Application of a novel impedance-based freeze drying microscope for formulation development

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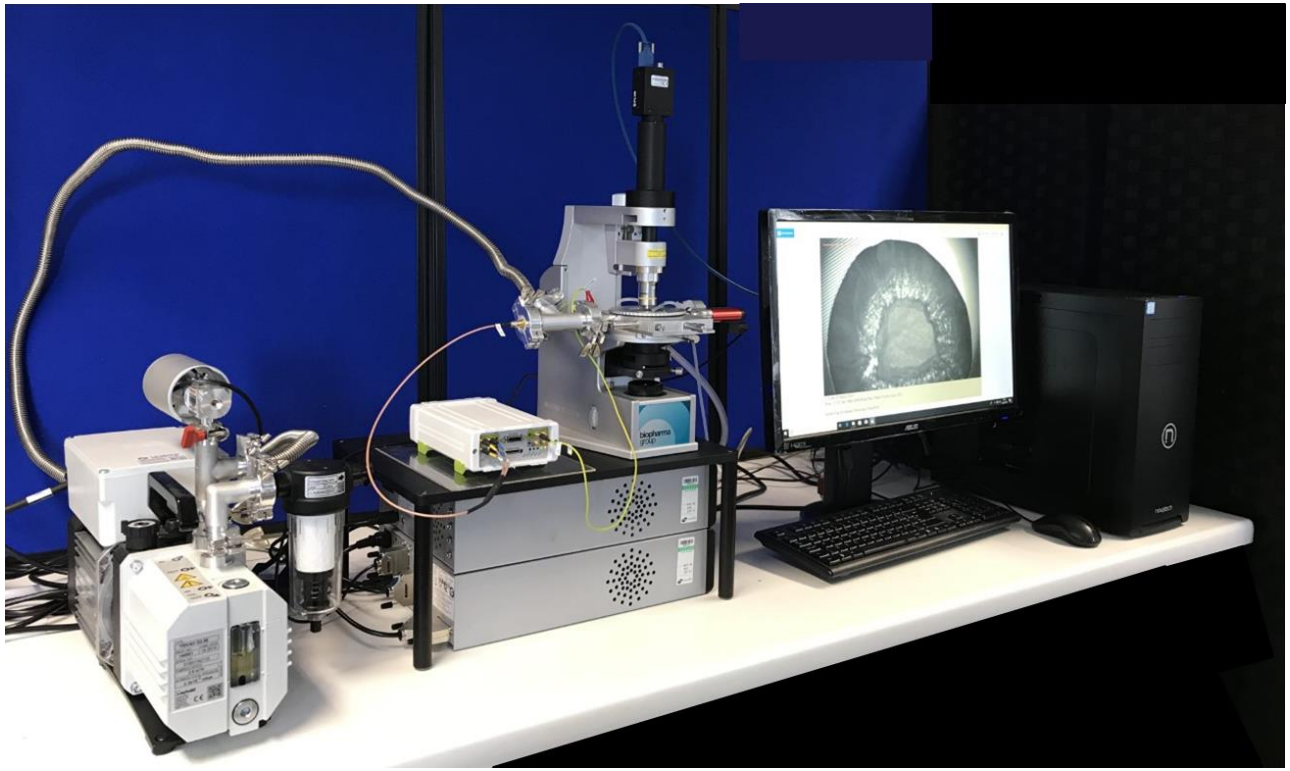

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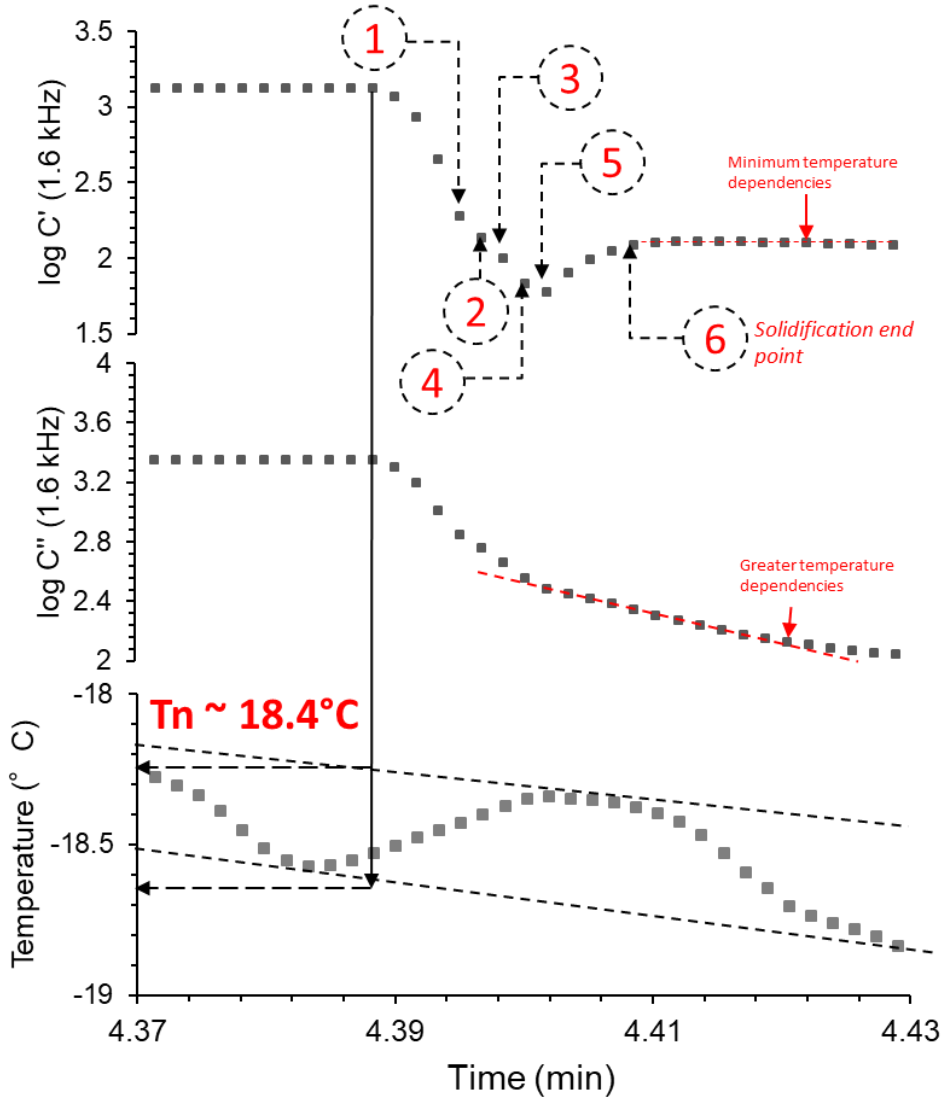
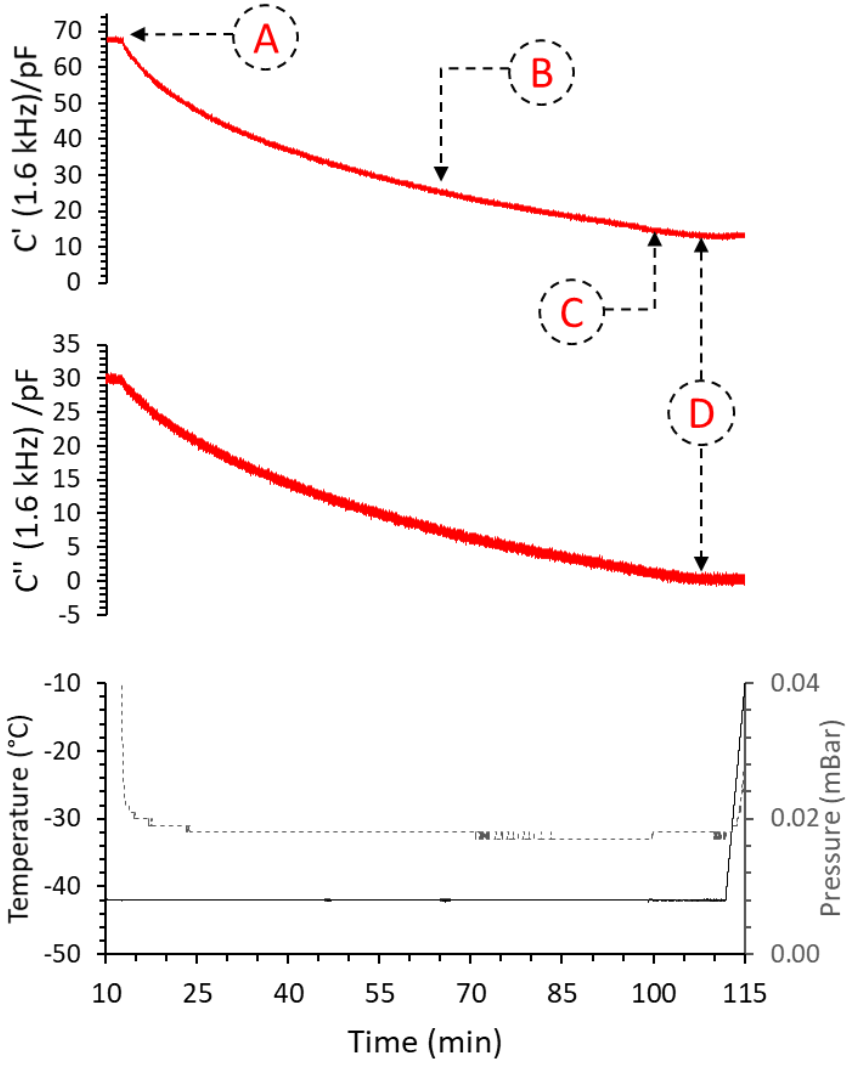
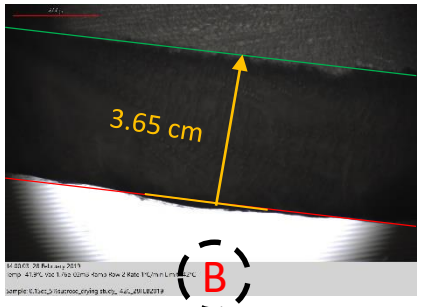
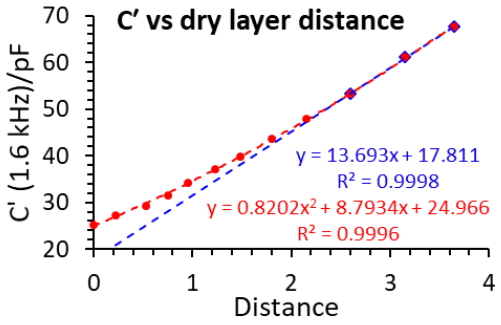


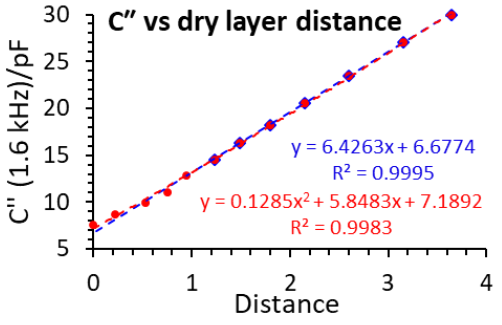
Z-FDM is sensitive and captures minute changes in the freezing step. At point 6 (solidification end-point), the C' has minimum temperature dependency.



- C′ and C″ decrease continuously until the ice disappears (Point D).
- Between point A & B, the dry layer distance measured to estimate the drying rate.

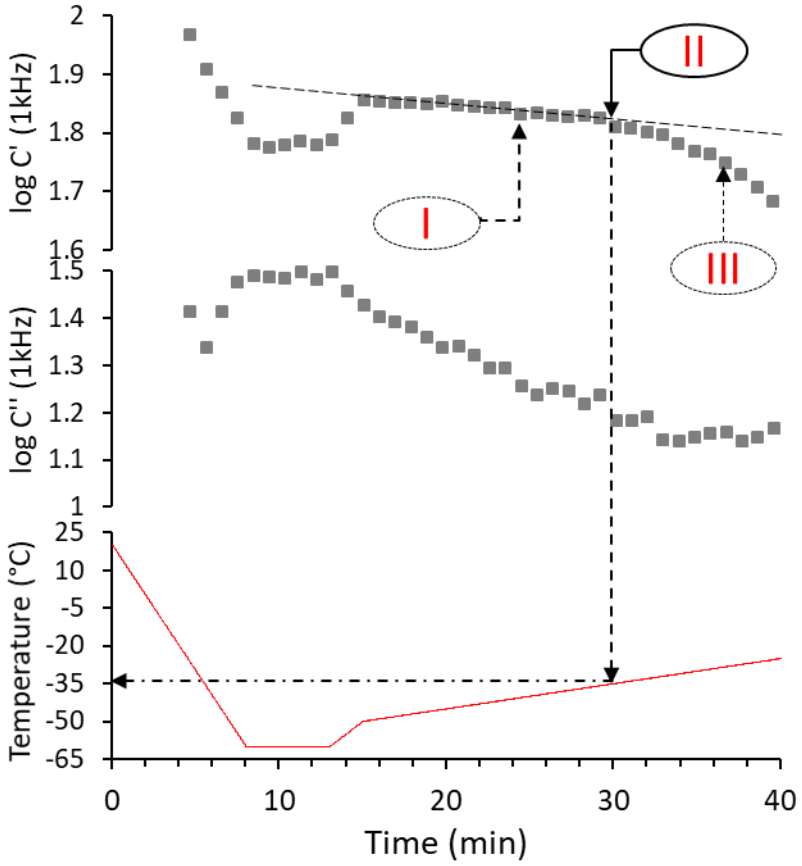


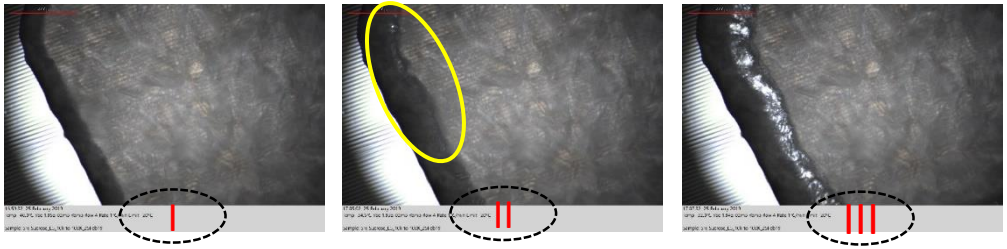




NB: Distance is an arbitrary unit.

C″ is more **linear** with the dry layer length and therefore more suited to drying rate calibration





The onset of collapse temperature was recorded at -34.5°C by a change in gradient of the real capacitance at 1KHz (point II)

To conclude

Parameter	C′	C″
Nucleation onset	✓	✓
Solidification end-point	✓	-
Drying rate	-	✓
Collapse temperature	✓	-