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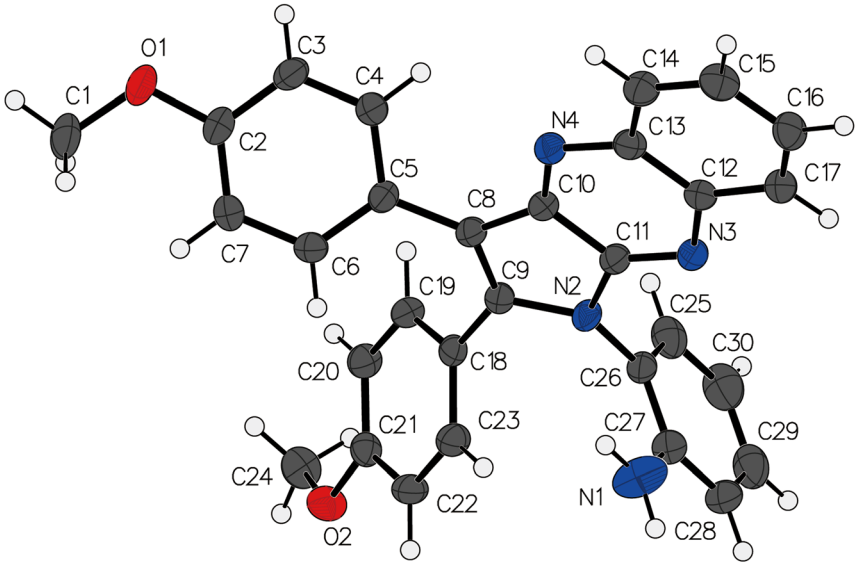
Crystal structure of 2-(2,3-bis(4-methoxyphenyl)-1*H*-pyrrolo[2,3-*b*]quinoxalin-1-yl)anilin, $C_{30}H_{24}N_4O_2$



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Abstract

$C_{30}H_{24}N_4O_2$, triclinic, $P\bar{1}$ (no. 2), a = 8.7813(5) Å, b = 12.2074(7) Å, c = 12.7561(7) Å, α = 112.071(2)°, β = 106.856(2)°, γ = 92.265(2)°, V = 1,195.65(12) Å^3, Z = 2, $R_{gt}(F)$ = 0.0586, w$R_{ref}(F^2)$ = 0.1534, T = 170 K.

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Table 1 contains crystallographic data and Table 2 contains the list of the atoms including atomic coordinates and displacement parameters.

Table 1: Data collection and handling.

Crystal:	Colourless block
Size:	0.12 × 0.06 × 0.05 mm
Wavelength:	Mo *K*α radiation (0.71073 Å)
μ:	0.08 mm^{-1}
Diffractometer, scan mode:	Bruker APEX-II, φ and ω
θ_{max}, completeness:	26.4°, 99 %
$N(hkl)_{measured}$, $N(hkl)_{unique}$, R_{int}:	13,892, 4,848, 0.043
Criterion for I_{obs}, $N(hkl)_{gt}$:	$I_{obs} > 2\sigma(I_{obs})$, 3,536
N(param)$_{refined}$:	315
Programs:	Bruker,[1] SHELX,[2,3] Olex2[4]

1 Source of materials

To a solution of 3,4-bis(4-methoxyphenyl)cyclobut-3-ene-1,2-dione (2.94 g, 10 mmol) and benzene-1,2-diamine (2.38 g, 22 mmol) in dimethyl sulfoxide (20 mL) was added potassium hydroxide (1.68 g, 30 mmol) and copper powder (32 mg, 0.5 mmol). The mixture was stirred at 120 °C for 12 h, until the TLC indicated the reaction was completed. The mixture was diluted with brine (30 mL), and then extracted with ethyl acetate (3 × 30 mL). The organic phase was washed with brine (30 mL), dried with anhydrous sodium sulphate, and then concentrated under pressure. The title compound was separated by silica-gel column chromatography with

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Table 2: Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å^2).

Atom	*x*	*y*	*z*	U_{iso}*/U_{eq}
C1	0.1689 (3)	0.4226 (2)	−0.0378 (2)	0.0423 (7)
H1C	0.119980	0.447877	−0.102694	0.063*
H1D	0.097207	0.429042	0.009757	0.063*
H1E	0.185255	0.339260	−0.071944	0.063*
C2	0.4062 (3)	0.4748 (2)	0.1329 (2)	0.0288 (5)
C3	0.5553 (3)	0.5477 (2)	0.2025 (2)	0.0341 (6)
H3	0.591757	0.608937	0.182217	0.041*
C4	0.6502 (3)	0.5315 (2)	0.3006 (2)	0.0313 (5)
H4	0.751833	0.581853	0.347244	0.038*
C5	0.5997 (3)	0.44235 (19)	0.33293 (19)	0.0247 (5)
C6	0.4500 (3)	0.3709 (2)	0.2630 (2)	0.0266 (5)
H6	0.412624	0.310291	0.283672	0.032*
C7	0.3537 (3)	0.3861 (2)	0.1632 (2)	0.0278 (5)
H7	0.252183	0.335680	0.116005	0.033*
C8	0.7040 (3)	0.42839 (19)	0.43949 (19)	0.0248 (5)
C9	0.7231 (3)	0.32409 (19)	0.45627 (19)	0.0250 (5)
C10	0.7993 (3)	0.52440 (19)	0.5501 (2)	0.0244 (5)
C11	0.8762 (3)	0.47160 (19)	0.6313 (2)	0.0250 (5)
C12	0.9936 (3)	0.6516 (2)	0.7769 (2)	0.0266 (5)
C13	0.9132 (3)	0.70698 (19)	0.7009 (2)	0.0257 (5)
C14	0.9308 (3)	0.8330 (2)	0.7472 (2)	0.0308 (5)
H14	0.876276	0.870829	0.697735	0.037*
C15	1.0254 (3)	0.9013 (2)	0.8626 (2)	0.0339 (6)
H15	1.035731	0.986222	0.892866	0.041*
C16	1.1077 (3)	0.8467 (2)	0.9371 (2)	0.0337 (6)
H16	1.174275	0.895119	1.016887	0.040*
C17	1.0925 (3)	0.7246 (2)	0.8954 (2)	0.0297 (5)
H17	1.148791	0.688707	0.946224	0.036*
C18	0.6509 (3)	0.1996 (2)	0.3751 (2)	0.0249 (5)
C19	0.6641 (3)	0.1507 (2)	0.2613 (2)	0.0275 (5)
H19	0.719063	0.199304	0.235867	0.033*
C20	0.5989 (3)	0.0325 (2)	0.1841 (2)	0.0293 (5)
H20	0.609535	0.000436	0.106660	0.035*
C21	0.5180 (3)	−0.03888 (19)	0.2205 (2)	0.0276 (5)
C22	0.5011 (3)	0.0091 (2)	0.3331 (2)	0.0324 (6)
H22	0.443845	−0.039139	0.357538	0.039*
C23	0.5674 (3)	0.1267 (2)	0.4097 (2)	0.0312 (5)
H23	0.556141	0.158604	0.486942	0.037*
C24	0.5021 (3)	−0.2179 (2)	0.0505 (2)	0.0371 (6)
H24A	0.462467	−0.184873	−0.009549	0.056*
H24B	0.458282	−0.303655	0.015691	0.056*
H24C	0.620275	−0.206822	0.076296	0.056*
C25	1.02230 (19)	0.21448 (14)	0.57623 (14)	0.0383 (6)
H25	1.056822	0.236017	0.521514	0.046*
C26	0.89901 (18)	0.26484 (13)	0.61519 (14)	0.0280 (5)
C27	0.84850 (18)	0.23332 (14)	0.69525 (14)	0.0348 (6)
C28	0.9213 (2)	0.15145 (15)	0.73635 (14)	0.0424 (6)
H28	0.886752	0.129913	0.791061	0.051*
C29	1.0446 (2)	0.10109 (14)	0.69738 (17)	0.0478 (7)
H29	1.094303	0.045135	0.725470	0.057*
C30	1.09507 (18)	0.13261 (15)	0.61733 (17)	0.0474 (7)
H30	1.179337	0.098187	0.590697	0.057*
N1	0.7232 (3)	0.2803 (2)	0.7291 (2)	0.0561 (7)
H1A	0.687663	0.258825	0.777503	0.067*
H1B	0.678062	0.332083	0.702537	0.067*
N2	0.8273 (2)	0.34932 (16)	0.57284 (16)	0.0265 (4)
N3	0.9740 (2)	0.52937 (16)	0.74079 (17)	0.0274 (4)
N4	0.8169 (2)	0.64207 (16)	0.58424 (17)	0.0264 (4)
O1	0.3208 (2)	0.49790 (16)	0.03709 (15)	0.0394 (4)
O2	0.4515 (2)	−0.15715 (14)	0.15169 (15)	0.0345 (4)

methanol – dichloromethane (5 %) gradient solvent system. The target product was obtained as a light red solid. Yield: 68 %. For crystal growth, the product was dissolved in a minimal amount of hot ethanol and slowly cooled to room temperature.

2 Experimental details

Single crystals were obtained by slow evaporation from a solvent mixture. Data collection was performed on a Bruker D8 Venture diffractometer with MoKα radiation (λ = 0.71073 Å).[1] The structure was solved by Direct Methods and refined using SHELX-2014.[2–4] All non-hydrogen atoms were refined anisotropically, and hydrogen atoms were placed in calculated positions and refined using a riding model.

3 Comment

The previous research has demonstrated that pyrrolo[3,2-b]quinoxaline derivatives exhibit low nanomolar affinity towards Eph kinases *in vitro* and display excellent selectivity within a panel of 453 human kinases (395 non-mutant).[5] To date, only a limited number of crystal structures of pyrrolo[3,2-b]quinoxaline derivatives have been reported.[6–9] Exploring the crystal structures of pyrrolo[3,2-b]quinoxaline derivatives is crucial for the development of novel therapeutics.

As illustrated in the compound under study, two anisole groups substitute the hydrogen atoms on the C atoms of the pyrrolo[3,2-b]quinoxaline heterocyclic ring, with methoxy groups positioned para. An aniline group replaces the hydrogen atom on the N atom of the pyrrolo[3,2-b]quinoxaline heterocyclic ring, with the amino group located ortho on the benzene ring. The framework atoms of the pyrrolo[3,2-b]quinoxaline moiety are nearly coplanar, consistent with previously reported crystal structures of pyrrolo[3,2-b]quinoxaline derivatives.[10–12] The two anisole

and one aniline groups show deviations relative to the pyrrolo[3,2-b]quinoxaline plane, with dihedral angles measured at 37.0°, 55.4°, and 80.1°, respectively.

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

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