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The crystal structure of 3-(1-fluoro-2-(naphthalen-2-yl)-2-oxoethyl)-2-methoxy-3,4-dihydroisoquinolin-1(2*H*)-one, $C_{22}H_{18}FNO_3$

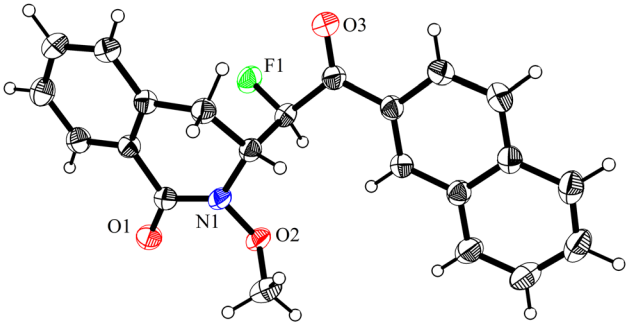

Table 1: Data collection and handling.

Crystal:	Clear light white plate
Size:	0.20 × 0.03 × 0.01 mm
Wavelength:	Cu *K*α radiation (1.54184 Å)
μ:	0.82 mm^{-1}
Diffractometer, scan mode:	Rigaku Synergy, ω scans
θ_{max}, completeness:	78.6°, 100 %
$N(hkl)_{measured}$, $N(hkl)_{unique}$, R_{int}:	11495, 3518, 0.029
Criterion for I_{obs}, $N(hkl)_{gt}$:	$I_{obs} > 2\ \sigma(I_{obs})$, 2967
$N(param)_{refined}$:	245
Programs:	Bruker,[1] Shelx,[2] Olex2[3]

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Abstract

$C_{22}H_{18}FNO_3$, monoclinic, $P2_1/n$, (no. 14), a = 11.0201(3) Å, b = 7.3436(2) Å, c = 21.6386(6) Å, β = 94.376(2)°, V = 1746.05(8) Å^3, Z = 4, $R_{gt}(F)$ = 0.0391, $wR_{ref}(F^2)$ = 0.1090, T = 213 K.

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The molecular structure is shown in the figure. Table 1 contains the crystallographic data and the list of the atoms including atomic coordinates and displacement parameters can be found in the cif-file attached to this article.

1 Source of materials

N-Methoxybenzamide (30.2 mg, 0.2 mmol), 2,2-difluoro-1-(naphthalen-2-yl) but-3-en-1-one (69.6 mg, 0.3 mmol), Rh cat. (8.3 mg, 5 mol%), sodium dihydrogenphosphate (31.2 mg, 0.2 mmol), and MeOH (2 mL) were placed in a 10 mL glass tube. The mixture was stirred at 50 °C. After 24 h the mixture was concentrated *in vacuo*. The residue was purified through flash chromatography. Finally, the crude product was recrystallized from dichloromethane and hexane (2 mL/4 mL). Clear light white plate, yield 80.2 %.

2 Experimental details

The SHELXL[2] refinement package was employed to refine the crystal structure. The Olex2[3] was used to visualize the crystal structure. All hydrogen atoms were placed in idealized positions. Their U_{iso} values were set to 1.2U_{eq} of the parent atoms.

3 Comment

Fluorine chemistry is widely prevalent in the fields of organic chemistry and pharmaceutical chemistry. The introduction of fluorine atoms or fluorine-containing groups into biologically active compounds often alters their biological activity and physicochemical properties.[4,5] This unique characteristic of fluorine means that introducing fluorine atoms or fluorine-containing groups into molecular structures can significantly alter relevant molecular properties, including physical, chemical, and biological characteristics.[6] There are two main basic strategies for forming C–F bonds in organic fluorine compounds: fluorination and building block methods.[7] In addition, dihydroisoquinolinone

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series compounds exhibit numerous important biological activities such as antimalarial,[8] antitussive,[9] and anti-parkinsonian properties,[10] and so on. We have enriched the library of fluorine-containing compounds by using a rhodium-catalyzed fluorine-modification method for the synthesis of dihydroisoquinoline derivatives.

In this study, the crystal structure was determined to gain a better understanding of its molecular conformation and intermolecular interactions. The title molecule, is shown in the figure. The bond distance of F1–C11 is 1.3926(15) Å. The bond lengths of O1–C1, O2–N1 and O3–C12 are 1.2284(16), 1.4025(14) and 1.2113(17) Å. The N1–O2–C10, and O2–N1–C9 angles are 110.32(11) and 112.69°, respectively, while those for C1–N1–C9 is 127.67(11)°. All of the hydrogen atoms were placed in the calculated positions. The bond lengths and angles within the molecule are within the expected ranges, indicating a well-ordered structure.[11,12]

Author contribution: All the authors have accepted responsibility for the entire content of this submitted manuscript and approved submission.

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

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References

1. Meyer, M., Paciorek, W., Kowalski, A., Muszynski, A., Wisniewski, A., Pol M., Przewozniczek, M. *CrysAlis^{PRO} Software System*, *Version 1.171.42.94a*; Rigaku Oxford Diffraction, Rigaku Corporation: Wroclaw, 2023.
2. Sheldrick, G. M. Crystal Structure Refinement with SHELXL. *Acta Crystallogr.* **2015**, *C71*, 3–8.
3. Dolomanov, O. V.; Bourhis, L. J.; Gildea, R. J.; Howard, J. A. K.; Puschmann, H. OLEX2: A Complete Structure Solution, Refinement and Analysis Program. *J. Appl. Cryst.* **2009**, *42*, 339–341.
4. Wang, X. Y.; Wang, X.; Wang, J. B. Application of Carbene Chemistry in the Synthesis of Organofluorine Compounds. *Tetrahedron* **2019**, *75*, 949–964.
5. Hu, J. B.; Ding, K. l. Organofluorine Chemistry: A Unique and Useful Research Frontier of Chemistry. *Acta Chimica Sinica* **2018**, *76*, 905–906.
6. Wilkinson, J. A. Recent Advances in the Selective Formation of the Carbon-Fluorine Bond. *Chem. Rev.* **1992**, *92*, 505–519.
7. Hyla-Kryspin, I.; Haufe, G.; Grimme, S. Weak Hydrogen Bridges. A Systematic Theoretical Studyon the Nature and Strength of C–H F–C Interactions. *Chem. A Eur J.* **2004**, *10*, 3411–3422.
8. Liu, J.; Wang, Z.; Levin, T. A.; Emge, T. J.; Rablen, P. R.; Floyd, D. M.; Knapp, S. N-Methylimidazole Promotes the Reaction of Homophthalic Anhydride with Imines. *J. Org. Chem.* **2014**, *79*, 7593–7599.
9. Kumar, I.; Thakur, A.; Sharma, U. *α*-Oxygenation of N-Aryl/Alkyl Heterocyclic Compounds via Ruthenium Photocatalysis. *React. Chem. Eng.* **2021**, *6*, 2087–2091.
10. Lorenc Koci, E.; Sokolowska, M.; Kwiecien', I.; Wlodek, L. Treatment with 1,2,3,4-Tetrahydroisoquinolone Affects the Levels of Nitric Oxide, S-Nitrosothiols, Glutathione and the Enzymatic Activity of Gamma-Glutamyl Transpeptidase in the Dopaminergic Structures of Rat Brain. *Brain Res.* **2005**, *1049*, 133–146.
11. Ye, Y. S.; Laverny, A.; Wodrich, M. D.; Laplaza, R.; Fadaei–Tirani, F.; Scopelliti, R.; Corminboeuf, C.; Cramer, N. Enantiospecific Synthesis of Planar Chiral Rhodium and Iridium Cyclopentadienyl Complexes: Enabling Streamlined and Computer-Guided Access to Highly Selective Catalysts for Asymmetric C–C;H Functionalizations. *J. Am. Chem. Soc.* **2024**; https://doi.org/10.1021/jacs.4c13279.
12. Samipillai, M.; Govender, T.; Kruger, H. G.; Tricia, N. Crystal Structure of (S)-benzyl 3-(benzylcarba-moyl)-3,4-dihydroisoquinoline-2(1*H*)-carboxylate. *Z. Kristallogr. - N. Cryst. Struct.* **2017**, *232*, 425–426.