Electronic Supplementary Information (ESI)

Designing a new cocrystal of olanzapine drug and observation of concomitant polymorphism in a ternary cocrystal system

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Electronic supplementary information (ESI) available: CIF files, TGA and DSC plots, FT-IR spectra and crystal packing diagrams.

Table S1. The percentage of atom···atom contacts from Hirshfeld surface analysis in polymorphs.

	O…H, %	N…H, %	C…H, %	S…H, %	H…H, %	C…C, %
Form I, OLZ	3.9	5.5	21.5	7.5	58.8	1.4
Form II, OLZ	3.5	5.9	25.2	6.5	56.9	0.2
Form I, Toluene	3.7	1.3	22.4	0.7	65.5	0.5
Form II, Toluene	2.6	0.0	26.5	2.7	66.1	1.1
Form I, HQ-A	15.1	5.6	21.7	2.1	51.0	0.0
Form I, HQ-B	12.7	5.5	17.4	3.6	56.2	0.0
Form II, HQ-A	17.6	11.7	24.3	0.7	45.7	0.7
Form II, HQ-B	17.1	12.5	23.9	2.7	45.0	1.1

Table S2. Comparison of Hirshfeld Surface parameters in two polymorphs.

	Hirshfeld surface volume /Å^3	Hirshfeld surface area / Å^2
Form I, OLZ	397.88	353.10
Form II, OLZ	400.79	360.13
Form I, Toluene	147.96	154.94
Form II, Toluene	164.47	164.54
Form I, HQ-A	131.08	140.90
Form I, HQ-B	134.94	143.95
Form II, HQ-A	143.25	149.90
Form II, HQ-B	131.23	143.56

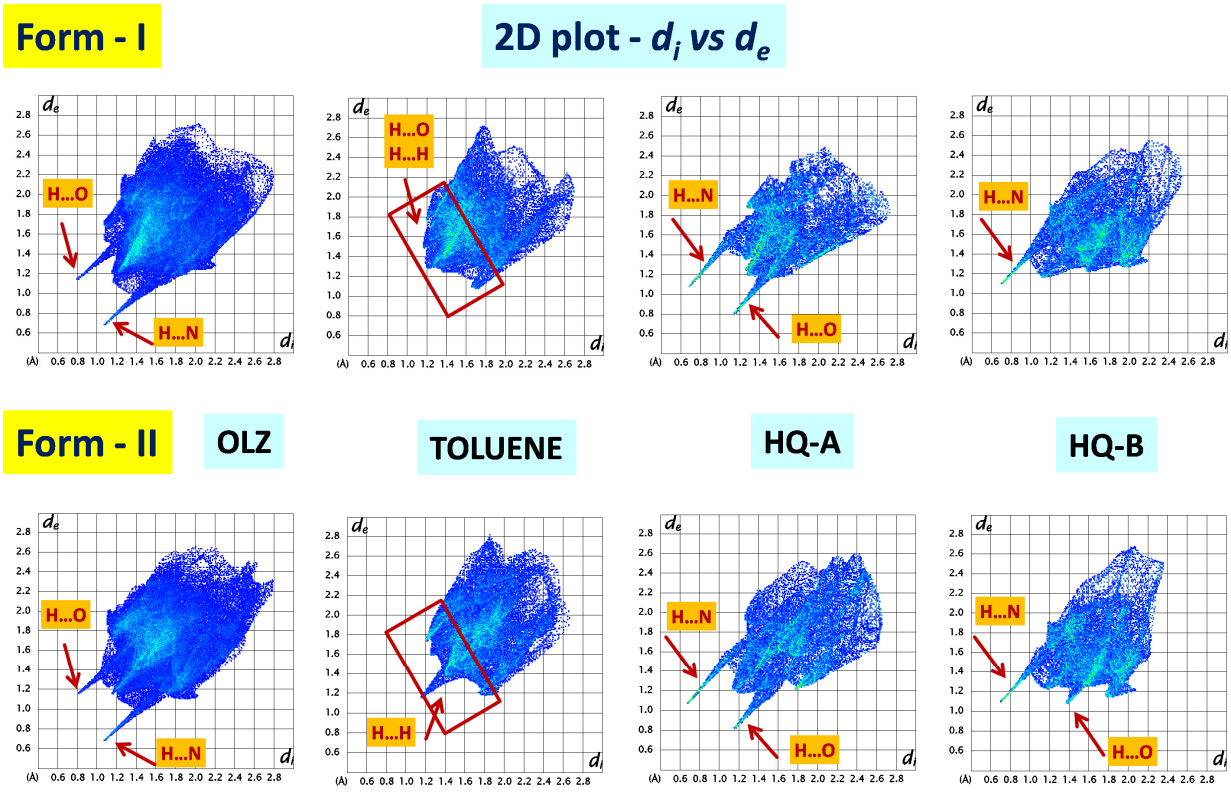


Figure S1. Comparison of 2D plots between d_i and d_e distances to Hirshfeld surfaces of olanzapine, toluene, and hydroquinone molecules HQ-A and HQ-B. Sharp spikes are indicative of strong hydrogen bonds.

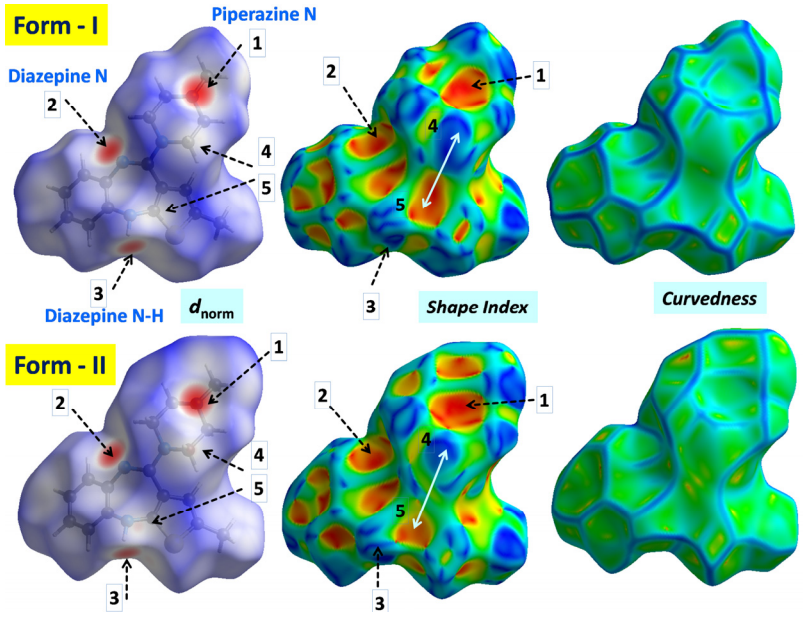
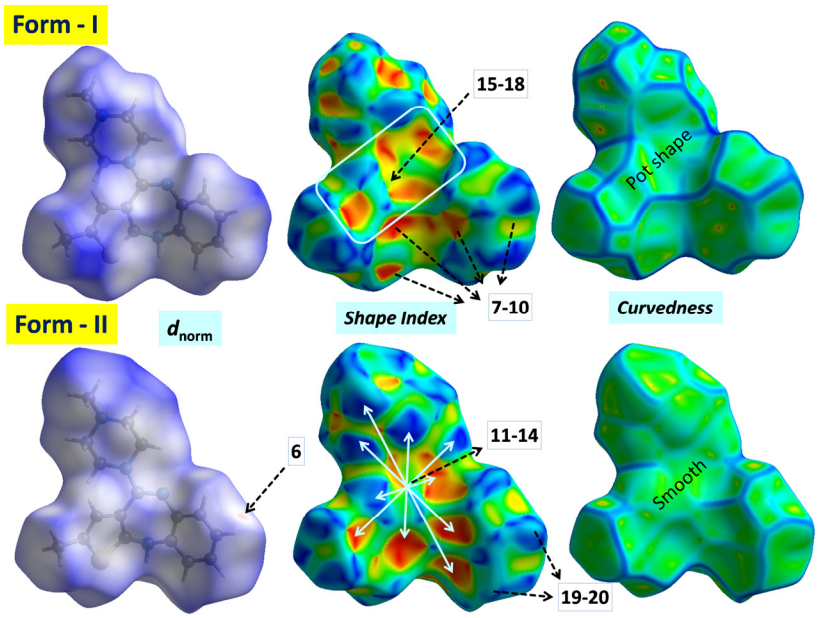


Figure S2. Comparison of Hirshfeld surfaces of olanzapine (**convex side**) mapped with d_{norm}, *shape index* and *curvedness* property in two polymorphs. Double headed arrows indicate donor (blue) and acceptor (red) groups which participate in complementary interactions.



FigureS3. Comparison of Hirshfeld surfaces of olanzapine (**concave side**) mapped with d_{norm}, *shape index* and *curvedness* property in two polymorphs. Double headed arrows indicate complementary donor (blue) and acceptor (red) groups. The *pot shaped* blue line signature on the *curvedness* surface of form I is noticed for docking aromatic and methyl portions of toluene into the concave grove of olanzapine.

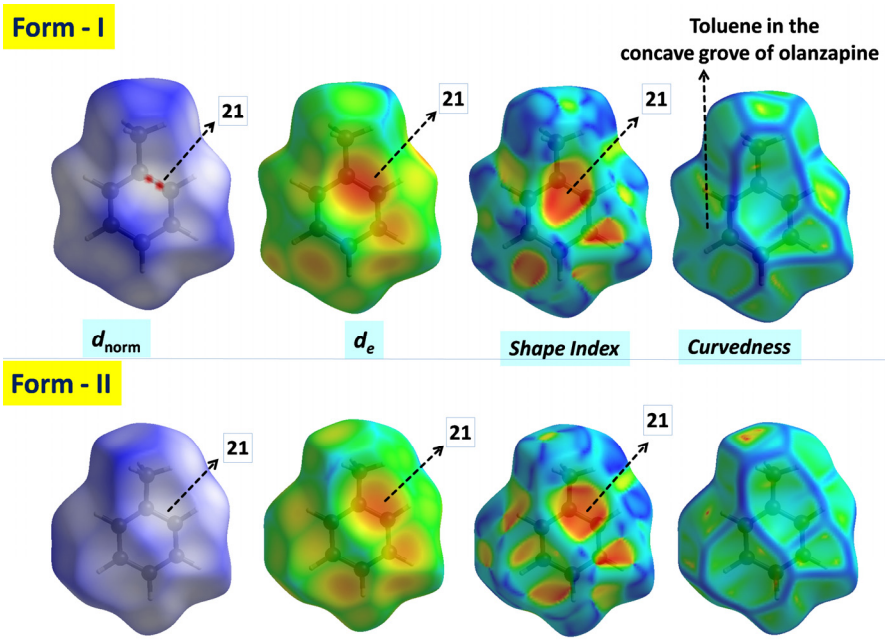


Figure S4. Comparison of Hirshfeld surfaces of toluene (**front side**) in two polymorphs mapped with d_{norm}, d_e, *shape index* and *curvedness* property. Form I shows a shorter C–H···π interaction between N-methyl piperazine C-H donor with toluene ring [Donor…Acceptor distance is 3.738(5) in form I and 3.995(5)Å in form II].

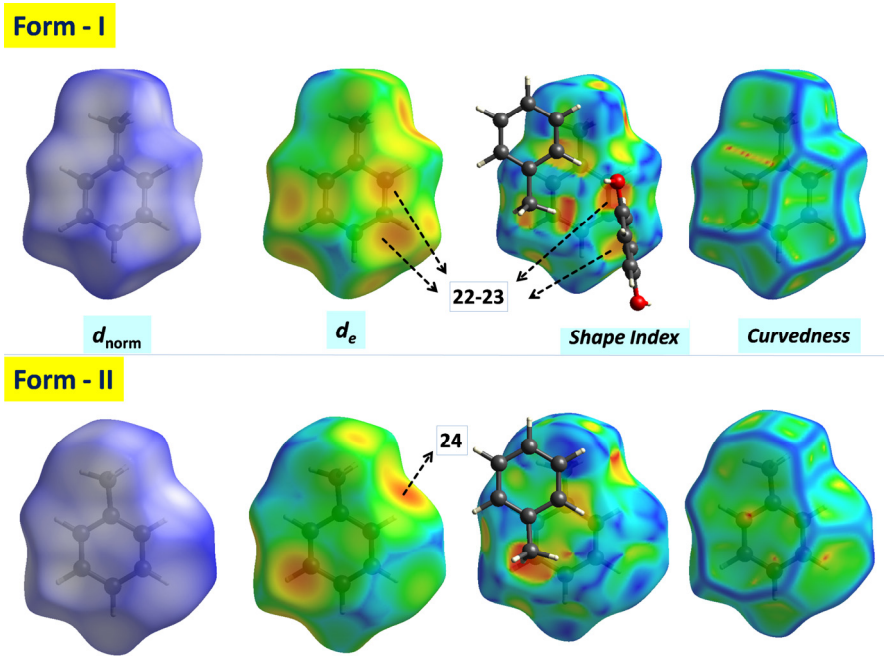


Figure S5. Comparison of Hirshfeld surfaces of toluene (**rear side**) in two polymorphs mapped with d_{norm}, d_e, *shape index* and *curvedness* property.

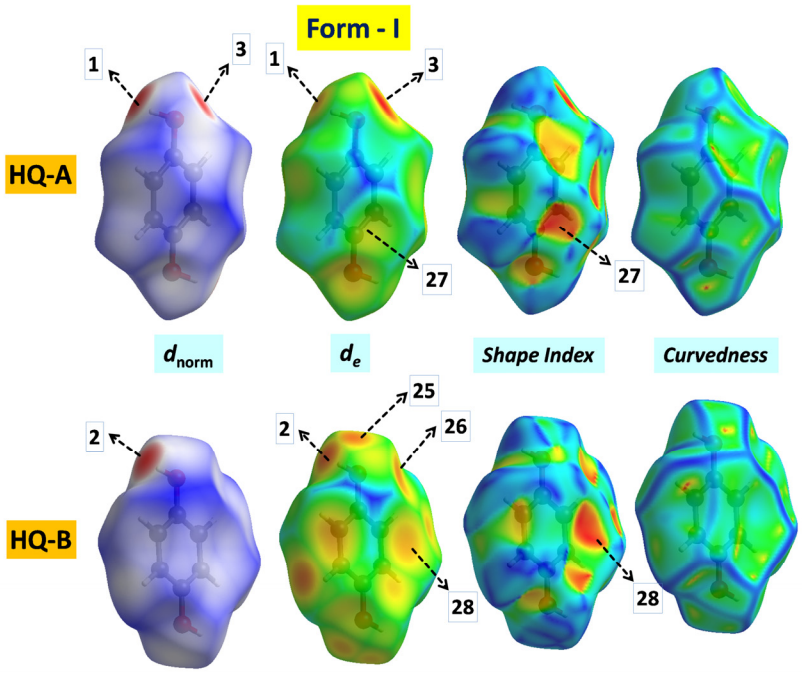


Figure S6. Comparison of Hirshfeld surfaces of hydroquinone HQ-A and HQ-B in polymorph I mapped with d_{norm}, d_e, *shape index* and *curvedness* property. The Hirshfeld surfaces analysis is carried out only on one side of the hydroquinone for the other side is related through centre of inversion.

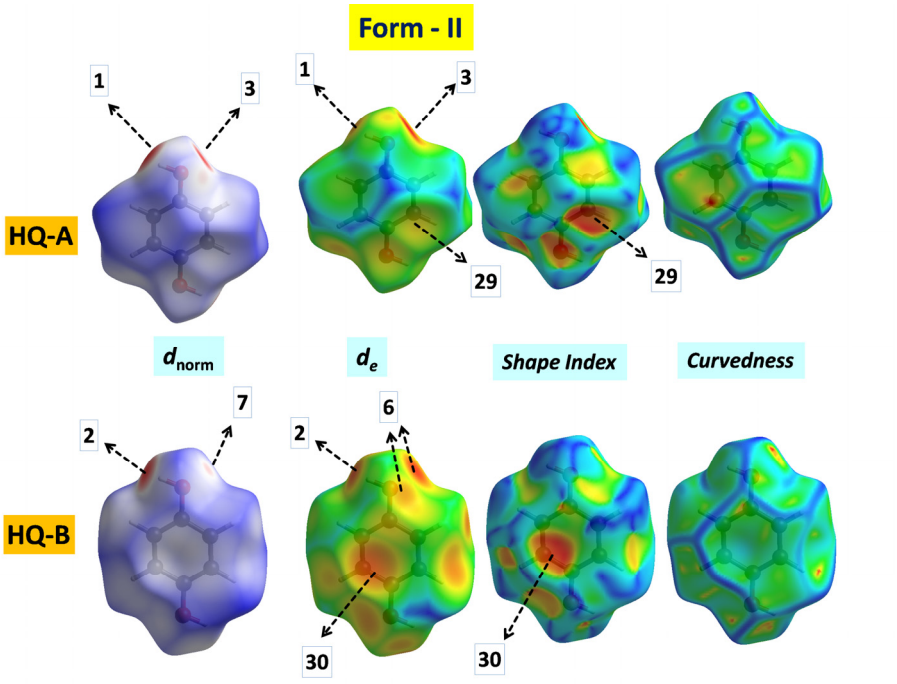


Figure S7. Comparison of Hirshfeld surfaces of hydroquinone HQ-A and HQ-B in polymorph II mapped with d_{norm}, d_e, *shape index* and *curvedness* property. The Hirshfeld surfaces analysis is carried out only on one side of the hydroquinone for the other side is related through centre of inversion.

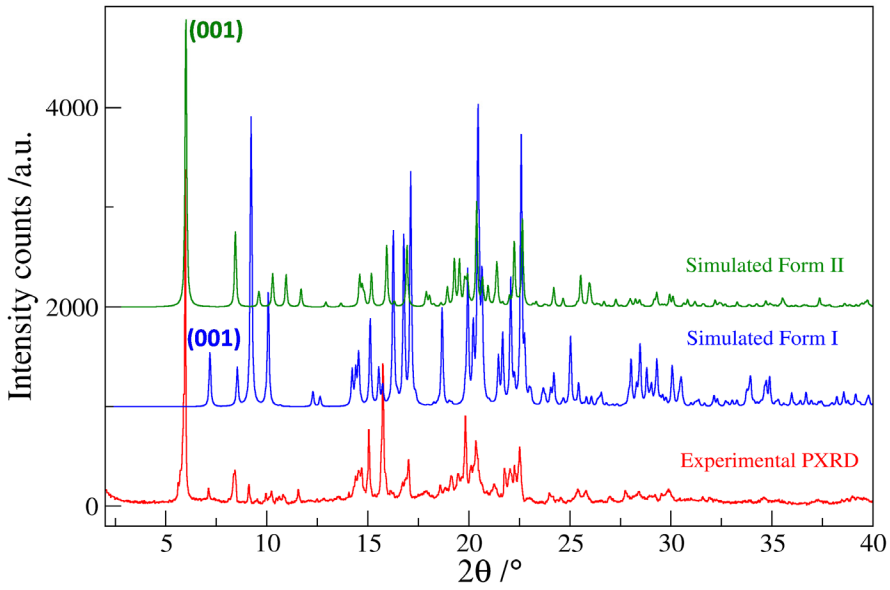
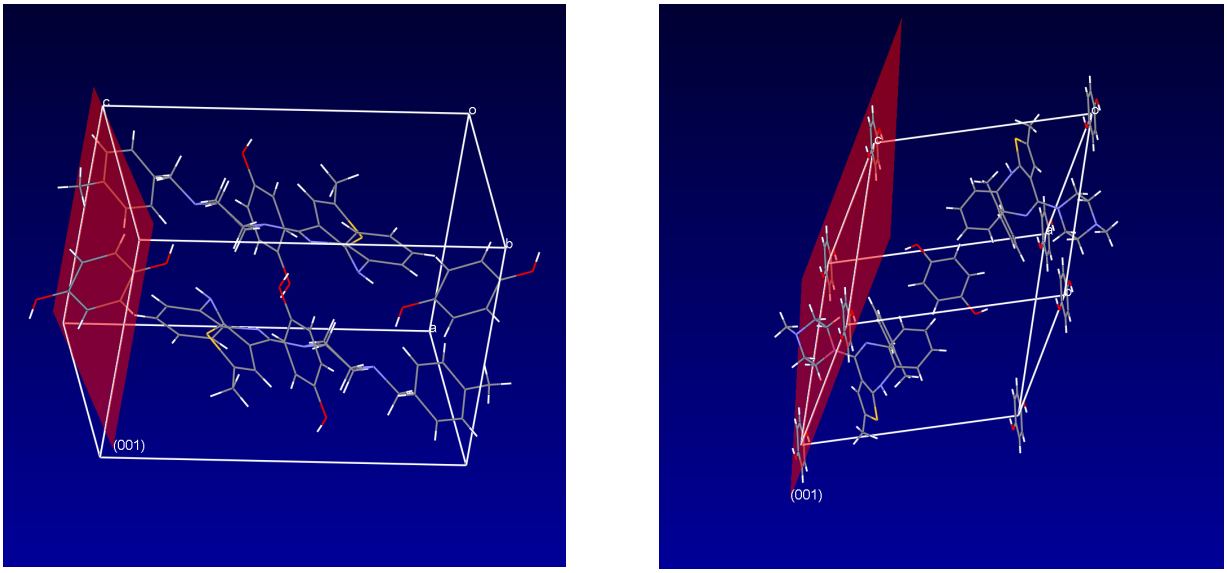
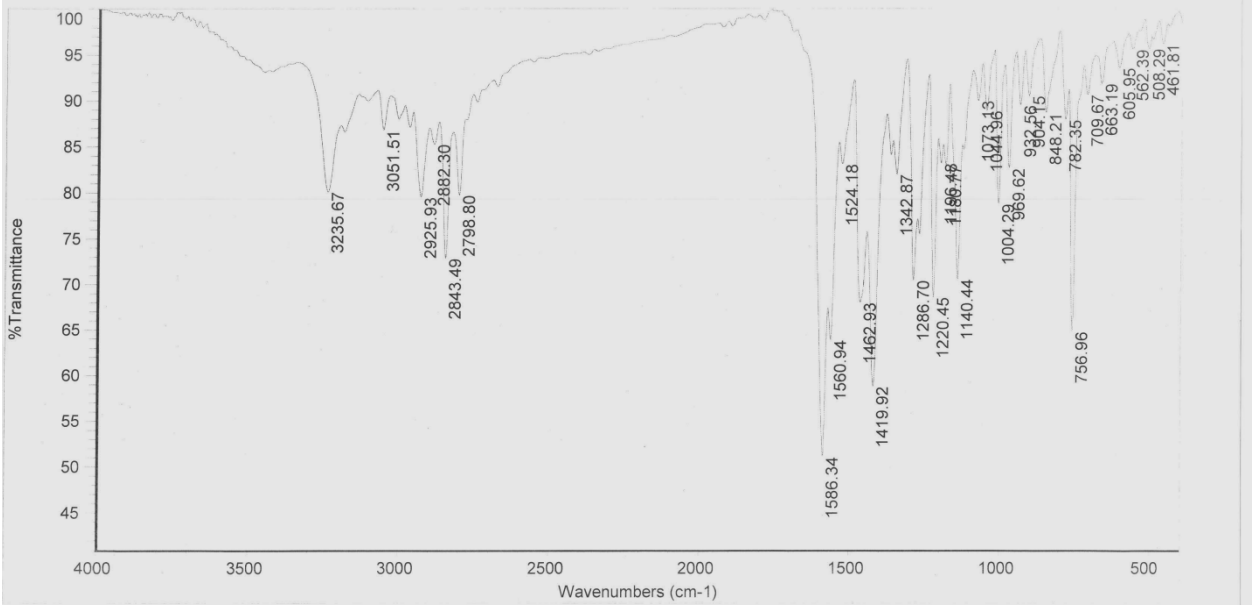


Fig. S8 Comparison of PXRD pattern of bulk material with simulated PXRD patterns from polymorphic cocrystals, forms I and II. The bulk material contains peaks of both polymorphs.



(a) (b)

Fig. S9 Comparison of hkl (001) peak which appears at 2θ 7.18° in form I and 6.00° in form II. The intensity of the peak arises from the scattering power of atoms lying in that particular planes in both polymorphs. There are hardly few carbon atoms in form I and therefore appears as a small peak while there are several carbon, oxygen and nitrogen atoms lie close to 001 plane in form II and appears as the most intense peak in Fig.S8. The experimental PXRD pattern of bulk material shows the 001 peaks of both polymorphs and indicates as polymorphic mixture in the bulk material.


%Transmittance
Wavenumbers (cm-1)
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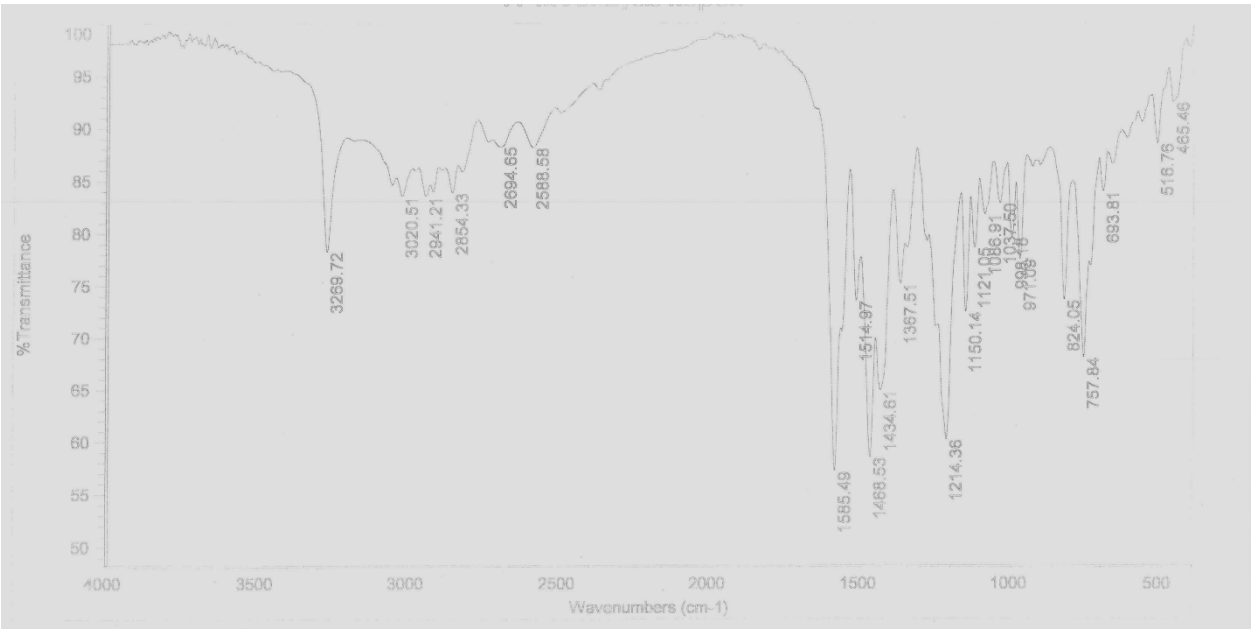
2925.93
2882.30
2843.49
2798.80
1586.34
1560.94
1524.18
1462.93
1419.92
1342.87
1286.70
1220.45
1140.44
1004.29
969.62
848.21
782.35
756.96
709.67
663.19
605.95
562.39
508.29
461.81

(a)


%Transmittance
Wavenumbers (cm-1)
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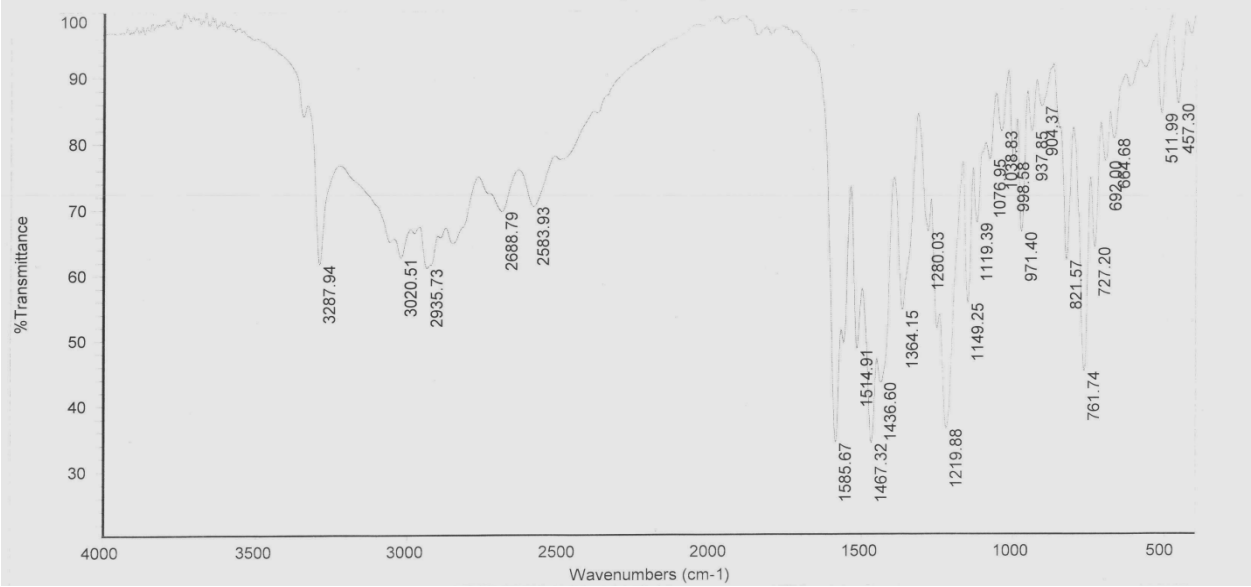
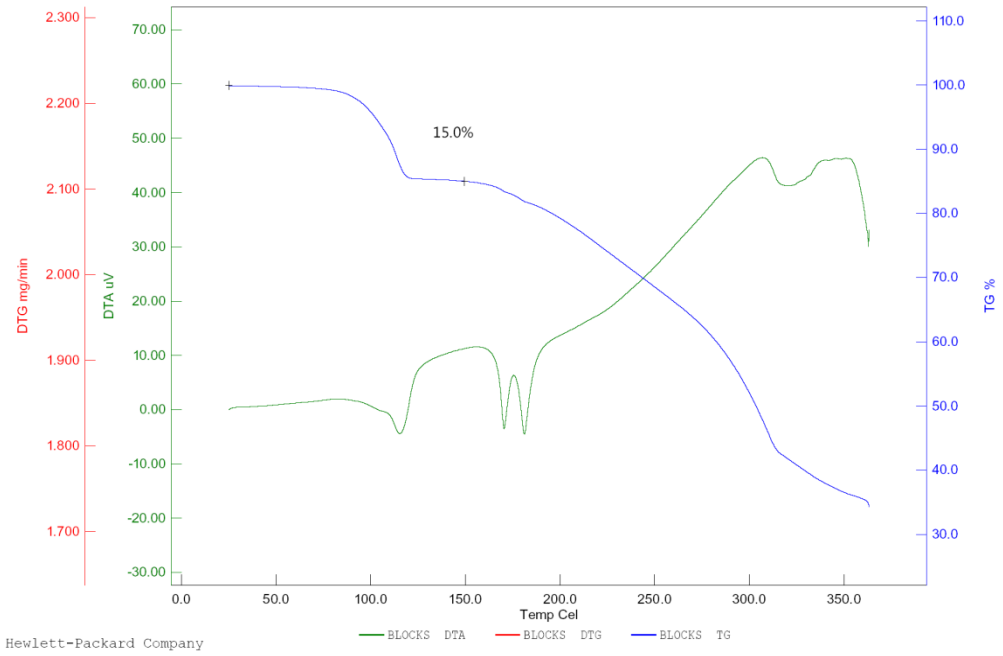
3020.51
2941.21
2854.33
2694.65
2588.58
1585.49
1514.97
1468.53
1434.61
1367.51
1214.36
1150.14
1121.05
1086.91
1037.50
824.05
757.84
693.81
516.76
485.46

(b)

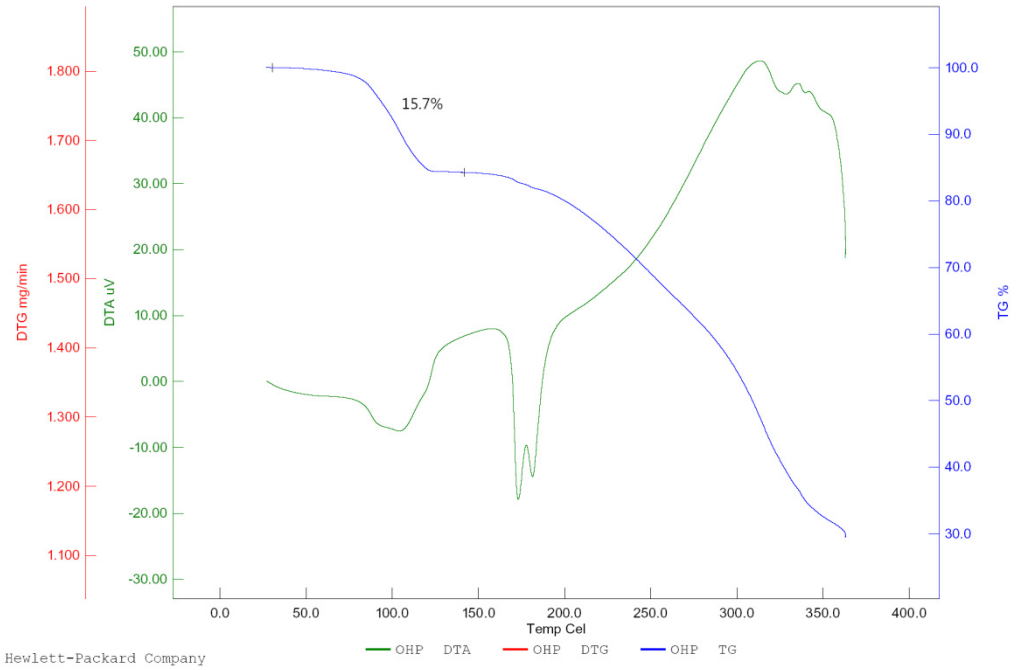


(c)

Fig. S10 FT-IR spectra of (a) olanzapine (b) Olanzapine-hydroquinone-toluene form I (c) Olanzapine-hydroquinone-toluene form II



(a)



(b)

Fig.S11. TGA scans of polymorphic cocrystals (a) Form I (b) Form II.