Supporting Information

S1. X-ray data for acetaminophen crystallized from pure ethanol and in the presence of α-lactose monohydrate, D-mannitol, graphite, L-histidine and sodium chloride.

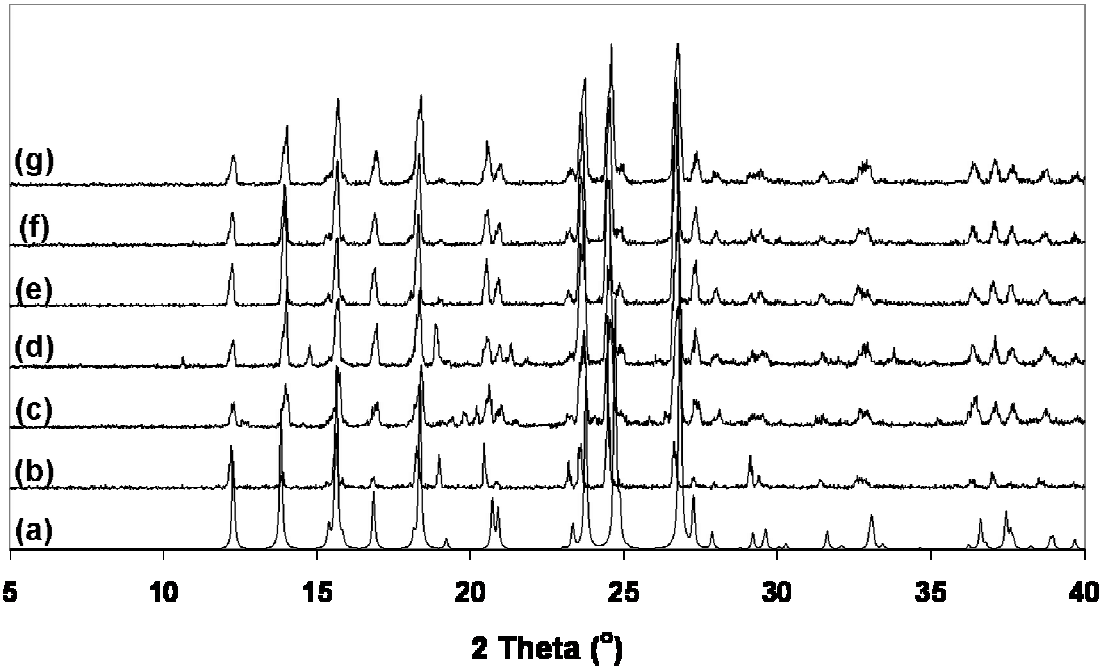

Figure S1. X-ray diffraction data for (a) AAP Form I simulated in Mercury 2.4 (b) AAP from pure ethanol (c) AAP crystallized in the presence of α-lactose monohydrate (d) AAP crystallized in the presence of D-mannitol (e) AAP crystallized in the presence of graphite (f) AAP crystallized in the presence of L-histidine and (g) AAP crystallized in the presence of sodium chloride.

Diffraction pattern simulated in Mercury 2.4 using CIF file found in Cambridge Structural Database (REF Code: HXACAN07).

S2. Optical micrographs of the α-lactose monohydrate and D-mannitol crystals used in the induction time measurements.

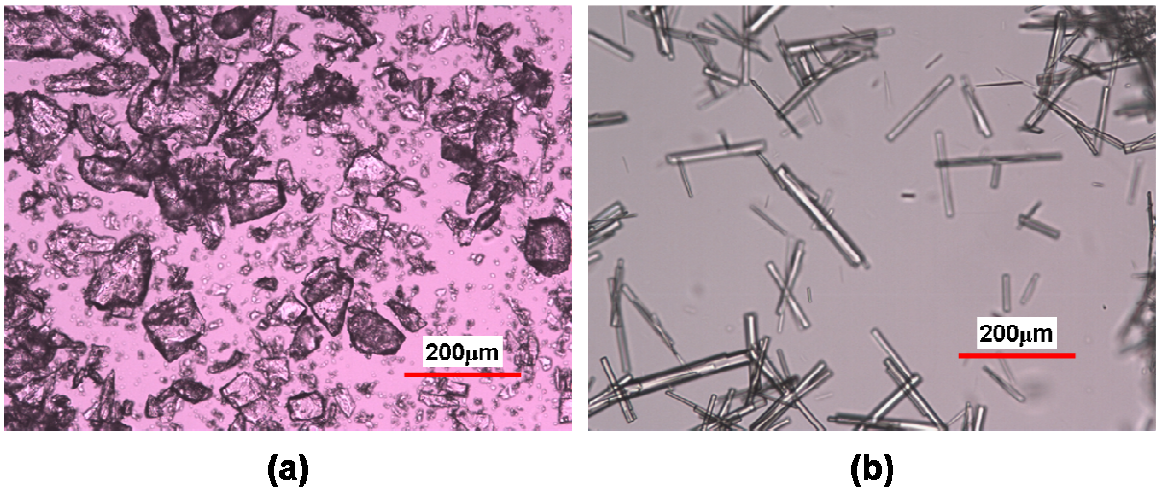

Figure S2. Optical micrographs of (a) α-lactose monohydrate and (b) D-mannitol crystals used in the acetaminophen induction time experiments.

S3. EpiCalc epitaxy calculation for (0-11) Form I acetaminophen with (0-11) α-lactose monohydrate and (100) Form I acetaminophen with (00-1) D-mannitol.

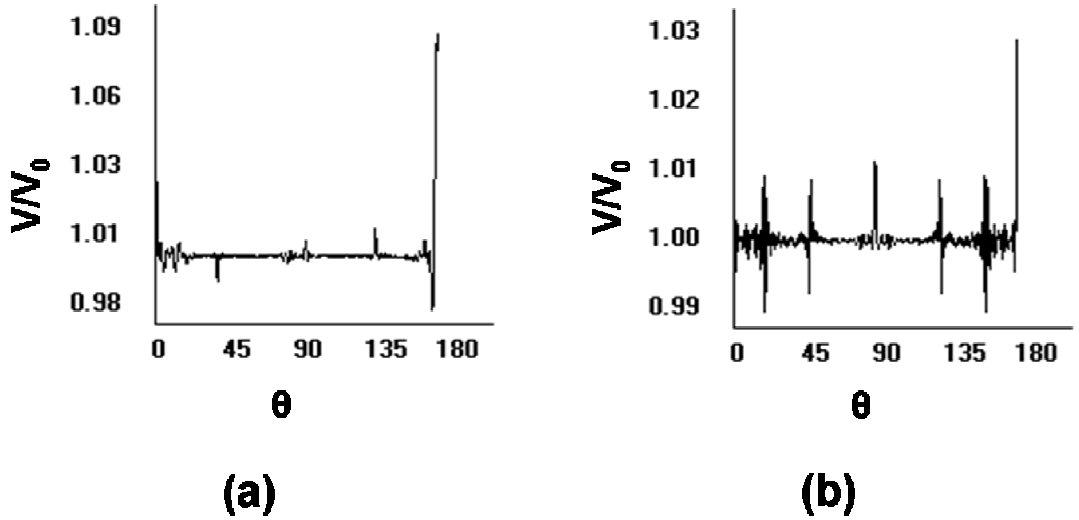

Figure S3. A plot of dimensionless potential energy (V/V_0) as a function of orientation angle (θ) for **a)** (0-11) face of acetaminophen and (0-11) face of α-lactose monohydrate and **b)** (100) face of acetaminophen and (00-1) of D-mannitol.

The EpiCalc calculations were performed using the following lattice values for the (0-11) and (100) faces of Form I acetaminophen, the (0-11) face of α-lactose monohydrate and the (00-1) face of D-mannitol:

(0-11) Form I acetaminophen: a = 14.84 Å, b = 7.09 Å and $\beta = 96.12^o$

(100) Form I acetaminophen: a = 11.62 Å, b = 9.23 Å and $\beta = 90^o$

(0-11) α-lactose monohydrate: a = 15.19 Å, b = 9.57 Å and $\alpha = 95.85^o$

(00-1) D-mannitol: a = 16.9 Å, b = 8.69 Å and $\alpha = 90^o$

The acetaminophen overlayer dimensions were 25 x 25 cells and the orientation angle range tested was 180^o with a step size of 0.25^o.

S4. EpiCalc epitaxy calculation for the (100) and (0-11) faces of Form I acetaminophen with the (002) face of graphite

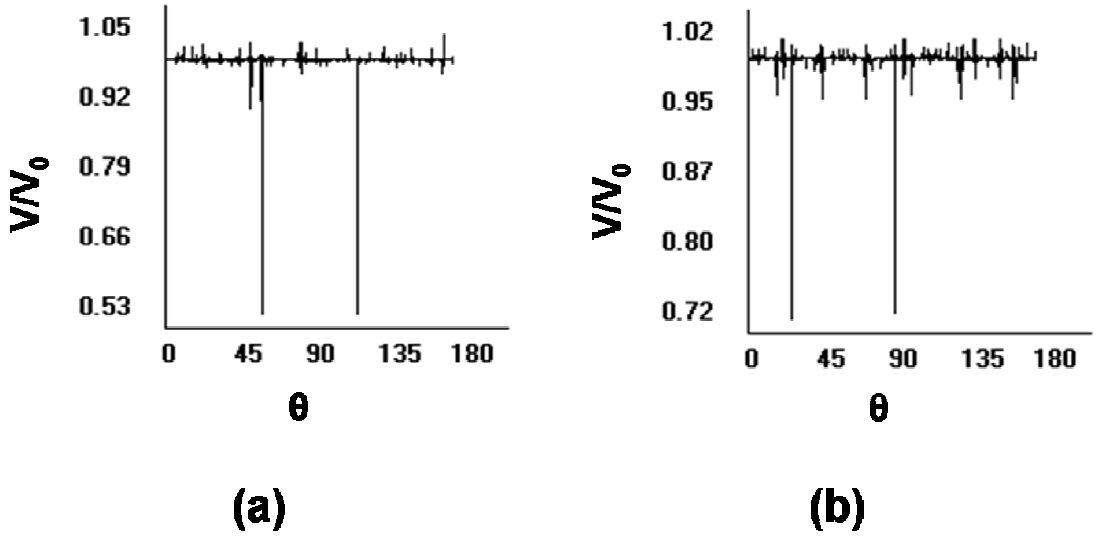

Figure S4. A plot of dimensionless potential energy (V/V_0) as a function of orientation angle (θ) for **a)** (100) face of acetaminophen and (002) face of graphite and **b)** (0-11) face of acetaminophen and (002) of graphite.

The EpiCalc calculations were performed using the following lattice values for the (100) and (0-11) faces of Form I acetaminophen and the (002) face of graphite:

(100) Form I acetaminophen: a = 11.62 Å, b = 9.23 Å and $\beta = 90^o$

(0-11) Form I acetaminophen: a = 14.84 Å, b = 7.09 Å and $\beta = 96.12^o$

(002) graphite: a = b = 2.456 Å and $\alpha = 120^o$

The acetaminophen overlayer dimensions were 25 x 25 cells and the orientation angle range tested was 180^o with a step size of 0.25^o.

S5. Table displaying the minimum interaction energy and optimal orientation angle between the D-mannitol (00-1) face and acetaminophen (100) face at different interplanar distances

Interplanar distance (Å)	Azimuthal Angle (°)	Interaction energy per cell (kcal/mol)
7	90	-0.50
6.8	270	-0.55
6.6	270	-0.61
6.4	270	-0.66
6.2	270	-0.72
6	270	-0.78
5.8	270	-0.83
5.6	90	-0.92
5.4	90	-1.01
5.2	90	-1.11
5	90	-1.24
4.8	90	-1.39
4.6	90	-1.56
4.4	90	-1.72
4.2	75	-1.91
4	25	-2.16
3.8	25	-2.45
3.6	25	-2.77
3.4	25	-3.06
3.2	270	-3.33
3	90	-3.78
2.8	90	-4.28
2.6	90	-4.78
2.4	90	-4.99
2.2	90	-4.85
2	155	-4.84
1.8	270	-5.15
1.6	270	-5.59
1.4	270	-5.61
1.2	270	-4.53
1	260	-1.93
0.8	260	3.94
0.6	260	20.93
0.4	90	57.26
0.2	90	108.45

S6. Table displaying the minimum interaction energy and optimal orientation angle between the α-lactose (0-11) face and acetaminophen (0-11) face at different interplanar distances

Interplanar distance (Å)	Azimuthal Angel (°)	Interaction energy per cell (kcal/mol)
6	265	-2.00
5.8	265	-2.25
5.6	265	-2.53
5.4	265	-2.84
5.2	265	-3.17
5	265	-3.56
4.8	265	-4.01
4.6	265	-4.53
4.4	265	-5.08
4.2	265	-5.61
4	265	-6.33
3.8	85	-7.20
3.6	85	-8.20
3.4	85	-9.19
3.2	85	-10.21
3	85	-11.31
2.8	85	-12.21
2.6	85	-13.33
2.4	85	-13.84
2.2	85	-12.98
2	265	-10.48
1.8	265	-8.39
1.6	265	-2.10
1.4	265	12.98
1.2	265	45.84
1	265	114.05
0.8	265	247.20
0.6	265	547.61
0.4	265	1200.92
0.2	265	3233.64