Alternative Text for Figures in the CrystEngComm article "*Project M: Investigating the effect of additives on calcium carbonate crystallisation through a school citizen science program.*"

Figure 1 Alternative Text:

An arrow with the text 'Reagents (and additives)' points down into a conical flask. In the conical flask there are colourful bubbles with different words in the centre representing the different variables. These variables are: pH, molecule size, solvent, reaction time, charge, mixing time, and polarity. Another arrow (with the words 'Filter, Wash and Dry') is in the centre of the image and it links the conical flask on the left with two glass petri dishes on the right. The petri dishes show the two options for the polymorph formation in this reaction, either (a) dominated by calcite entirely or (b) a mix of calcite and vaterite.

Figure 2 Alternative Text:

(a) Crystal structures of calcite and vaterite, showing how the carbonate lies horizontally in calcite and vertically in vaterite when both are viewed down the b axis. The calcium is represented by large green balls, with the carbon and oxygen represented as smaller black and red balls respectively.
(b) Diffraction data for a representative sample with calcite and vaterite. There is a good fit between the observed and calculated data, with very small differences mainly located around the largest calcite peak at 15.6 degrees 2Theta, which is the (104) peak.

Figure 3 Alternative Text:

A plot of the standard deviation ('s.d.') of the lattice parameters a and c for calcite and vaterite. The calcite values are shown first, with small deviations (<0.005) for the calcite Controls and calcite Mixing-only *a* and *c* lattice parameters. The values for All Additives and the literature biogenic are similar, whereby the calcite *c* s.d. is >0.05 for both but the *a* is ~ 0.01. The values for literature synthetic (for pure calcite) has a small s.d. for calcite *a* but a s.d. of 0.01 for the c. The vaterite s.d.s are all smaller than 0.005 for the vaterite Controls, vaterite All Additives and vaterite Mixing.

All values reported in this graph are available in the supplementary information.

Figure 4 Alternative Text:

The top plot shows the calcite lattice parameter *c* binned between 17.040 and 17.125. The plot shows both the calcite Controls data and the data for All Additives calcite samples. The majority of the former are concentrated between 17.050 and 17.066. All Additives Samples have two discrete populations, peaking at 17.065 and at 17.083 (the latter is a smaller peak).

The bottom plot shows the vaterite lattice parameter *a* binned between 4.122 and 4.132. The plot shows both the vaterite Controls data and the data for All Additives vaterite samples. The majority of the former are concentrated between 4.126 and 4.130, peaking at 4.128.

Figure 5 Alternative Text:

A plot of the calcite:vaterite polymorph indicator, where a value greater than 2 indicates the dominance of calcite in the samples studied. The Controls value lies at 2.19, with Arg, Leu, Lys, Mixing, PimAci, SucAci and Val all lie above or close to 2, therefore being dominated by calcite. Cys, Ile and Met sit around 1.75. The rest of the samples lie beneath 1.5.

Figure 6 Alternative Text:

The mean values of calcite c for the samples of highest concentration/longest mixing time. Glu shows the biggest variation (ca. 17.095 angstroms) but also has the biggest standard deviation. Asn, Asp, Cyc, Gln, Gly, His and Met are all relatively large for calcite c (ca. 17.08-9).

Figure 7 Alternative Text:

A plot of the standard deviations for the calcite lattice parameter c for each of the additives. Most of the standard deviations lie above the controls line, apart from Arg, Ile, Lys, Phe, PimAci, Pro, Val, and Mixing - less than 0.004. Glu is the largest (more than 0.015), followed by Gln, Trp, Ser and then Asp (all more than 0.010).

Figure 8 Alternative Text:

A plot of the standard deviations for the vaterite lattice parameter *a* for each of the additives. Most of the standard deviations lie beneath the controls line, apart from arginine, aspartic acid, glutamic acid, malonic acid, and succinic acid. Alanine, asparagine, and phenylalanine all lie just above the controls line. The mixing standard deviation is very small - less than 0.0004.

Figure 9 Alternative Text:

This figure is a collection of 6 plots showing the log of the standard deviation of calcite (on x axis from 0.001 to 0.1) against the log of the standard deviation of vaterite (on y axis from 1E-4 to 0.001). The first plot discussed below is used as a reference for the remaining five graphs, described the positions of the values relative to the positions of Controls, All Additives and Mixing.

1. The first graph on the top left shows the data points for Controls, All Additives and Mixing. Controls has a similar vaterite value for All Additives (ca. 0.001) and a close but slightly larger value for Calcite than Mixing. Mixing has the smallest vaterite and calcite values, whilst All Additives has the largest values for both vaterite and calcite (0.01).

2. The second graph on the top right shows the values for Special Cases, which includes Pro, Cys and Gly. Pro lies close to mixing but with slightly larger values. Cys lies just to the right of All Additives on the calcite axis and Gly overlaps almost directly with All Additives

3. The third graph lies in the middle left with values for the polar uncharged side chains. Asn and Thr lie just to the right of Controls on the calcite axis, with Thr situated just beneath Asn on the vaterite

axis. Ser lies close to Thr on the vaterite axis but is located just to the left of All Additives on the calcite axis. Gln is positioned roughly in the middle of the Controls and All Additives on the calcite axis and roughly between Controls and Mixing on the vaterite axis.

4. The fourth graph on the middle right is for the electrically charged side chains. Lys is located on between Controls and Mixing on the vaterite axis and just to the left of Mixing on the calcite axis. His lies close to Controls and All Additives on the vaterite axis and lies approximately halfway between them on the calcite axis. Arg, Asp and Glu all sit above All Additives and Controls on the vaterite axis, with Arg close to controls on the calcite, Asp just to the left of All Additives and Glu to the right of All Additives on the same axis.

5. The fifth graph sits on the bottom left of the Figure, including the hydrophobic side chains. Phe and Ala have similar vaterite values to the Controls, with Phe lying to the left and Ala lying to the right of the Controls (the latter sits almost halfway between Controls and All Additives). Val is halfway between the vaterite values for Controls and Mixing and is at a similar position to Phe on the calcite axis, just to the left of Mixing. Leu, Met and Trp all have similar vaterite positions to Val, with Leu lying just to the right of Controls on the calcite axis, Met lying halfway between Controls and all Additives and Trp lying just to the right of All Additives on the calcite axis. Ile is a tiny bit bigger than vaterite value for Mixing and sits the furthest to the left for calcite in this graph.

6. The sixth graph is on the bottom right of the figure and covers dicarboxylic acids. AdiAci is located in the middle of the calcite values for Controls and All Additives and in the middles of the vaterite values for Mixing and Controls. PimAci has a similar vaterite value to Controls but has a smaller calcite value than Controls. MalAci and SucAci are located just above All Additives on the vaterite axis and sit in between Controls and All Additives on the calcite axis.

Figure 10 Alternative Text:

The top graph shows the mean values of calcite grouped according to the additive group are shown (sitting between 17.055 and 17.085 angstroms). The controls and mixing are both at the lower end of this scale, with Asp and Glu (both negatively charged side chains) showing the highest mean value and having the highest standard deviation. The special cases of Cys and Gly are the second highest mean values, but Pro is much smaller. For the positively charged side chains, His is the largest one, with Arg and Lys being much smaller (closer to the Controls). All of the hydrophobic additive mean values are quite small (but not as small as the controls/mixing). Polar uncharged side chain additive mean values are slightly higher than the hydrophobic group. The dicarboxylic acids are all quite similar sitting in between the hydrophobic and polar uncharged groups.

The bottom graph shows the mean values of vaterite grouped according to the additive group are shown (sitting all just under 4.13 angstroms). The standard deviation of these values is tiny, and the trend across all the mean values approaches a straight line. The scale of the axis is the same as for calcite, highlighting the scale of the differences.