**Zetasizer nano ZS**

**Equipment:** Zetasizer nano ZS (DLS, Malvern) and MPT-2 Multipurpose titrator (Malvern)

**No. of Equipment: IEM8**

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**Equipment Description**

**Description of equipment:**

*Zetasizer nano ZS (Malvern)*

Description of principle and use:

Dynamic light scattering (DLS) is a non-invasive, well-established technique for measuring the size and size distribution of molecules and particles typically in the submicron region. Typical applications of dynamic light scattering are the characterization of particles, emulsions or molecules, which have been dispersed or dissolved in a liquid. The Brownian motion of particles or molecules in suspension causes laser light to be scattered at different intensities. Analysis of these intensity fluctuations yields the velocity of the Brownian motion and hence the particle size using the Stokes-Einstein relationship.

Specifications and technical features:

* Temperature control range: 0°C - 90°C +/-0.1
* Light source: He-Ne laser 633nm, Max 4mW.
* Compliance with regulatory standards: ISO 13321, ISO 22412, 21 CFR Part 11.
* **Size by dynamic light scattering**
* Measurement range: 0.3nm – 10.0 microns (diameter).
* Measurement principle: Dynamic Light Scattering
* Minimum sample volume: 12µL
* Accuracy: Better than +/-2% on NIST traceable latex standards
* Precision / Repeatability: Better than +/-2% on NIST traceable latex standards
* Sensitivity: 0.1mg/mL (Lysozyme)
* **Zeta potential**
* Measurement range: 3.8nm – 100 microns (diameter)
* Measurement principle: Electrophoretic Light Scattering
* Minimum sample volume: 150µL (20µL using diffusion barrier method)
* Accuracy: 0.12µm.cm/V.s for aqueous systems using NIST

SRM1980 standard reference material

* Sensitivity: 10mg/mL (BSA)
* **Molecular weight**
* Measurement range: 980Da – 20MDa
* Measurement principle: Static Light Scattering using Debye plot
* Minimum sample volume: 12µL (3-5 sample concentrations required)
* Accuracy: +/- 10% typical

**Description of equipment:**

*MPT-2 Multipurpose titrator (Malvern)*

Description of principle and use:

The MPT-2 autotitrator is an optional accessory compatible with all members of the Zetasizer Nano series. It is designed as a sample preparation station to automate changes in the sample conditions between measurements of size, intensity and zeta potential.

The sample conditions that can be changed are: pH, conductivity, the concentration of an additive and the sample concentration.

A novel feature of the MPT-2 titrator is that two or even three different concentrations of acid or base can be connected simultaneously. During a titration, the system will automatically select the appropriate concentration of titrant. This has a number of benefits. It allows a concentrated titrant to be used to reach the extremes of pH without having to add large quantities of titrant. It also enables an accurate pH to be achieved when close to pH 7 without overshooting the target pH.

Specifications and technical features:

* Compatibility: Zetasizer Nano S, Z, ZS, S90, ZS90
* Number of titrants: Maximum of 3 connected simultaneously
* Titrant volume: 25mL for standard internal tubes, unlimited for external containers
* Minimum dispense volume: 0.28μL, 1.68μL during standard titration
* Maximum dilution factor: 15 (using 125ml beaker and insert)
* Maximum sample flow rate: 10mL/min
* Minimum sample volume: 2.5mL when using the size flow cell, 5.5mL when using pH probe, folded capillary cell and stirrer
* Maximum sample volume: 25mL in standard sample tube, 100mL in large volume container
* pH probe: Liquid filled glass combination electrode
* pH range: 1 - 13
* pH calibration: User definable. 2 point or greater
* Exclusion of air from sample: Nitrogen purge facility
* Sample stirrer: Magnetic follower, (supplied)
* Sample filter: In line disposable syringe type, 0.45μ supplied

**Specification of expertise relevant to NanoEnviCz workpackages:**

**WP3**a,d,f,g,h, **WP4**a,b, **WP6**a,d, **WP7**a,c,e,h,i, **WP9**a,b,c,d

**Detailed description of expertise**

**Please, specify the main research topics connected with equipment**:

Genotoxic potential of nanoparticles according to their size and surface properties (in model human cell lines)

Nanomaterials for biomedical research

**Please, specify the secondary research topics connected with equipment**:

Potential genotoxic effects of particulate matter in model human cell lines

**Keywords describing research area:**

Nanoparticles, zeta-potential, dynamic light scattering, hydrodynamic diameter

**Competence**

**Relevance for applied and industrial research:**

The ideal nanomaterial should exhibit low toxicity while maintaining desirable technical properties that is why it is so important to assess genotoxic potential of manufactured nanoparticles.

**Relevance for fundamental studies:**

Characterization of size and properties of different nanoparticles will allow for better understanding of relations between size and surface properties of nanomaterials and their biological effects in model human cell lines.