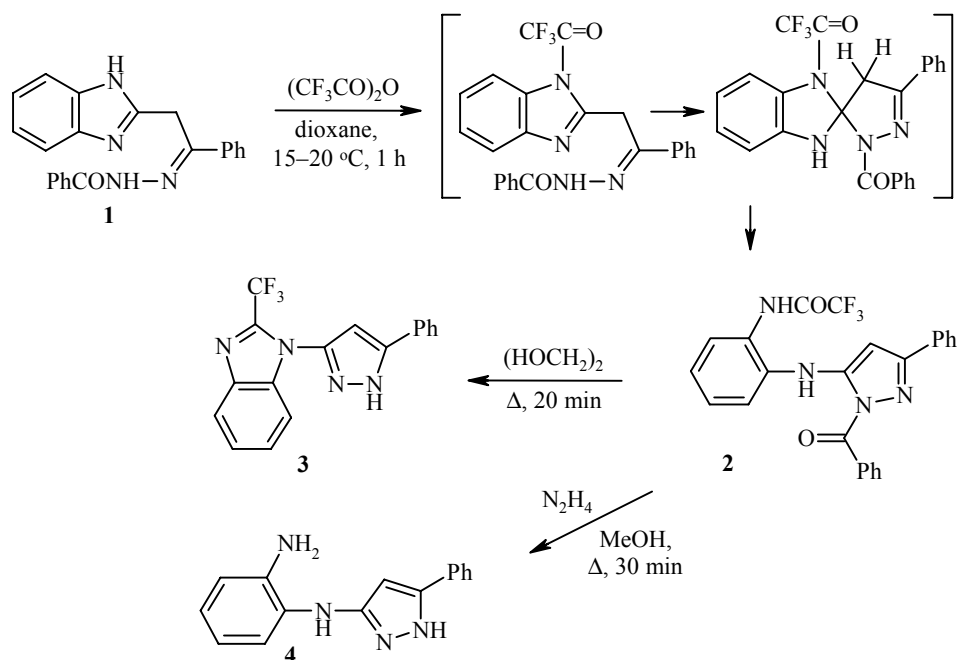


# RECYCLIZATION DURING TRIFLUOR- ACETYLATION OF 2-PHENACYL-1H- BENZIMIDAZOLE BENZOYLHYDRAZONE

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We have already shown that the acylation of arylhydrazones of 2-phenacyl-1H-benzimidazole by aroyl chlorides is directed at a heterocyclic nitrogen atom with recyclization to give 5-(2-acylaminoanilino)-1-arylpyrazoles [1]. Benzoylhydrazone **1**, which is a structural analog of the abovementioned arylhydrazones, reacts nonselectively with aroyl chlorides, according to our findings, to give product mixtures that prove difficult to separate into pure compounds. However, the reaction of **1** with trifluoroacetic anhydride has preparative value and proceeds with recyclization to give 1-benzoyl-5-[(2-trifluoroacetylaminophenyl)anilino]-3-phenylpyrazole (**2**). This reaction is not complicated by acylotropy in the pyrazole ring, which is characteristic for 5-anilino-1-benzoylpyrazoles [2].



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A necessary condition for recyclization is intramolecular addition of the benzoylamino group, which is a weak nucleophile, to the benzimidazole C=N bond. The electrophilicity of the C=N bond is enhanced to the required level by introducing the strongly electron-withdrawing trifluoroacetyl group at N<sub>(1)</sub>.

The structure of **2** was confirmed by two transformations. Heating in ethyleneglycol at reflux leads to alcoholysis of the benzoyl group and intramolecular cyclocondensation to give 1-(3-pyrazolyl)-2-trifluoromethylbenzimidazole **3**. Hydrazinolysis removes the benzoyl and trifluoroacetyl groups to give anilinopyrazole **4** described by Essai and Salem [3]. The spectral parameters of these compounds are in accord with the reported indices for their structural analogs [1, 2, 4] and the data of Essai [3].

**1-Benzoyl-3-phenyl-5-[(2-trifluoroacetylamino)anilino]pyrazole (2).** A sample of trifluoroacetic anhydride (6 mmol) was added to a solution of **1** (5 mmol) in anhydrous dioxane (2.5 ml). The mixture was stirred for 2-3 min until homogeneous and left for 1 h at 15-20°C. Then, 2-propanol (2.5 ml) and water (2.5 ml) were added with stirring. After 20 min, the precipitate was filtered off and washed with 2-propanol to give 1.30 g (58%) of compound **2** as yellow crystals; mp 161-162°C (2-propanol–water, 3:1). IR spectrum (KBr),  $\nu$ , cm<sup>-1</sup>: 1670, 1695 (C=O), 3285 (N–H). <sup>1</sup>H NMR spectrum (300 MHz, DMSO-d<sub>6</sub>, TMS as the internal standard),  $\delta$ , ppm (*J*, Hz): 6.70 (1H, s, 4-H); 7.20 (1H, t, *J* = 7.2, 4-H, 1,2-C<sub>6</sub>H<sub>4</sub>); 7.40-7.50 (5H, m, *m*- and *p*-protons Ph + 5- and 6-H 1,2-C<sub>6</sub>H<sub>4</sub>); 7.60 (2H, t, *J* = 7.8, *m*-protons C<sub>OPh</sub>); 7.71 (1H, t, *J* = 7.8, *p*-protons C<sub>OPh</sub>); 7.78 (1H, d, *J* = 7.2, 3-H 1,2-C<sub>6</sub>H<sub>4</sub>); 7.88-7.90 (2H, m, *o*-protons Ph); 8.10 (2H, d, *o*-protons C<sub>OPh</sub>); 9.51 (1H, s, NHHet); 11.33 (1H, s, NHCO). Found, %: C 64.12; H 3.97; F 12.79; N 12.38. C<sub>24</sub>H<sub>17</sub>F<sub>3</sub>N<sub>4</sub>O<sub>2</sub>. Calculated, %: C 64.00; H 3.80; F 12.65; N 12.44.

**1-(5-Phenyl-3-pyrazolyl)-2-trifluoromethyl-1H-benzimidazole (3).** A solution of **2** (2 mmol) in ethyleneglycol (2 ml) was heated at reflux for 20 min. Then, 2-propanol (0.5 ml) and water (0.5 ml) were added and stirred until the onset of crystallization. After cooling, the precipitate was filtered off and washed with 1:1 water–2-propanol to give 0.45 g (68%) of compound **3** as colorless crystals; mp 148-149.5°C (water–2-propanol, 3:1). <sup>1</sup>H NMR spectrum (300 MHz, DMSO-d<sub>6</sub>, TMS as the internal standard),  $\delta$ , ppm, *J* (Hz): 7.16 (1H, s, 4'-H); 7.42-7.56 (6H, m, 4-, 5-, 6-H + *p*- and *m*-protons Ph); 7.87 (2H, d, *J* = 7.5, *o*-protons Ph); 7.96 (1H, d, *J* = 6.3, 7-H); 13.96 (1H, s, NH). Found, %: C 62.32; H 3.47; F 17.28; N 16.95. C<sub>17</sub>H<sub>11</sub>F<sub>3</sub>N<sub>4</sub>. Calculated, %: C 62.20; H 3.38; F 17.36; N 17.07.

**3-(2-Aminoanilino)-5-phenylpyrazole (4).** A solution of **2** (2 mmol) and 80% hydrazine (18 mmol) hydrate in methanol (2 ml) was heated at reflux for 30 min. The solution was evaporated to half volume and an equal volume of water was added. The mixture was stirred. After cooling, the precipitate was filtered off and washed with 1:1 water–methanol to give 0.48 g (96%) of compound **4** as colorless crystals; mp 135-136.5°C (mp 142-144°C [3]). <sup>1</sup>H NMR spectrum (300 MHz, DMSO-d<sub>6</sub>, TMS as the internal standard),  $\delta$ , ppm, *J* (Hz): 4.78 (2H, br. s, NH<sub>2</sub>); 6.21 (1H, s, 4-H); 6.53 (1H, t, *J* = 7.8, 5-H 1,2-C<sub>6</sub>H<sub>4</sub>); 6.61-6.68 (2H, m, 3- and 4-H 1,2-C<sub>6</sub>H<sub>4</sub>); 6.12 (1H, s, NHHet); 7.30-7.45 (4H, m, *p*- and *m*-protons Ph + 6-H 1,2-C<sub>6</sub>H<sub>4</sub>); 7.72 (2H, d, *J* = 7.8, *o*-protons Ph); 12.38 (1H, br. s, 1-H).

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