Cell filling and cleaning procedures

TB1199 'D'

Product :	Zetasizer Nano series
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Immediate ☑
Next visit ☐
On failure ☐
Information only ☑

Introduction

When using cells with the Zetasizer Nano series instruments it is important to undertaken certain cleaning and filling procedures.

Filling the cell

When filling the cell there are several actions to consider; some that applies to all cells and other actions that are only applicable to the measurement type and the cell chosen.

General advice

- Only clean cells should be used.
  All size and zeta potential cells should be rinsed/cleaned with filtered dispersant before use - see **Cleaning the cells** later in this document.
  All molecular weight cells should be rinsed/cleaned with the filtered standard (i.e. Toluene) or solvent before use.
- The cell should be filled slowly to avoid air bubbles from being created. Ultrasonication can be used to remove air bubbles - but only if the sample is suitable for use with ultrasonics.
- If using syringe filters for the dispersant, never use the first few drops from the syringe, in case there are any residual dust particles in the filter that may contaminate the dispersant.

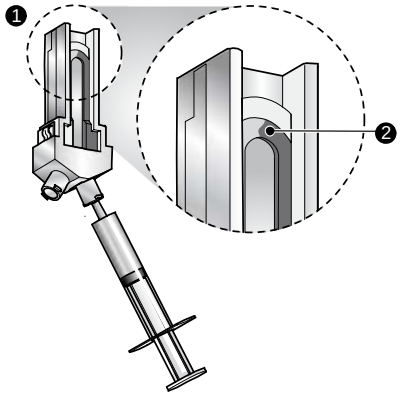
Zeta potential measurements

The two cells used for zeta measurements are the folded capillary cell and the dip cell; the dip cell will use square cuvettes to hold the sample. Though filling either cell is a simple task, there are a number of precautions to be aware of.

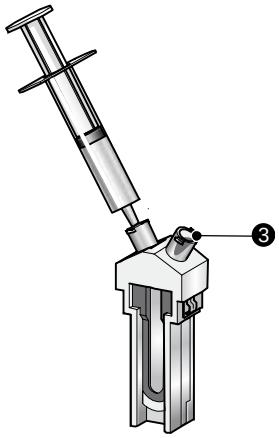
Folded capillary cell

Filling the folded capillary cell is a simple task, though there are a number of precautions to be aware of. Fill the cell as described below:

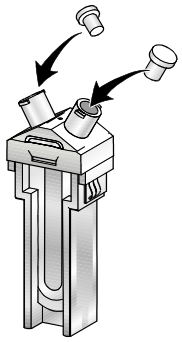
- Invert the cell ①.
- **Slowly** inject the **Zeta potential transfer standard** sample from its syringe into the cell, filling the U tube to just over half way ②.



- Check no air bubbles form in the cell. Tap the cell gently to dislodge any that do form.
- Turn the cell upright and continue injecting **slowly** until it is full ③.



- Check again for bubbles in the cell. Tap the cell gently to dislodge these.
- Check that the electrodes are completely immersed.
- Remove the syringe and insert a cell stopper in **each** port

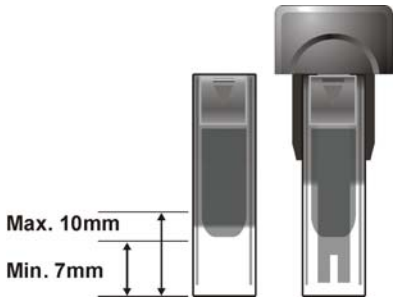


- Remove any liquid spilt on the electrodes.

Note: The stoppers **must** be fitted before a measurement is performed.

Universal 'Dip' cell

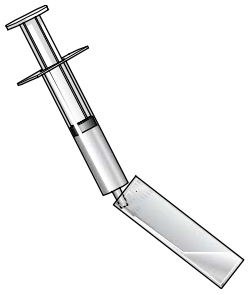
With the insertion of the dip cell the sample will be displaced upwards within the cuvette. If too much sample is placed into the cuvette prior to insertion of the dip cell there is a risk that the cuvette will overflow.



To ensure a minimum sample volume is provided for the sample to be measured, but protect against overfilling we recommend the cuvette is filled to a depth of between **7mm** and **10mm** (**before** the dip cell is inserted). The minimum level relates to approximately **0.7ml** of sample.

Do not overfill the cuvette; as well as overflowing the cuvette once the dip cell is inserted, this can also produce thermal gradients within the sample that will reduce the accuracy of the temperature control.

- **When filling**, tilt the cuvette and allow it to fill slowly.
- To stop bubbles forming let the sample flow down the inside.



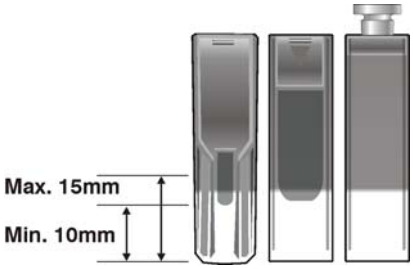
With the Dip-cell inserted, if necessary tap the cell lightly to dislodge any bubbles that may be caught between the electrodes.

Size and Molecular weight measurements

Standard cells

A minimum sample volume must be provided. However, this minimum volume depends on the actual cell type and it is easier to ensure a certain **depth** of the sample in the cell.

This **minimum** is **10mm** from the bottom of the cell (the measurement is made 8mm from the bottom of the cell).



Do not overfill the cell, about **15mm maximum**, as this can produce thermal gradients within the sample that will reduce the accuracy of the temperature control.

- **When filling**, tilt the cuvette and allow it to fill slowly.
- To stop bubbles forming let the sample flow down the inside.

Note: When filled place a lid securely on the cuvette.

Low volume cell

This cell is designed to use the minimum volume of sample possible for a size or molecular weight measurement. The sample must be pipetted carefully into the bottom of the cuvette, so it is filled from the bottom up.

The minimum volume that can be used is 12 microlitres. This will only partly fill the visible cell volume. After filling, carefully inspect the cell for trapped bubbles.

Cleaning the Cells

It is very important that the cells are cleaned thoroughly between measurements and especially between different types of sample. Any cross-contamination between samples can seriously affect the results.

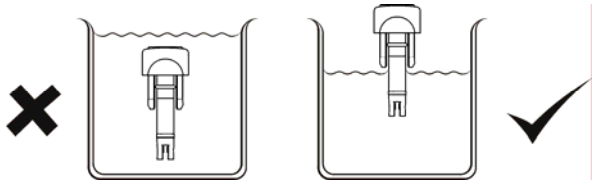
Cleaning the Universal 'Dip' cell

Caution:
Do not immerse the complete cell. Only the electrodes must dip in to the dispersant as shown below.

During a dip cell measurement, the voltage is applied across narrowly spaced electrodes. The higher currents produced in this electrode arrangement dictates that regular cleaning of the electrodes is critical. The cell electrodes are made of solid palladium and can be cleaned physically and chemically.

Cleaning procedure:

- Immerse the electrodes in a gentle ultrasound bath (30Watts) for 5 to 15 minutes before use. For the cleaning fluid, use the dispersant used for the previous sample. If the dispersant contains additives such as surfactants, follow this by ultrasonicating for two minutes in the pure solvent. Take account of any health and safety issues, as ultrasonication can produce a fine aerosol of the liquid in the bath.



- On removal from the bath rinse electrodes with pure solvent.
- Before a measurement, rinse the electrodes and the cuvette with the sample you are measuring.
- Each time you change the sample, the electrode needs to be thoroughly rinsed with pure dispersant to ensure cleanliness.
- A pipe cleaner may be used for **gentle** cleaning of the electrode.

To protect the dip cell after cleaning it is recommended it is placed into a empty cuvette for storage. This will prevent any damage occurring to the cell electrodes.

Note: The electrode holder is made from PEEK (polyetheretherketone) which is resistant to a wide range of chemical products, however, it is advisable to seek advice from Malvern and the sample manufacturer before using strong acid or strong base.

Cleaning Cuvettes

There are two main types of cuvette available, disposable polystyrene and reusable glass or quartz. Never attempt to clean and re-use disposable cuvettes. Cleaning disposable cuvettes will cause small surface scratches that will give inaccurate results.

The cleaning procedure for glass or quartz cuvettes is dependent on the sample that was measured, therefore specific instructions can not be given here. However, the following advice should be followed:

- Rinse the cuvette with the same dispersant that was used for the measurement, i.e. if the sample was dispersed in water - use clean water to rinse it.
- Try submerging the cuvette in an ultrasonic bath of clean solvent.
- Once clean, wipe the cuvette with a lint free tissue (photographers lens cleaning tissues are recommended).
- The smaller and more dilute the sample being measured, the more important the cleanliness of the cuvette.

Cleaning the Folded capillary cell

Before using a cell for the first time it is recommended that the cell be flushed through with ethanol or methanol to facilitate wetting. A syringe or a wash bottle may be used. Only sufficient fluid to wet the surface of the cell and electrodes is required.

It should then be flushed through with water as described below.

The folded capillary cell is intended to be used once then discarded, but can easily be used again if required. Using two 10ml syringes, wash the cell with the same dispersant as used for the measurement, or de-ionised water.

Procedure

- Fill one of the syringes with de-ionised water, or the dispersant being used for the measurement.
- Place the full syringe in one of the sample ports on the cell and the empty syringe into the other.
- Flush the contents of the full syringe, through the capillary, into the empty syringe.
- Repeat the flushing process 5 more times, flushing the liquid back and forth between the syringes.

After this the cell is ready for use.

Caution:
Never clean the outside of the folded capillary cell. this will cause small surface scratches that will give inaccurate results.