Electronic Supplementary Information

Unravelling conformational and crystal packing preferences of cyclohexane-5-spirohydantoin derivatives incorporating a halogenated benzoyl group

Anita Lazić,[a] Lidija Radovanović,[a] Kristina Gak Simić,[a] Jelena Rogan,[b]

Goran Janjić,[c] Nemanja Trišović [b] and Ivana Đorđević [c]

[a]Innovation Centre of the Faculty of Technology and Metallurgy, Karnegijeva 4, 11120 Belgrade, Serbia
[b]Faculty of Technology and Metallurgy, University of Belgrade, Karnegijeva 4, 11120 Belgrade, Serbia
[c]Institute of Chemistry, Technology and Metallurgy, National Institute of the Republic of Serbia, University of Belgrade, Njegoševa 12, 11001 Belgrade, Serbia

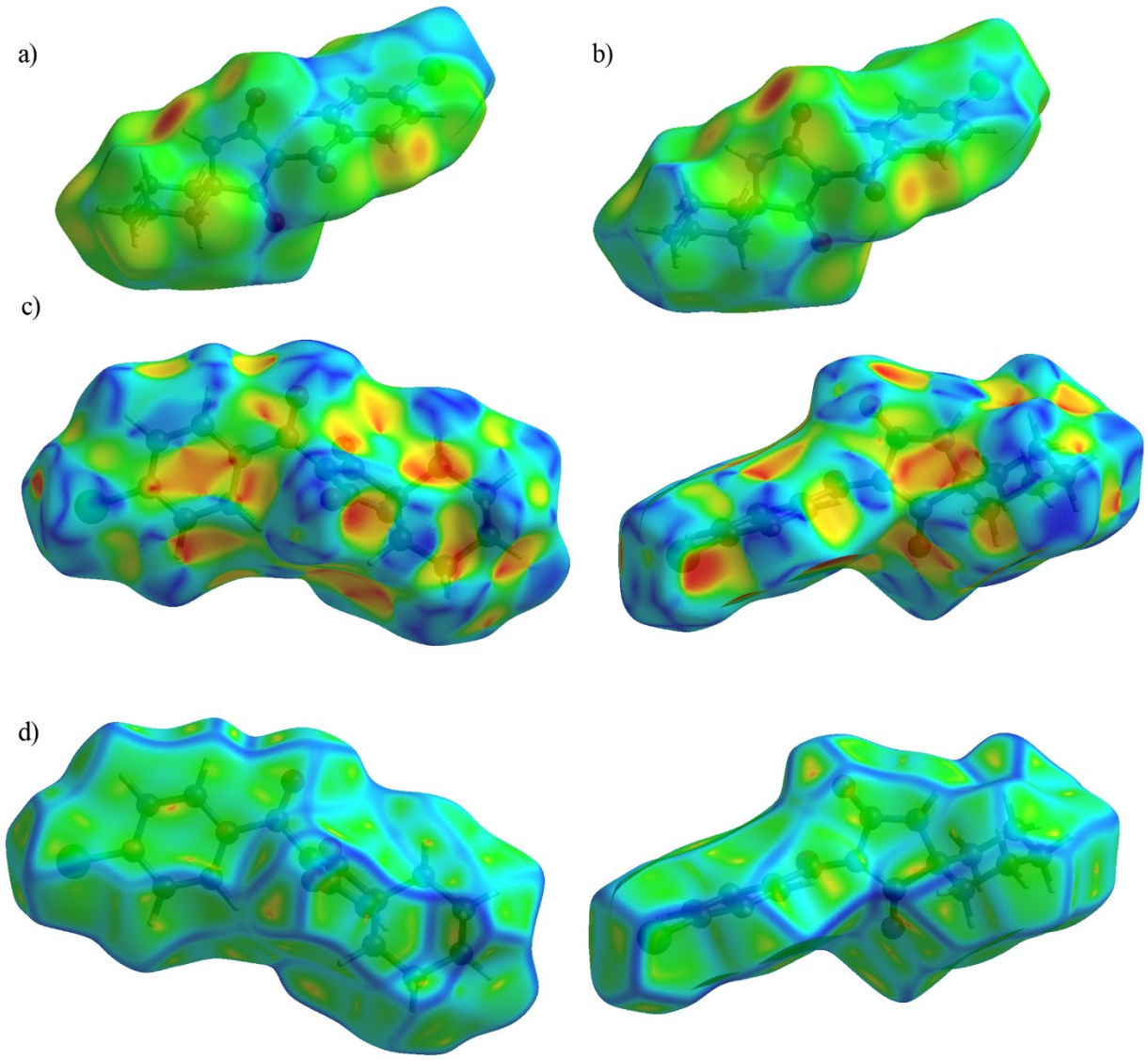

Fig. S1 a) Hirshfeld surface generated on parameters d_i, b) on parameters d_e, c) shape index and d) curvedness mapped over the Hirshfeld surface for **1**.

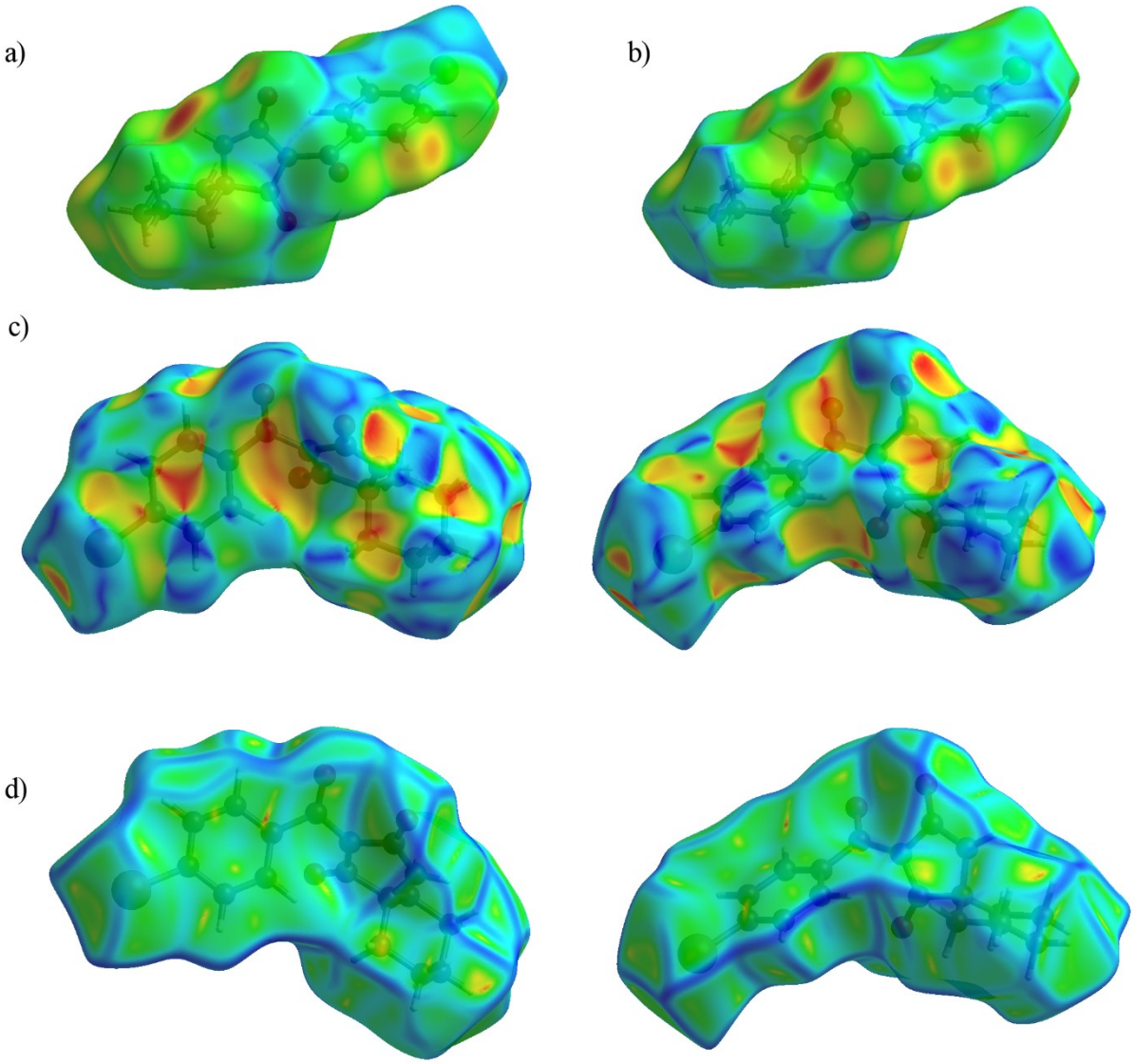

Fig. S2 a) Hirshfeld surface generated on parameters d_i, b) on parameters d_e, c) shape index and d) curvedness mapped over the Hirshfeld surface for **2**.

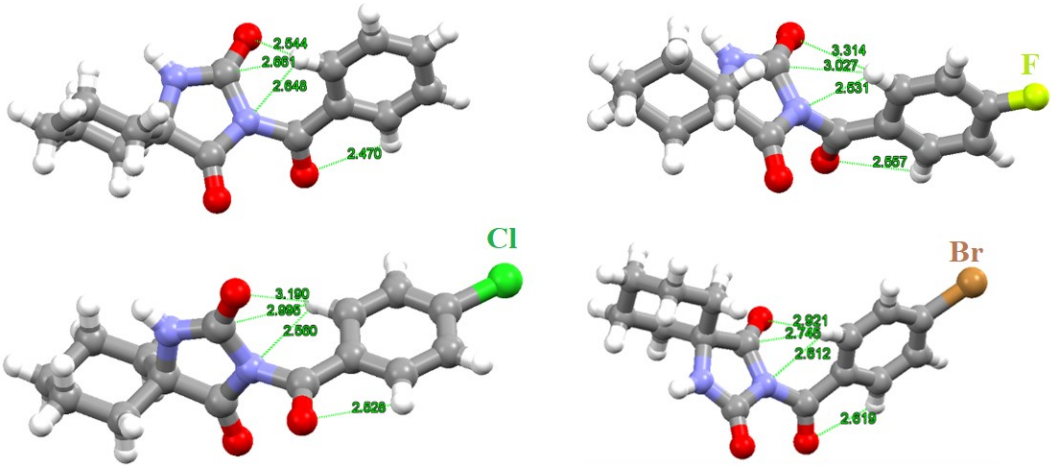

Fig. S3 Intramolecular interactions in the crystal structure of **1**–**4**.

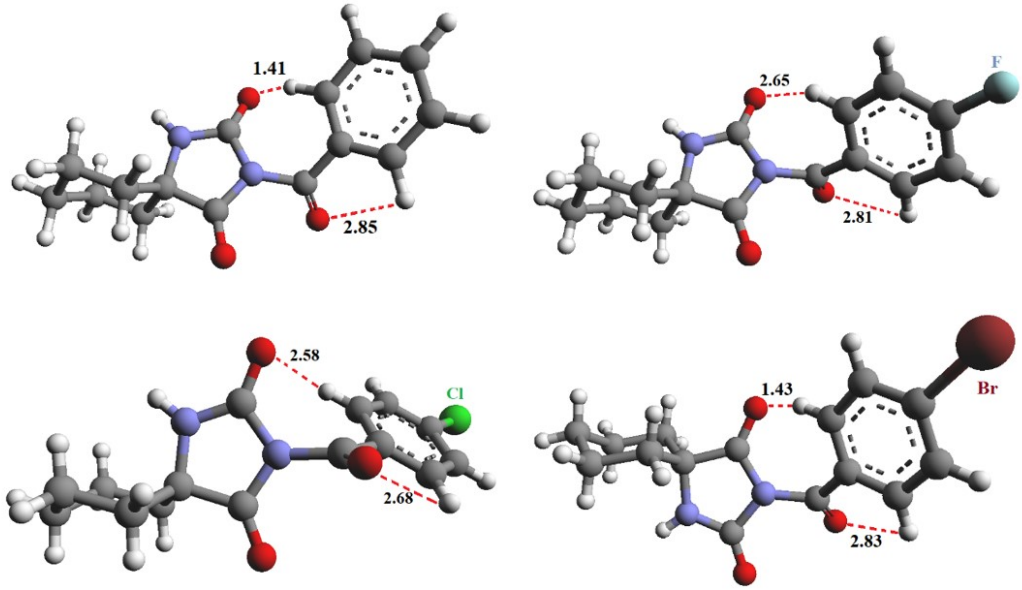

Fig. S4 Intramolecular interactions in the conformations of **1**–**4** obtained through rotation about the bond C11–C12 for 140°.

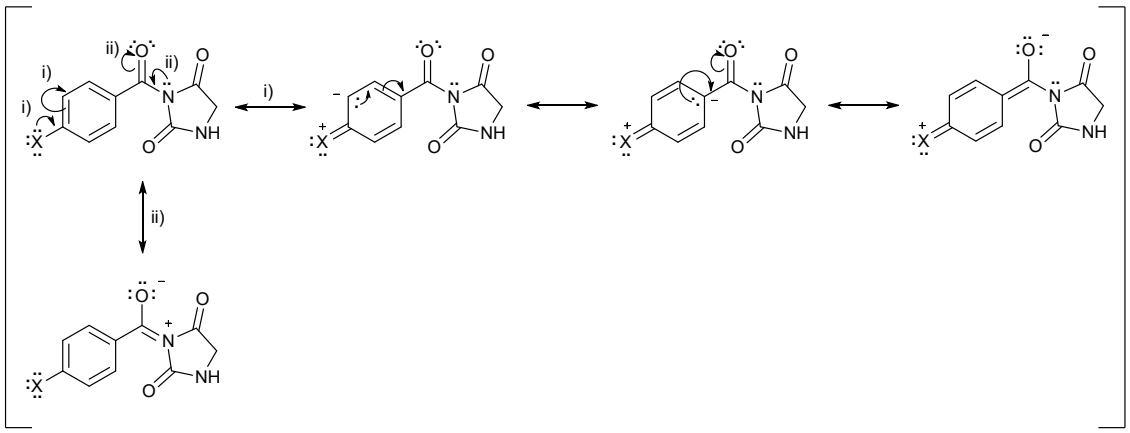

Fig. S5 Resonance structures involving the carbonyl bridge when X is a halogen atom.

Table S1 Selected bond lengths (Å) and angles (°) in the investigated compounds.

	1	**2**
N1–C2	1.329(3)	133.3(5)
C2–N3	1.402(3)	1.425(5)
N3–C4	1.377(3)	1.398(6)
C4–C5	1.518(3)	1.508(5)
C5–N1	1.450(3)	1.462(6)
N3–C11	1.457(3)	1.430(5)
C11–C12	1.463(3)	1.484(5)
C2–O1	1.213(3)	1.211(5)
C4–O2	1.204(4)	1.204(5)
C11–O3	1.198(4)	1.200(5)
C2–N1–C5	113.9(2)	114.6(3)
O1–C2–N1	129.5(2)	128.9(4)
O1–C2–N3	123.3(2)	124.7(3)
N1–C2–N3	107.2(2)	106.3(3)
C2–N3–C4	111.0(2)	110.2(3)
O2–C4–N3	125.5(2)	124.5(4)
O2–C4–C5	127.4(2)	128.0(4)
N3–C4–C5	107.1(2)	107.5(3)
N1–C5–C4	100.8(2)	100.6(3)
N3–C11–C12	117.3(2)	115.7(3)
N3–C11–O3	117.0(2)	120.0(4)
C12–C11–O3	125.7(2)	124.3(4)

Table S2 Energy of C–H···O interaction between the substituted phenyl group and the hydantoin unit for different distances between the interacting atoms (*d*).

d / Å / Compound	**3** (X = H)	**4** (X = F)	**1** (X = Cl)	**2** (X = Br)
2.0	–0.05	–0.57	–0.66	–0.78
2.2	–1.09	–1.52	–1.60	–1.69
2.3	–1.33	–1.72	–1.80	–1.88
2.4	–1.44	–1.81	–1.88	–1.95
2.5	**–1.48**	**–1.82**	**–1.89**	**–1.95**
2.6	–1.45	–1.77	–1.83	–1.89
2.7	–1.39	–1.69	–1.75	–1.80
2.8	–1.31	–1.59	–1.64	–1.69
2.9	–1.22	–1.48	–1.54	–1.58
3.0	–1.13	–1.37	–1.42	–1.46
3.2	–0.94	–1.16	–1.21	–1.24
3.5	–0.71	–0.89	–0.93	–0.96

Table S3 Energy of C–H···π interaction between the substituted phenyl group and the hydantoin unit for different distances between the interacting atoms (*d*).

d / Å / Compound	**3** (X = H)	**4** (X = F)	**1** (X = Cl)	**2** (X = Br)
2.2	–0.02	–0.04	–0.15	–0.16
2.5	–1.40	–1.39	–1.49	–1.49
2.6	–1.53	–1.52	–1.61	–1.61
2.7	**–1.56**	**–1.57**	**–1.64**	**–1.64**
2.8	–1.54	–1.53	–1.61	–1.60
2.9	–1.47	–1.46	–1.54	–1.53
3.0	–1.38	–1.37	–1.44	–1.44
3.2	–1.18	–1.17	–1.23	–1.23
3.5	–0.86	–0.86	–0.91	–0.90

Table S4 Energy profile for the rotation about the bond C11–N3. All energies are relative to the most stable conformation.

τ_2/° \ Compound	**3** (X = H)	**4** (X = F)	**1** (X = Cl)	**2** (X = Br)
0	99.59	136.69	84.98	71.20
20	18.43	150.10	171.43	127.53
40	1.09	28.03	48.79	69.71
60	**0.00**	3.44	6.49	12.16
80	1.08	1.50	2.47	2.56
100	9.95	0.91	2.31	1.67
120	9.95	**0.00**	0.94	0.35
140	73.82	5.68	**0.00**	**0.00**
160	204.86	44.66	7.74	10.58
180	99.59	136.69	84.98	71.20

Table S5 Energy density, *H*(r), potential energy density *V*(r), Lagrangian kinetic energy *G*(r), expressed in kcal/mol, at the selected bond critical points (BCP).

Critical point	Compound	Substituent X	Δ*H*(r)	Δ*V*(r)	Δ*G*(r)
C11–C12 (bond)	**3**	H	0	0	0
	4	F	–20.61	–25.97	5.35
	1	Cl	–14.64	–18.34	3.69
	2	Br	–2.40	–2.23	–0.17
C11–N3 (bond)	**3**	H	0	0	0
	4	F	24.04	37.47	–13.43
	1	Cl	22.95	36.11	–13.15
	2	Br	–5.22	–7.91	2.69