

Molecular
Dimensions

NEW PRODUCT!

TG40



Straight forward temperature screening

It has long been recognised that temperature should be utilized more effectively in the crystallization of bio-molecules. With targets becoming ever more difficult to crystallize, introducing a simple and effective temperature screen to induce and optimise crystallization has never been more important. The TG40 opens the door to the routine sampling of temperature in everyday crystallography:

Why Screen temperature?

The Science:

Making temperature work for you – *the three "i"s"*:

Increasing crystallization space search alongside precipitant, pH, buffer etc.

The ability to **easily sample an incremental range of temperatures in a single location** can yield both new crystal hits and improved crystal forms.

Probe solubility - around 80% of proteins display a temperature dependence^(1,2), as well as the phase behaviour of protein-detergent solutions^(3,4)

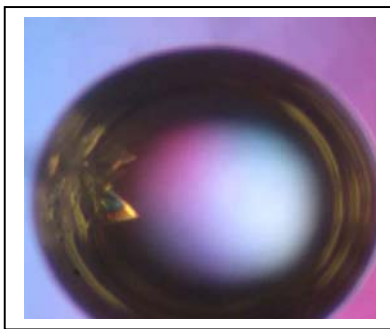
Influence the kinetics of crystallization by **altering diffusion and equilibrium rates**⁽⁵⁾

Inducing crystal growth - increasing supersaturation:

A controlled slow drop in temperature is a powerful strategy rarely employed in macromolecular crystallography. In lower salt systems this can **fine tune the level of supersaturation and hence nucleation**⁽⁶⁾.

Improving crystal quality - uncoupling nucleation from growth⁽⁷⁾:

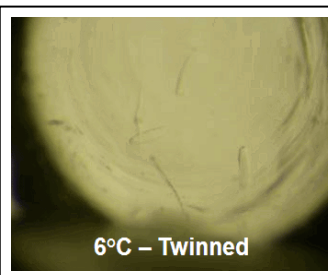
A temperature shift⁽⁶⁾ or temperature cycling (combined with seeding)⁽⁸⁾ during a crystallization can yield dramatic **improvements in both size and quality**. Temperature screening can also **resolve twinning and alter crystal space group**.



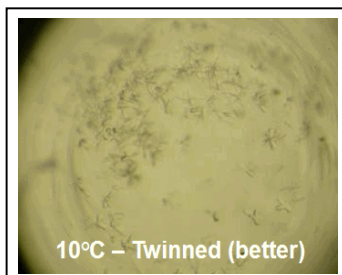
17mer RNA at 16°C –
clusters – 7Å diffraction
(Saridakis, NCSR, Athens, Greece)



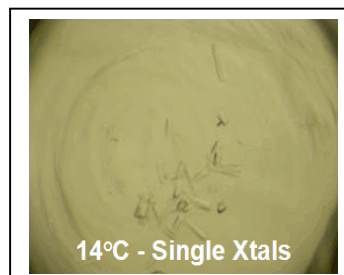
17mer RNA at 37°C –
single crystal – 1.6Å
diffraction
(Saridakis, NCSR, Athens, Greece)



6°C – Twinned

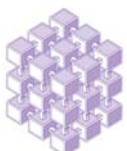


10°C – Twinned (better)



14°C - Single Xtals

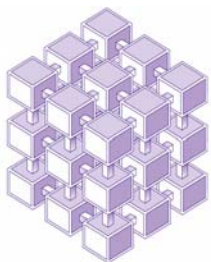
Protein crystal
improvement – images
courtesy of Andrew Bent.



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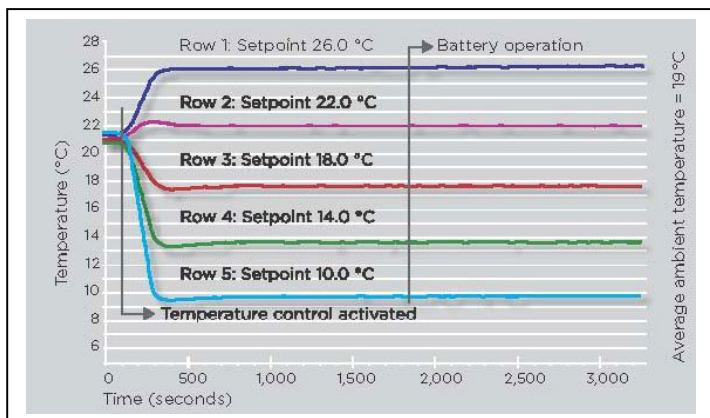


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The Solution:



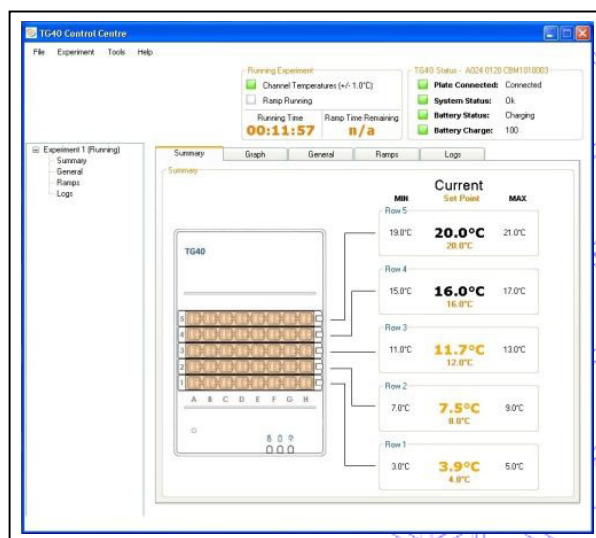
The graph on the left shows the performance of the TG40. Initially the microplate is connected to the docking station and running off an external power supply. At 100s the automatic temperature control system is activated, which had previously been programmed to maintain the temperature of rows 1 to 5 at 26.0°C, 22.0°C, 18.0°C, 14.0°C and 10.0°C respectively. At 1850s the plate is disconnected from the external power supply and continues temperature controlled operation using the built-in battery. The switch between power sources has no effect on the accuracy and stability of the temperature control system.

Features of the TG40:

- Accurately control and screen **5 different temperatures simultaneously** - one set temperature per row.
- At 20°C ambient the **temperature range is 4°C to 60°C** (accuracy is 1.0°C).
- **Portable operation**- built-in battery.
- **Disposable inserts** (3µl sub well, 60µl main well) avoid cross-contamination.



- **40 wells (5x8)** of standard SBS pitch for ease-of-use with automation.



- **Simple, intuitive software** for protocol set up and recording.

Product Specifications:

Temperature range: 4°C to 60°C.
Temperature accuracy: 1.0°C.
Well pitch and position: Standard 9mm SBS (96-well).
Portable operation: Typically 30 minutes.
Microplate Dimensions: 127.7 mm (L), 85.4 mm(W), 28.0 mm(H).
Weight: 500 grams.
Power supply: 120-240VAC, 50/60Hz.

Manufactured by Centeo Biosciences, UK.

References:

- (1) Christopher *et al.* (1998) *J. Cryst. Growth* **191**,820.
- (2) Zhu *et al.* (2006) *J. Struct. Biol.* **154**,297.
- (3) Garavito & Picot (1991) *J. Cryst. Growth* **110**,89.
- (4) Lorber *et al.* (1991) *J. Cryst. Growth* **110**,103.
- (5) Lorber & Giegé (1992) *J. Cryst. Growth* **122**,168.
- (6) L. Lloyd Haire, in T.M. Bergfors(ed) *Protein Crystallization (1st edition)*, I.U.L. 1999, pp. 65-68.
- (7) Penkova *et al.* (2002) *Acta Cryst.* **D58**,1606.
- (8) Budayova-Spano *et al.* (2007) *Acta Cryst.* **D63**, 339.



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