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Crystal structure of (*E*)-*N*-(2-(benzylamino)-2-oxo-1-(4-oxo-4*H*-chromen-3-yl)ethyl)-*N*-(4-bromophenyl)-3-chloroacrylamide hydrate, $C_{27}H_{22}BrClN_2O_5$

Table 1: Data collection and handling.

Crystal:	Colourless block
Size:	0.35 × 0.30 × 0.25 mm
Wavelength:	Mo K α radiation (0.71073 Å)
μ :	1.72 mm ⁻¹
Diffractometer, scan mode:	Super Nova, ω
$\theta_{\max}$, completeness:	26.4°, >99%
$N(hkl)_{\text{measured}}$, $N(hkl)_{\text{unique}}$, R_{int} :	10514, 5316, 0.040
Criterion for I_{obs} , $N(hkl)_{\text{gt}}$:	$I_{\text{obs}} > 2 \sigma(I_{\text{obs}})$, 3325
$N(\text{param})_{\text{refined}}$:	337
Programs:	Olex2 [1], SHELX [2]

Table 2: Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å²).

Atom	x	y	z	$U_{\text{iso}}^*/U_{\text{eq}}$
Br1	0.14653(9)	0.99459(6)	0.60388(5)	0.0998(3)
Cl1	0.73865(19)	1.00239(11)	1.05188(10)	0.0761(4)
O1	0.5960(4)	0.6003(3)	0.55076(18)	0.0546(8)
O2	1.1004(4)	0.6530(3)	0.6687(2)	0.0657(10)
O3	0.4406(4)	0.5593(2)	0.8475(2)	0.0539(8)
O4	0.8641(4)	0.6982(2)	0.94801(19)	0.0540(8)
N1	0.7019(4)	0.7309(2)	0.8204(2)	0.0365(7)
N2	0.7094(5)	0.4694(2)	0.8799(2)	0.0400(8)
H2	0.830(6)	0.471(3)	0.882(3)	0.041(11)*
C1	0.7684(6)	0.6133(3)	0.4946(3)	0.0442(10)
C2	0.7578(7)	0.6064(4)	0.3996(3)	0.0588(12)
H2A	0.6387	0.5937	0.3763	0.071*
C3	0.9245(8)	0.6184(4)	0.3407(3)	0.0667(14)
H3	0.9189	0.6130	0.2768	0.080*
C4	1.1020(7)	0.6386(4)	0.3747(3)	0.0669(14)
H4	1.2144	0.6472	0.3336	0.080*
C5	1.1124(6)	0.6457(4)	0.4686(3)	0.0568(12)
H5	1.2318	0.6595	0.4912	0.068*
C6	0.9432(6)	0.6325(3)	0.5311(3)	0.0412(9)
C7	0.9495(5)	0.6372(3)	0.6321(3)	0.0405(9)
C8	0.7610(5)	0.6222(3)	0.6866(2)	0.0335(8)
C9	0.5987(5)	0.6063(3)	0.6434(3)	0.0452(10)
H9	0.4803	0.5989	0.6803	0.054*
C10	0.7554(5)	0.6284(3)	0.7912(2)	0.0338(8)
H10	0.8879	0.6143	0.8091	0.041*
C11	0.6192(5)	0.5485(3)	0.8437(2)	0.0340(8)
C12	0.6125(6)	0.3801(3)	0.9278(3)	0.0478(10)
H12A	0.4754	0.3949	0.9434	0.057*
H12B	0.6714	0.3631	0.9858	0.057*

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Abstract

$C_{27}H_{22}BrClN_2O_5$, triclinic, $P\bar{1}$, $a = 6.8549(4)$ Å, $b = 13.2863(12)$ Å, $c = 14.3690(13)$ Å, $\alpha = 85.944(7)^\circ$, $\beta = 84.882(6)^\circ$, $\gamma = 89.932(6)^\circ$, $V = 1300.18(18)$ Å³, $Z = 2$, $R_{\text{gt}}(F) = 0.0655$, $wR_{\text{ref}}(F^2) = 0.1841$, $T = 293(2)$ K.

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The crystal structure is shown in the figure. Tables 1 and 2 contain details on crystal structure and measurement conditions and a list of the atoms including atomic coordinates and displacement parameters.

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Table 2 (continued)

Atom	<i>x</i>	<i>y</i>	<i>z</i>	<i>U</i> _{iso} [*] / <i>U</i> _{eq}
C13	0.6284(6)	0.2915(3)	0.8684(3)	0.0465(10)
C14	0.7900(8)	0.2311(4)	0.8681(4)	0.0726(15)
H14	0.8871	0.2441	0.9070	0.087*
C15	0.8130(12)	0.1516(5)	0.8119(5)	0.103(2)
H15	0.9254	0.1123	0.8113	0.123*
C16	0.6685(14)	0.1320(5)	0.7576(5)	0.106(2)
H16	0.6811	0.0774	0.7205	0.127*
C17	0.5047(11)	0.1901(6)	0.7558(5)	0.098(2)
H17	0.4074	0.1755	0.7176	0.117*
C18	0.4848(7)	0.2707(5)	0.8112(4)	0.0702(14)
H18	0.3742	0.3112	0.8099	0.084*
C19	0.5695(5)	0.7929(3)	0.7691(2)	0.0358(8)
C20	0.6386(6)	0.8488(3)	0.6887(3)	0.0471(10)
H20	0.7708	0.8464	0.6679	0.057*
C21	0.5142(7)	0.9082(4)	0.6390(3)	0.0561(12)
H21	0.5610	0.9462	0.5848	0.067*
C22	0.3187(6)	0.9103(3)	0.6710(3)	0.0526(11)
C23	0.2478(6)	0.8561(3)	0.7506(3)	0.0512(11)
H23	0.1159	0.8595	0.7718	0.061*
C24	0.3735(6)	0.7959(3)	0.7997(3)	0.0441(9)
H24	0.3258	0.7575	0.8535	0.053*
C25	0.7696(5)	0.7578(3)	0.9010(2)	0.0367(9)
C26	0.7297(5)	0.8612(3)	0.9286(3)	0.0422(9)
H26	0.6752	0.9084	0.8877	0.051*
C27	0.7712(6)	0.8858(4)	1.0104(3)	0.0534(11)
H27	0.8228	0.8358	1.0496	0.064*
O5	0.1062(5)	0.4466(3)	0.8976(3)	0.0693(11)
H5A	0.121(8)	0.415(5)	0.954(4)	0.09(2)*
H5B	0.188(8)	0.477(4)	0.885(4)	0.068(19)*

Source of material

The solution of 4-oxo-4*H*-chromene-3-carbaldehyde (174 mg, 1 mmol), isocyanobenzene (103 mg, 1 mmol), 4-bromobenzenamine (172 mg, 1 mmol) and propiolic acid (70 mg, 1 mmol) in methanol (8 mL) was added in a 20 mL microwave vial. The solution was stirred at room temperature overnight, then evaporated the solvent. The residue was dissolved in 5% hydrochloric acid/acetic acid, which was sealed and heated under microwave irradiation at 25 °C for 15 min. The reaction mixture was washed with water and brine, and extracted with ethyl acetate. The organic solution was dried, concentrated and purified by column chromatography over silica gel eluting with a gradient of ethyl acetate/hexane (0–20%) to afford the colourless solid. Yield, 397 mg, 72%. The title compound was dissolved in ethyl acetate, and the solvent slowly evaporated at room temperature. After one week, colourless crystals were obtained.

Experimental details

All of the hydrogen atoms were placed in the calculated positions and all the non-hydrogen atoms were refined anisotropically.

Comment

The Ugi reaction is a branch of isocyanide-based multicomponent reactions (IMCRs), which is a powerful tool to synthesize complex, drug-like molecules in short synthetic sequences [3]. During the past years, research focused their attention on the use of Ugi four-component reactions (U-4CRs) for the synthesis of substituted amides [4, 5]. The NMR results are consistent with the proposed structure. The asymmetric unit of the title compound contains one (*E*)-*N*-(2-(benzylamino)-2-oxo-1-(4-oxo-4*H*-chromen-3-yl)ethyl)-*N*-(4-bromophenyl)-3-chloroacrylamide and one water molecule. The bond lengths and angles are in the normal ranges. In conclusion, we have developed a facile microwave-assisted process for the synthesis of substituted amide compound using a Ugi four-component reaction. This facile procedure can be readily used to synthesize a diverse range of compounds for high throughput screening in medicinal chemistry.

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