Electronic Supplementary Material (ESI) for CrystEngComm.

Supporting Information

Halogen-bond driven co-crystallization of potential anti-cancer compounds: A structural study

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Experimental

The four 3-pyridyl *bis*-acetamido compounds (**A_8-A_0**, Scheme 1) were synthesized according to literature methods (S. Mutha, J. Yip and J. Vittal, *J. Chem. Soc., Dalton Trans*., **2002**, 4561–4569). **D_2-D_8** were purchased from Alfa Aesar and Sigma Aldrich. Infrared spectroscopy analysis was carried out using Nicolet 380 FT-IR and melting point/decomposition point determination was done using Fisher-Johns melting point apparatus and are uncorrected.

Table S1. IR analysis of the co-crystals

	D_2 (1144,1096, 833, 685) cm^{-1}		**D_4** (1192, 1134, 1041) cm^{-1}		**D_6** (1200, 1141, 1087) cm^{-1}		**D_8** (1200, 1145,1053, 965) cm^{-1}	
	Co-crystal (cm^{-1})	Δ (cm^{-1})	Co-crystal (cm^{-1})	Δ (cm^{-1})	Co-crystal (cm^{-1})	Δ (cm^{-1})	Co-crystal (cm^{-1})	Δ (cm^{-1})
A_8	1136 1090 827	-8 -5 -6	1189 1140 1045	-3 +6 +4	1191 1132 1080	-8 -9 -7	1191 1153 1059	-9 -8 -6
A_6	1137 1090 700	-7 -6 +15	1197 1138 1046	+5 +4 +5	1180 1150 1084	-20 +9 -3	1208 1143 1056	-8 -1 +3
A_4	1145 1090	+1 -6	1184 1122	-8 -12	1192 1132 1085	-8 -9 -2	1144 1056	-1 +3
A_2	-		1188 1126 1044	-4 -8 +3	1214 1079	+14 -8	1214 1057 962	+14 +4 -3
A_0	-		-		-		-	

Table S2. Synthesis and melting points of co-crystals

	Solvent/s (ratios)	Decomposition point (˚C)	Melting point (˚C)
$\mathbf{A_8 \cdot D_2}$	Ethanol	72	150-152
$\mathbf{A_8 \cdot D_4}$	Ethanol	79	151-153
$\mathbf{A_8 \cdot D_6}$	Ethanol	81	150-151
$\mathbf{A_6 \cdot D_2}$	Ethanol:chloroform (1:1)	78	157-159
$\mathbf{A_6 \cdot D_6}$	Ethanol:chloroform (1:1)	81	158-160
$\mathbf{A_6 \cdot D_8}$	Ethanol:chloroform (1:1)	86	158-159
$\mathbf{A_4 \cdot D_2}$	Methanol	95	202-203
$\mathbf{A_4 \cdot D_4}$	Methanol	101	204-205
$\mathbf{A_4 \cdot D_6}$	Methanol	76	204-206
$\mathbf{A_4 \cdot D_8}$	Methanol	125	201-203
$\mathbf{A_2 \cdot D_4}$	Methanol	89	220-221
$\mathbf{A_2 \cdot D_6}$	Methanol	86	221-222
$\mathbf{A_2 \cdot D_8}$	Methanol	99	218-219

Table S3. X-ray data

Systematic name	$\mathbf{A_8D_2}$	$\mathbf{A_8D_4}$	$\mathbf{A_8D_6}$	$\mathbf{A_6D_2}$
Formula moiety	$(C_{20}H_{26}N_4O_2)$ $(C_2F_4I_2)$	$(C_{20}H_{26}N_4O_2)$ $(C_4F_8I_2)$	$(C_{20}H_{26}N_4O_2)$ $(C_6F_{12}I_2)$	$(C_{18}H_{22}N_4O_2)$ $(C_2F_4I_2)$
Empirical formula	$C_{22}H_{26}F_4I_2N_4O_2$	$C_{24}H_{26}F_8I_2N_4O_2$	$C_{26}H_{26}F_{12}I_2N_4O_2$	$C_{20}H_{22}F_4I_2N_4O_2$
Molecular weight	708.27	808.29	908.31	680.22
Color, Habit	colorless plate	colorless prism	colorless plate	yellow plate
Crystal system	Triclinic	Triclinic	Triclinic	Triclinic
Space group, Z	P-1, 1	P-1, 1	P-1, 1	P-1, 1
a, Å	5.0587(4)	5.0194(3)	5.0345(12)	5.0593(7)
b, Å	5.0974(4)	5.0906(3)	5.1049(12)	5.0774(7)
c, Å	24.1635(19)	26.5502(14)	29.113(7)	22.229(3)
α, °	84.859(2)	85.503(2)	85.793(6)	94.513(5)
β, °	84.330(2)	85.901(2)	87.469(7)	91.986(4)
γ, °	88.194(2)	88.2190(10)	88.033(5)	91.522(4)
Volume, $Å^3$	617.38(8)	674.36(7)	745.1(3)	568.65(14)
Density, g/cm^3	1.905	1.990	2.024	1.986
Temperature, K	120(2)	120(2)	120(2)	120(2)
X-ray wavelength	0.71073	0.71073	0.71073	0.71073
μ, mm^{-1}	2.604	2.418	2.219	2.823
Crystal size, min x mid x max	0.08 x 0.30 x 0.36	0.12 x 0.18 x 0.26	0.18 x 0.38 x 0.44	0.14 x 0.22 x 0.32
Absorption corr	multi-scan	multi-scan	multi-scan	multi-scan
Trans min / max	0.4541 / 0.8187	0.5721 / 0.7601	0.4418 / 0.6908	0.4653 / 0.6933
θ_{min}, °	1.70	1.54	2.81	1.84
θ_{max}, °	32.56	33.14	34.97	32.57
Reflections				
collected	15075	15718	14798	12442
independent	4054	4765	5389	3612
observed	3877	4641	5266	3479
Threshold expression	>2σ(I)	>2σ(I)	>2σ(I)	>2σ(I)
R_1 (observed)	0.0219	0.0161	0.0281	0.0244
wR_2 (all)	0.0599	0.0414	0.0725	0.0752
Goodness of fit (all)	0.989	1.022	1.131	1.183
Δρ max / min	0.745 / -0.833	0.561 / -0.309	0.689 / -1.257	1.062 / -0.634
2θ limit	30.00	30.00	30.00	27.50
Completeness to 2θ limit	0.969	0.992	0.965	0.968

Table S4. X-ray data

Systematic name	$\mathbf{A_6D_6}$	$\mathbf{A_6D_8}$	$\mathbf{A_4D_2}$	$\mathbf{A_4D_4}$
Formula moiety	$(C_{18}H_{22}N_4O_2)$ $(C_6F_{12}I_2)$	$(C_{18}H_{22}N_4O_2)$ $(C_8F_{16}I_2)$	$(C_{16}H_{18}N_4O_2)$ $(C_2F_4I_2)$	$(C_{16}H_{18}N_4O_2)$ $(C_4F_8I_2)$
Empirical formula	$C_{24}H_{22}F_{12}I_2N_4O_2$	$C_{26}H_{22}F_{16}I_2N_4O_2$	$C_{18}\ H_{18}\ F_4\ I_2\ N_4\ O_2$	$C_{20}\ H_{18}\ F_8\ I_2\ N_4\ O_2$
Molecular weight	880.26	980.28	652.16	752.18
Color, Habit	colorless plate	colorless plate	colorless / block	colorless / plate
Crystal system	Orthorhombic	Triclinic	Monoclinic	Triclinic
Space group, Z	$Pca2_1$, 4	P-1, 1	C2/c	P-1
a, Å	64.445(6)	5.0528(4)	40.059(5)	4.9772(12)
b, Å	4.9349(4)	5.1104(4)	5.6695(5)	10.655(3)
c, Å	9.1473(8)	29.870(2)	9.7828(12)	12.169(3)
α, °	90.00	86.386(2)	90.00	71.067(2)
β, °	90.00	87.930(2)	102.959(3)	88.865(3)
γ, °	90.00	87.776(2)	90.00	86.924(2)
Volume, $Å^3$	2909.1(4)	768.75(10)	2165.2(4)	609.6(3)
Density, g/cm^3	2.010	2.117	2.001	2.049
Temperature, K	120(2)	120(2)	90(2)	100(2)
X-ray wavelength	0.71073	0.71073	0.71073	0.71073
μ, mm^{-1}	2.270	2.178	2.961	2.667
Crystal size, min x mid x max	0.06 x 0.12 x 0.32	0.06 x 0.24 x 0.32	0.20 x 0.15 x 0.10	0.30 x 0.15 x 0.10
Absorption corr	multi-scan	multi-scan	multi-scan	multi-scan
Trans min / max	0.6598 / 0.7463	0.5425 / 0.8804	0.7561/0.5889	0.7763/0.5017
θ_{min}, °	1.90	2.05	3.13	1.77
θ_{max}, °	32.03	31.43	26.43	26.47
Reflections collected	24753	13832	11345	9444
independent	8238	4733	2229	2518
observed	6834	4368		
Threshold expression	>2σ(I)	>2σ(I)	>2σ(I)	>2σ(I)
R_1 (observed)	0.0367	0.0273	0.0142	0.0269
wR_2 (all)	0.1164	0.0729	0.0361	0.0525
Goodness of it (all)	1.047	0.975	1.052	1.021
Δρ max / min	0.642 / -0.840	1.241 / -1.121	0.388/-0.287	0.789/-0.491
2θ limit	30.00	30.00	25.00	25.00
Completeness to 2θ limit	0.962	0.983	0.999	0.999

Table S5. X-ray data

Systematic name	**A_4D_6**	**A_4D_8**	**A_2D_4**	**A_2D_6**	**A_2D_8**
Formula moiety	$(C_{16}H_{18}N_4O_2)$ $(C_6F_{12}I_2)$	$(C_{16}H_{18}N_4O_2)$ $(C_8F_{16}I_2)$	$(C_{14}H_{14}N_4O_2)$ $(C_4F_8I_2)$	$(C_{14}H_{14}N_4O_2)$ $(C_6F_{12}I_2)$	$(C_{14}H_{14}N_4O_2)$ $(C_8F_{16}I_2)$
Empirical formula	$C_{22}H_{18}F_{12}I_2N_4O_2$	$C_{24}H_{18}F_{16}I_2N_4O_2$	$C_{18}H_{14}F_8I_2N_4O_2$	$C_{20}H_{14}F_{12}I_2N_4O_2$	$C_{22}H_{14}F_{16}I_2N_4O_2$
Molecular weight	852.20	952.22	724.13	824.15	924.17
Color, Habit	colorless prism	colorless plate	colorless prism	colorless plate	colorless prism
Crystal system	Monoclinic	Monoclinic	Monoclinic	Monoclinic	Monoclinic
Space group, Z	C2/c, 4	C2/c, 4	$P2_1/c$, 2	$P2_1/c$, 2	$P2_1/c$, 2
a, Å	49.953(3)	54.569(3)	12.7557(6)	13.7352(8)	15.1894(18)
b, Å	5.5707(3)	5.6337(3)	9.5667(5)	9.3958(5)	9.3947(11)
c, Å	9.7257(6)	9.7038(6)	9.7394(5)	9.8519(6)	9.8668(11)
α, °	90.00	90.00	90.00	90.00	90.00
β, °	95.234(2)	92.370(2)	110.9880(10)	103.888(2)	95.169(4)
γ, °	90.00	90.00	90.00	90.00	90.00
Volume, $Å^3$	2695.1(3)	2980.6(3)	1109.65(10)	1234.25(12)	1402.3(3)
Density, g/cm^3	2.100	2.122	2.167	2.218	2.189
Temperature, K	120(2)	120(2)	120(2)	120(2)	120(2)
X-ray wavelength	0.71073	0.71073	0.71073	0.71073	0.71073
μ, mm^{-1}	2.447	2.243	2.925	2.667	2.380
Crystal size, min x mid x max	0.18 x 0.26 x 0.34	0.06 x 0.18 x 0.26	0.14 x 0.22 x 0.32	0.12 x 0.22 x 0.34	0.18 x 0.26 x 0.34
Absorption corr	multi-scan	multi-scan	multi-scan	multi-scan	multi-scan
Trans min / max	0.4901 / 0.6671	0.5932 / 0.8772	0.4545 / 0.6848	0.4641 / 0.7402	0.4983 / 0.6739
θ_{min}, °	2.46	1.49	2.73	1.53	1.35
θ_{max}, °	33.12	32.56	31.51	34.39	33.12
Reflections					
collected	21607	16963	11790	20293	21943
independent	4804	4886	3403	4958	4814
observed	4604	4249	3095	4517	4426
Threshold expression	>2σ(I)	>2σ(I)	>2σ(I)	>2σ(I)	>2σ(I)
R_1 (observed)	0.0220	0.0266	0.0252	0.0211	0.0300
wR_2 (all)	0.0574	0.0641	0.0631	0.0484	0.1023
Goodness of fit (all)	1.033	1.070	1.069	1.034	1.213
Δρ max / min	0.692 / -0.798	0.620 / -0.843	0.721 / -0.805	0.555 / -0.469	0.841 / -0.899
2θ limit	30.00	30.00	27.50	32.50	30.00
Completeness to 2θ limit	0.989	0.980	0.984	0.989	0.976