

Operating Instructions for Malvern Nano-Zeta Potential Instrument

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1. Sample Preparation and Handling

Type of samples: Stable dispersions of inorganic particles in both polar and non-polar solvents, stable dispersions of biomolecules such as proteins and emulsions.

Concentration: Samples with High RI (i.e. Titania) can be measured at very low concentrations but samples with low RI (i.e. proteins) require much higher concentrations.

Cell type: Plastic folded Capillary cells for aqueous samples. Quartz Dip Cell for non-polar samples. (Cells will be provided by RIC)



Dip cell



Folded Capillary cell

- Clean the cell by flushing it with ethanol followed by pure solvent (i.e. DI H₂O for aqueous samples)
- Fill the cell up to the mark using either a syringe or pipette without introducing air bubbles. If air bubbles are present, slowly tap the side of the cell until all the bubbles are gone. Make sure both electrodes are covered by the sample.

2. Turn On the Instrument

ON/Off switch is located in the back of the instrument (Closer to upper right corner). It is best to turn on the instrument at least 15 mins prior to the experiment to stabilize the Laser.

3. Software

Login to the computer and open Malvern Zetasizer software using the  desktop icon.

Type in your user name in the User name window and click OK. Your data will be stored in the software under this user name!

3.1. Create New Measurement file

Software stores your data in the measurement file.

Must create a new measurement file before the 1st use. After that you can keep using the same measurement file or create a new one based on your experiments.

3.2. Create New SOP

Creating a SOP allows you to make repetitive measurements of the same material efficiently.

Go to File → New → SOP or click  to open new SOP window. Input all the required parameters in the list on the left side by clicking each name on the list.

New SOP - Zeta Potential

File Help

Back

Measurement type: Zeta Potential

Sample

Material

Dispersant

General options

Temperature

Cell

Measurement

Instructions

Advanced

Data processing

Reports

Export

Sample name: Leave Blank

Notes: Add any notes

Custom parameters:

Parameter name	Value
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Add

Delete

☐ Show this page when the SOP is started so the user can modify and add notes.

New SOP - Zeta Potential

File Help

Back

Measurement type: Zeta Potential

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Material: Polystyrene latex

RI: 1.590 Absorption: 0.010

Click here to open materials manager

Materials Manager

Name	Refractive index	Absorption
Polystyrene latex	1.590	0.010
Protein	1.450	0.001
WS2	0.612	0.000
di-np	1.470	0.020
lipid	1.200	0.020
plga-nlx	1.000	0.020

Select your material from the list if present otherwise click Add

Material Properties

Type in details about your material. Click OK

Name:

Refractive index: Absorption:

OK Cancel Help

Modify... Add... Delete OK Cancel Help

Once the right material is selected Click OK

e.g. Absorbance

Emulsions	0.00
Latex	0.01
Coloured samples	0.3
Blue/black samples	0.9

New SOP* - Zeta Potential

File Help

Back

Measurement type: Zeta Potential

Sample

- Material
- Dispersant**
- General options
- Temperature
- Cell

Measurement

- Instructions
- Advanced
- Data processing
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- Export

Dispersant

Water

Temperature: 25.0 °C Viscosity: 0.8872 cP RI: 1.33 Dielectric constant: 78.5

Click here to open dispersant manager

Dispersants Manager

Name	Temperature (°C)	Viscosity (cP)	Dielectric constant
40% Sucrose	Any Temperature	Varies with temperature	Undefined
Acetone	Any Temperature	Varies with temperature	20.70
Decane	25.0	0.9200	Undefined
Ethylene Glycol	Any Temperature	Varies with temperature	37.70
Heptane	25.0	0.3900	Undefined
ICN PBS Tablets	Any Temperature	Varies with temperature	79.00
Isopar P	25.0	4.3000	Undefined
Kerosene	25.0	1.7400	Undefined
Methanol	Any Temperature	Varies with temperature	33.00
Methyl Methacrylate	25.0	0.5300	Undefined
Microheology Optimisation	25.0	10.0000	Undefined
Propan-2-ol	25.0	2.3200	Undefined
THF	Any Temperature	Varies with temperature	7.52
Toluene	Any Temperature	Varies with temperature	2.38

Modify... Add... Delete OK Cancel Help

Simple Dispersant or Solvent
Complex Solvent

Dispersant Properties

Name:

Temperature: °C

Viscosity: 0.0000 cP

Refractive Index: Dielectric Constant:

OK Cancel Help

Type in details about your material. Click OK

Select your dispersant from the list if present Otherwise click Add and pick the type of the solvent

Once the right material is selected Click OK

New SOP* - Zeta Potential

File Help

Back

Measurement type: Zeta Potential

Sample

- Material
- Dispersant
- General options**
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F(ka) selection

Model: Smoluchowski

F(ka) value: 1.50

Calculate

☒ Use dispersant viscosity as sample viscosity

☐ Prompt operator to enter viscosity

☐ Allow operator to specify the measurement temperature

Input the F(ka) to be used in the Henry's equation.

- ❖ For most particles in aqueous media select Smoluchowski: 1.5.
- ❖ For non-aqueous measurements, or for very small particles in low conductivity media measurements, select Huckel : 1.0.

New SOP* - Zeta Potential

File Help

Back

Measurement type: Zeta Potential

Sample

- Material
- Dispersant
- General options
- Temperature**
- Cell

Measurement

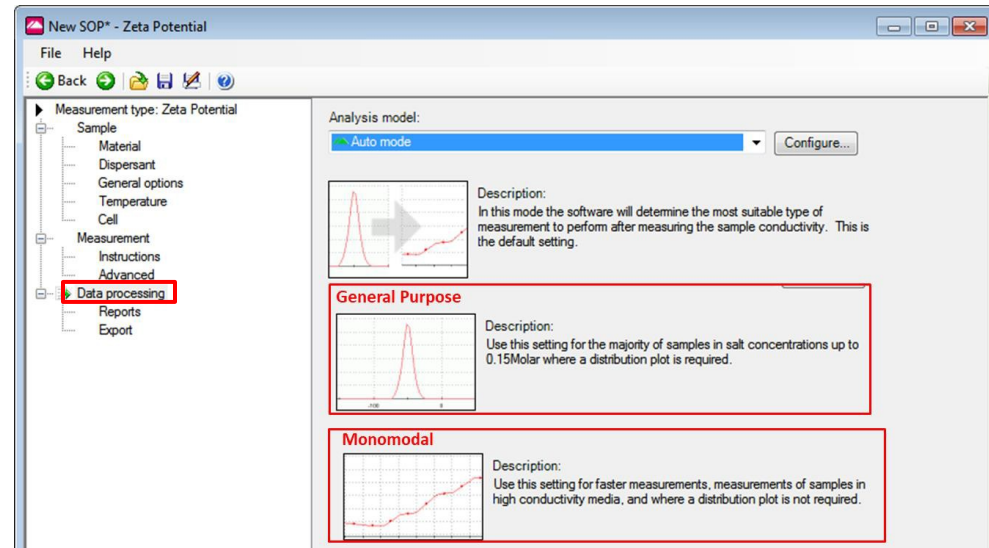
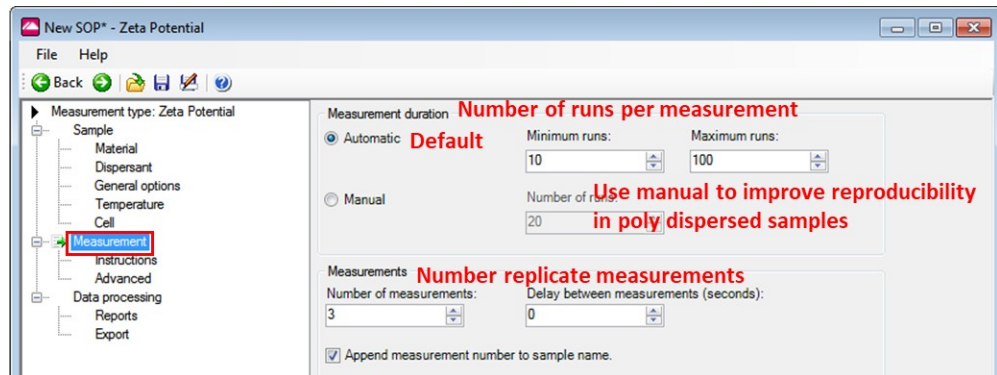
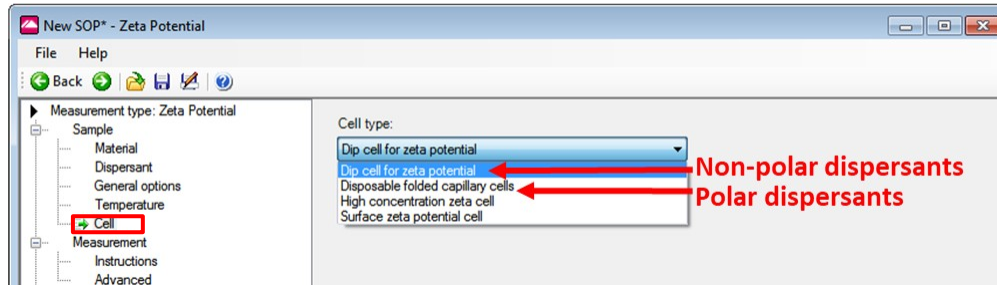
- Instructions
- Advanced
- Data processing
- Reports
- Export

Temperature: 25.0 °C

Min: 20 C Max: 90 C

Equilibration time (seconds): 120

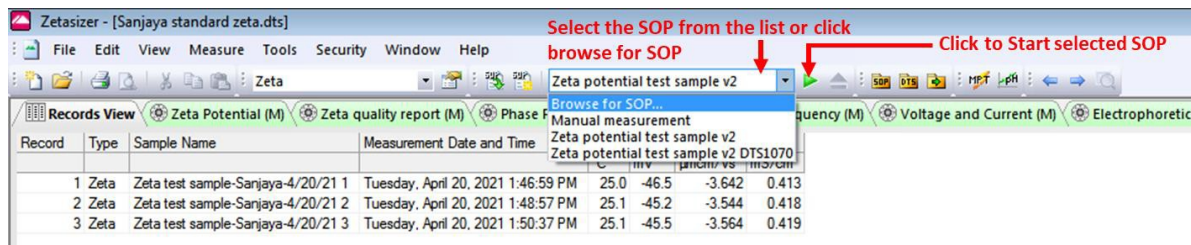
Set the desired temperature and equilibration time.



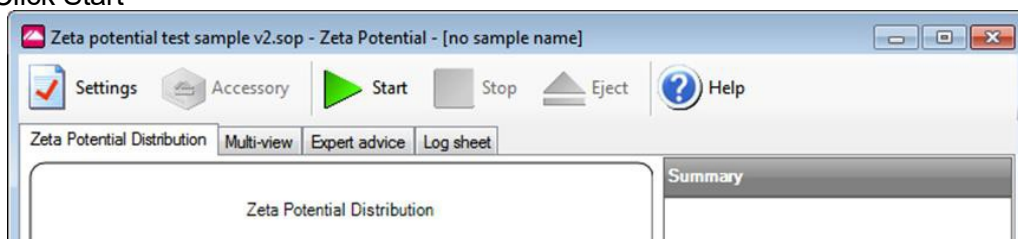
Click  Icon and Save the SOP with a preferred name in the SOP folder.

3.3. Making a measurement

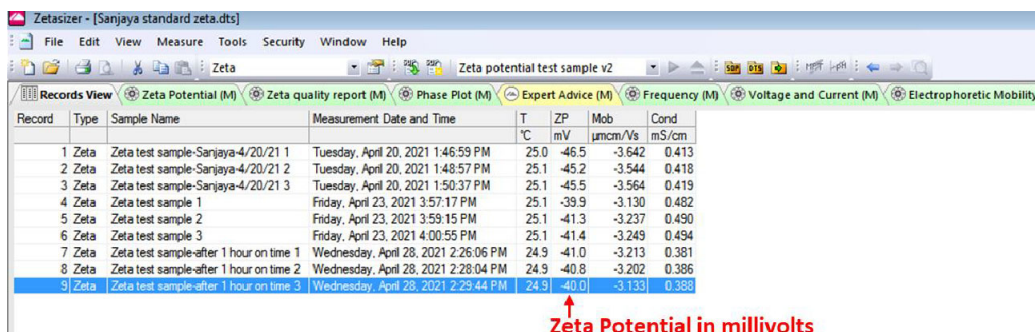
1. Select the Saved SOP from the list and click Start



2. Type sample name and click OK in the next Window.
3. Fill the correct Cell with the sample according to the instructions in Sample preparation section.
4. Open the Cell area cover by pressing the access button on the Instrument. Insert the cell filled with the sample and close the cover.
5. Click Start



6. Once all the measurements are completed data will be displayed in records view. Click on the different types of reports to view detailed results.



7. Data can be copied and pasted to Excel or other software.
- 8.

Record	Type	Sample Name	Measurement Date and Time	T °C	ZP mV	Mob µmcm/Vs	Cond mS/cm
1	Zeta	Zeta test sample-Sanjaya-4/20/21 1	Tuesday, April 20, 2021 1:46:59 PM	25.0	-46.5	-3.642	0.413
2	Zeta	Zeta test sample-Sanjaya-4/20/21 2	Tuesday, April 20, 2021 1:48:57 PM	25.1	-45.2	-3.544	0.418
3	Zeta	Zeta test sample-Sanjaya-4/20/21 3	Tuesday, April 20, 2021 1:50:37 PM	25.1	-45.5	-3.564	0.419
4	Zeta	Zeta test sample 1	Friday, April 23, 2021 3:57:17 PM	25.1	-39.9	-3.130	0.482
5	Zeta	Zeta test sample 2	Friday, April 23, 2021 3:59:15 PM	25.1	-41.3	-3.237	0.490
6	Zeta	Zeta test sample 3	Friday, April 23, 2021 4:00:55 PM	25.1	-41.4	-3.249	0.494
7	Zeta	Zeta test sample-after 1 hour on time 1	Wednesday, April 28, 2021 2:26:06 PM	24.9	-41.0	-3.213	0.381
8	Zeta	Zeta test sample-after 1 hour on time 2	Wednesday, April 28, 2021 2:28:04 PM	24.9	-40.8	-3.202	0.386
9	Zeta	Zeta test sample-after 1 hour on time 3	Wednesday, April 28, 2021 2:29:44 PM	24.9	-40.0	-3.133	0.382

To generate a PDF report, first select one or more rows of data from the "Record View." Then, click on **"Zeta Potential (M)"** to display all the data and the top result. Save the file in PDF format and transfer it to a USB drive. Below are the results from a standard solution -42mM $\pm$ 4.2 mM with dip (left) and folded cell (right).

Zeta Potential Report v2.3



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Sample Details

Sample Name: Standard 1
SOP Name: Standard_dip_Cell_03082025.sop
General Notes:

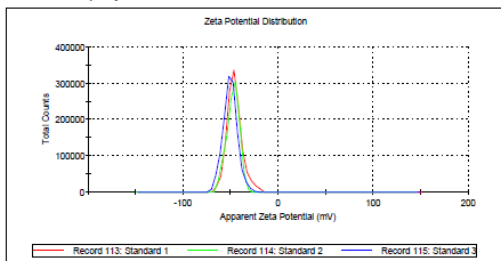
File Name: 1.mea Dispersant Name: Water
Record Number: 113 Dispersant RI: 1.330
Date and Time: Sunday, March 9, 2025 7:44:53 PM Viscosity (cP): 0.8872
Dispersant Dielectric Constant: 78.5

System

Temperature (°C): 25.0 Zeta Runs: 12
Count Rate (kops): 79.8 Measurement Position (mm): 0.00
Cell Description: Zeta dip cell Attenuator: 8

Results

Zeta Potential (mV): -46.1	Mean (mV)	Area (%)	St Dev (mV)
Zeta Deviation (mV): 8.03	Peak 1: -46.1	100.0	8.03
Conductivity (mS/cm): 0.419	Peak 2: 0.00	0.0	0.00
Result quality: Good	Peak 3: 0.00	0.0	0.00



Zeta Potential Report v2.3



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Sample Details

Sample Name: 1
SOP Name: Standard_folded_Cell_03082025.sop
General Notes:

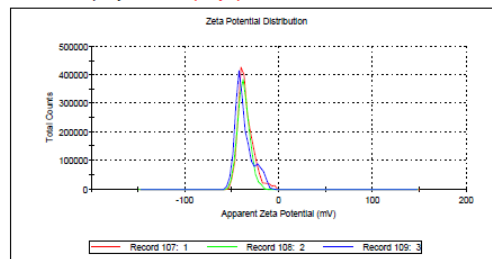
File Name: 1.mea Dispersant Name: Water
Record Number: 107 Dispersant RI: 1.330
Date and Time: Saturday, March 8, 2025 7:03:47 ... Viscosity (cP): 0.8872
Dispersant Dielectric Constant: 78.5

System

Temperature (°C): 25.0 Zeta Runs: 12
Count Rate (kops): 202.1 Measurement Position (mm): 0.00
Cell Description: Clear disposable zeta cell Attenuator: 9

Results

Zeta Potential (mV): -35.4	Mean (mV)	Area (%)	St Dev (mV)
Zeta Deviation (mV): 8.27	Peak 1: -35.6	98.8	7.93
Conductivity (mS/cm): 0.453	Peak 2: -5.98	1.2	1.83
Result quality: See result quality report	Peak 3: 0.00	0.0	0.00



If you have additional questions regarding sample preparation, instrument operation or Data analysis please contact Alope Bera. Email: bera@purdue.edu