

Freezing samples in glass vials

The short-term freezing of samples in glass vials down to approx. -4°C generally causes no problem. For storage down to -80°C , whether short or long term, it is the closures that determine whether freezing is successful rather than the borosilicate glass laboratory vials. In any case, certain basic principles should be observed.

- Observe the coefficient of thermal expansion
- Defrost evenly
- Place glass vials in a rack or storage box for the freezer
- Vial geometry and closures, the crucial point
- Carry out representative test



Observe the coefficient of thermal expansion

As a rule, the sample has a higher coefficient of thermal expansion than the borosilicate glass of the laboratory vial. Therefore, the vial should only be filled to $\frac{2}{3}$, maximum $\frac{3}{4}$ of the possible volume so that the liquid has room to expand. Otherwise, the closed vial may burst due to the increasing pressure inside.

Allow the sample to freeze at an angle (approx. 45°) to increase the surface area. Organic substances expand less during cooling than aqueous substances and are therefore less problematic. The expansion of the content can be monitored during the process by gradual cooling.

Defrost evenly

It is best to defrost the vials at room temperature in the rack or storage box. If you only want to thaw individual vials from a batch of vials, it is best to place them on a plastic or wooden surface, never on metal or stone.

The content should warm up evenly from all sides. It may also be thawed from above, so that the surface liquefies first and the material can expand to the top.

Alternatively, the frozen vials can be immersed in a liquid bath, whereby the temperature difference must not exceed 100°C . Please note, however, that mechanical defects on the surface of the glass, such as severe scratches, can significantly reduce the thermal shock resistance. Avoid shock-like thawing and draughts at all costs. Do not place the vials in the sun or in an oven and do not move them during thawing. All this can lead to the vials breaking.

Place glass vials in a rack or storage box for the freezer

For freezing and thawing, it is best to place the vials in a rack or a plastic storage box. The cardboard sleeve box from infochroma's Storage and Septum Vial packaging is also suitable. Place these sleeve boxes on a grid or a corrugated base for defrosting. This prevents the cardboard from moistening due to the condensation that occurs during defrosting. Thus the sleeve box will last for three to four freezing and defrosting cycles.

Vial geometry

The larger the internal volume of the vial used compared to the opening, the better. Vials with a wide neck are more suitable than those with a narrow neck.

Closures, the crucial point

The material of the closures behaves differently to glass when cooling and thawing. It also has different temperature limits.

Crimp caps made of aluminium can withstand low temperatures without any problems.

Conventional screw caps made of polypropylene, on the other hand, can become brittle and splinter. Depending on the composition of the polypropylene this may be the case at as little as low sub-zero temperatures or not until -30 °C. infochroma's Storage Vial caps made of glass fibre-reinforced polyamide, on the other hand, work well down to approx. -40 °C. Closed-top caps seal better than open-top caps. Snap ring closures are not recommended at all.

Do not forget the septa inserted into the caps. Those made of rubber can be used down to approx. -40 °C, those made of silicone down to approx. -60 °C.

Carry out a representative test

Before storing a large number of samples at low temperature, we recommend carrying out a representative test over several freezing and thawing cycles. We are happy to provide you with the necessary samples.

We recommend our Storage Vials with glass fibre reinforced polyamide caps and inserted silicone/PTFE septum. The packaging of the Storage Vials can be used as a storage box for the freezer.

