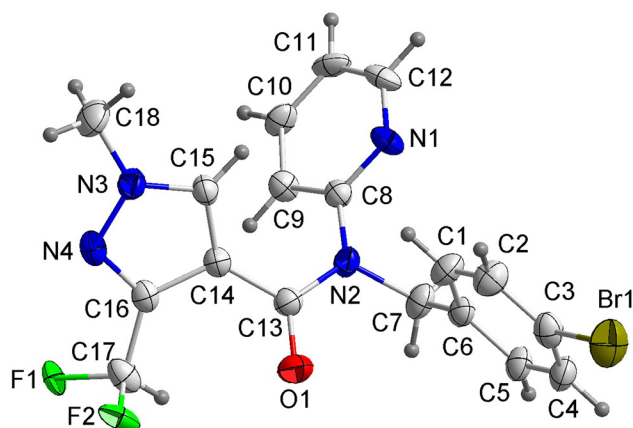


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# Crystal structure of *N*-(4-bromobenzyl)-3-(difluoromethyl)-1-methyl-*N*-(pyridin-2-yl)-1*H*-pyrazole-4-carboxamide, C<sub>18</sub>H<sub>15</sub>BrF<sub>2</sub>N<sub>4</sub>O



**Table 1:** Data collection and handling.

|                                                                            |                                                   |
|----------------------------------------------------------------------------|---------------------------------------------------|
| Crystal:                                                                   | Colorless block                                   |
| Size:                                                                      | 0.20 × 0.15 × 0.14 mm                             |
| Wavelength:                                                                | Mo K $\alpha$ radiation (0.71073 Å)               |
| $\mu$ :                                                                    | 2.29 mm <sup>-1</sup>                             |
| Diffractometer, scan mode:                                                 | Bruker APEX-II, $\varphi$ and $\omega$            |
| $\theta_{\max}$ , completeness:                                            | 25.5°, >99 %                                      |
| $N(hkl)_{\text{measured}}$ , $N(hkl)_{\text{unique}}$ , $R_{\text{int}}$ : | 13,255, 3390, 0.045                               |
| Criterion for $I_{\text{obs}}$ , $N(hkl)_{\text{gt}}$ :                    | $I_{\text{obs}} > 2\sigma(I_{\text{obs}})$ , 2181 |
| $N(\text{param})_{\text{refined}}$ :                                       | 237                                               |
| Programs:                                                                  | Bruker [1], SHELX [2, 3], Diamond [4]             |

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## Abstract

C<sub>18</sub>H<sub>15</sub>BrF<sub>2</sub>N<sub>4</sub>O, monoclinic, *C*2/*c* (no. 15),  $a = 22.984(4)$  Å,  $b = 10.0726(16)$  Å,  $c = 16.551(3)$  Å,  $\beta = 107.972(2)^\circ$ ,  $V = 3644.8(10)$  Å<sup>3</sup>,  $Z = 8$ ,  $R_{\text{gt}}(F) = 0.0412$ ,  $wR_{\text{ref}}(F^2) = 0.1051$ ,  $T = 296(2)$  K.

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The molecular structure is shown in the figure. Table 1 contains crystallographic data and Table 2 contains the list of the atoms including atomic coordinates and displacement parameters.

## 1 Source of materials

3-(Difluoromethyl)-1-methyl-1*H*-pyrazole-4-carboxylic acid (1.76 g, 10.0 mmol), thionyl chloride (30.0 mmol) and *N,N*-dimethylformamide (0.5 mL) were reacted at 95 °C for 4 h. At the end of the reaction, the excess thionyl chloride was distilled away to obtain 3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carbonyl chloride, which was dissolved in dichloromethane solution (30.0 mL). Then, *N*-(4-bromobenzyl)pyridin-2-amine (2.62 g, 10.0 mmol), triethylamine (2.02 g, 20.0 mmol) and dichloromethane (30.0 mL) were added into 100 mL single neck bottle, cooled to 0 °C, and the dichloromethane solution of 3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carbonyl chloride parts was slowly added under stirring conditions. After addition, the reaction solution was stirred at room temperature for 6 h, and the reaction was monitored by thin-layer chromatography (TLC). After the reaction is over, silica gel was added and fully mixed. Column chromatography ( $V[\text{petroleum ether}]:V[\text{ethyl acetate}] = 1:2$ ) was used to elute and purify the final product *N*-(4-bromobenzyl)-3-(difluoromethyl)-1-methyl-*N*-(pyridin-2-yl)-1*H*-pyrazole-

**Table 2:** Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å<sup>2</sup>).

| Atom | <i>x</i>     | <i>y</i>    | <i>z</i>     | <i>U</i> <sub>iso</sub> */ <i>U</i> <sub>eq</sub> |
|------|--------------|-------------|--------------|---------------------------------------------------|
| C1   | 0.16762 (15) | 0.7552 (3)  | 0.28637 (19) | 0.0601 (8)                                        |
| H1   | 0.1951       | 0.7739      | 0.3395       | 0.072*                                            |
| C2   | 0.11871 (16) | 0.8397 (3)  | 0.2521 (2)   | 0.0648 (9)                                        |
| H2   | 0.1133       | 0.9147      | 0.2817       | 0.078*                                            |
| C3   | 0.07848 (14) | 0.8111 (3)  | 0.1739 (2)   | 0.0579 (8)                                        |
| C4   | 0.08649 (14) | 0.7021 (3)  | 0.1292 (2)   | 0.0599 (8)                                        |
| H4   | 0.0592       | 0.6839      | 0.0758       | 0.072*                                            |
| C5   | 0.13554 (14) | 0.6198 (3)  | 0.16443 (19) | 0.0535 (8)                                        |
| H5   | 0.1412       | 0.5459      | 0.1340       | 0.064*                                            |
| C6   | 0.17631 (13) | 0.6437 (3)  | 0.24321 (17) | 0.0464 (7)                                        |
| C7   | 0.22571 (14) | 0.5432 (3)  | 0.2794 (2)   | 0.0577 (8)                                        |
| H7A  | 0.2078       | 0.4671      | 0.2988       | 0.069*                                            |
| H7B  | 0.2415       | 0.5132      | 0.2346       | 0.069*                                            |
| C8   | 0.28921 (13) | 0.5241 (3)  | 0.42894 (18) | 0.0437 (7)                                        |
| N1   | 0.24392 (14) | 0.5203 (3)  | 0.4606 (2)   | 0.0771 (9)                                        |
| C12  | 0.2534 (3)   | 0.4499 (5)  | 0.5317 (4)   | 0.1080 (16)                                       |
| H12  | 0.2216       | 0.4449      | 0.5552       | 0.130*                                            |
| C11  | 0.3057 (3)   | 0.3854 (5)  | 0.5722 (3)   | 0.1023 (16)                                       |
| H11  | 0.3096       | 0.3378      | 0.6217       | 0.123*                                            |
| C10  | 0.3519 (2)   | 0.3918 (4)  | 0.5391 (3)   | 0.0928 (13)                                       |
| H10  | 0.3888       | 0.3496      | 0.5659       | 0.111*                                            |
| C13  | 0.31674 (13) | 0.6772 (3)  | 0.33157 (18) | 0.0482 (7)                                        |
| C14  | 0.36331 (12) | 0.7445 (3)  | 0.40087 (17) | 0.0434 (7)                                        |
| C15  | 0.36056 (13) | 0.7901 (3)  | 0.47766 (18) | 0.0484 (7)                                        |
| H15  | 0.3289       | 0.7757      | 0.5005       | 0.058*                                            |
| C16  | 0.41965 (12) | 0.7925 (3)  | 0.39641 (18) | 0.0456 (7)                                        |
| C17  | 0.44625 (15) | 0.7774 (3)  | 0.3256 (2)   | 0.0614 (9)                                        |
| H17  | 0.4282       | 0.7004      | 0.2905       | 0.074*                                            |
| C18  | 0.42850 (17) | 0.9286 (4)  | 0.5948 (2)   | 0.0778 (11)                                       |
| H18A | 0.3922       | 0.9602      | 0.6057       | 0.117*                                            |
| H18B | 0.4544       | 1.0025      | 0.5929       | 0.117*                                            |
| H18C | 0.4499       | 0.8690      | 0.6392       | 0.117*                                            |
| F1   | 0.50773 (9)  | 0.7643 (2)  | 0.35612 (14) | 0.0866 (6)                                        |
| F2   | 0.43681 (12) | 0.8889 (2)  | 0.27754 (16) | 0.1063 (9)                                        |
| C9   | 0.34422 (16) | 0.4614 (3)  | 0.4654 (2)   | 0.0661 (9)                                        |
| H9   | 0.3754       | 0.4661      | 0.4406       | 0.079*                                            |
| N2   | 0.27710 (11) | 0.5923 (2)  | 0.35049 (14) | 0.0478 (6)                                        |
| N3   | 0.41167 (11) | 0.8591 (3)  | 0.51367 (15) | 0.0522 (6)                                        |
| N4   | 0.44917 (11) | 0.8612 (3)  | 0.46532 (17) | 0.0540 (6)                                        |
| O1   | 0.31226 (11) | 0.7041 (2)  | 0.25761 (14) | 0.0727 (7)                                        |
| Br1  | 0.01111 (2)  | 0.92581 (4) | 0.12561 (3)  | 0.0921 (2)                                        |

4-carboxamide (1.46 g), which was a light yellow solid with a yield of 58.0 %.

## 2 Experimental details

All H atoms were included in calculated positions and refined as riding atoms, with C–H = 0.90–0.97 Å with  $U_{\text{iso}}(\text{H}) = 1.5 U_{\text{eq}}(\text{C})$  for methyl H atoms and  $1.2 U_{\text{eq}}(\text{C})$  for all other H atoms.

## 3 Comment

Nitrogen-containing heterocyclic compounds have gained significant attention as crucial intermediates in the synthesis of numerous pharmaceutical drugs [5, 6]. Pyrazole amides, as a significant class of nitrogen-containing heterocyclic compounds, serve as fundamental structural frameworks for numerous drug molecules [7, 8]. They encompass a wide range of pharmacological effects, making them vital in the fields of pesticides and medicine [9, 10]. Therefore, in recent years, the synthesis of pyrazole amide compounds and the investigation of their biological activity have garnered increasing attention from the scientific community. For instance, Zhong et al. have designed and synthesized 36 novel pyridine ring pyrazolamide derivatives with the help of active substructure splicing strategy [11]. Zhong et al. also have reported the structure of 3-(difluoromethyl)-1-methyl-N-(4, 11, 11-trimethyl-1, 2, 3, 4-tetrahydro-1,4-tetrahydro-1,4-methanoacridin-9-yl)-1H-pyrazole-4-carboxamide monohydrate [12]. These reports are all based on amide compounds formed by carboxylic acids and bases, which show different pharmacological effects through different substituents. N-(4-bromobenzyl)-3-(difluoromethyl)-1-methyl-N-(pyridin-2-yl)-1H-pyrazole-4-carboxamide was synthesized by us from 3-(difluoromethyl)-1-methyl-1H-pyrazole-4-carbonyl chloride and N-(4-bromobenzyl)pyridin-2-amine.

In the molecule of the title compound, bond lengths and angles are very similar to those given in the literature [11–13]. The dihedral angles of the C1–C6 phenyl plane, the pyrazole ring and the pyridine ring plane were 69.3(1)°, 66.3(1)° and 67.3(1)°, respectively. The torsion angles of C5–C6–C7–N2, C6–C7–N2–C8, C6–C7–N2–C13, C7–N2–C13–O1, C7–N2–C13–C14, and N2–C13–C14–C15 are 163.8(3)°, 120.8(3)°, –73.6(3)°, –5.1(4)°, 170.9(3)° and 38.6(4)°, respectively. There are still some weak C–H⋯N, C–H⋯O and C–H⋯F hydrogen bonds in the stacking structure of molecules.

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**Conflict of interest statement:** The authors declare no conflicts of interest regarding this article.

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