

<p>Equipment Name: Malvern Zetasizer Nano ZS</p>	<p>Category: C. Particle Characterisation in and ex-situ and/or</p> <p>Institute: University of Leeds</p> <p>Location: ParticlesCIC, Engineering Building, Leeds. LS2 9JT. UK</p> <p>Contact Details of Technology Expert: Name, Susanne Patel Phone, +44 113 3432378 Fax, +44 1133432377 E-mail k.s.patel@leeds.ac.uk</p>
<p>Short technology description/Overview (<i>approx 300 words</i>):</p> <p>Measurement of particle size, particle size distribution and zeta potential of colloidal particulates using dynamic light scattering.</p> <p>Size Dynamic light scattering (DLS), sometimes referred to as Photon Correlation Spectroscopy (PCS) or Quasi-Elastic Light Scattering (QELS), is a non-invasive technique for measuring the size of very small particles (0.6 nm to 6 um) in a dispersion. The technique measures Brownian motion by detection of the time-dependent fluctuations in the intensity of scattered light from a suspension of particles. Analysis of these intensity fluctuations allows for the determination of the diffusion coefficients, which in turn yield the particle size through the Stokes-Einstein equation [1].</p> $d(H) \propto \frac{kT}{3\pi\eta D} \quad [1]$ <p>where:-</p> <p>$d(H)$ = hydrodynamic diameter D = translational diffusion coefficient k = Boltzmann's constant T = absolute temperature η = viscosity</p> <p>The diameter that is measured in Dynamic Light Scattering is the hydrodynamic diameter and refers to how a particle diffuses within a fluid. The diameter obtained by this technique is that of a sphere that has the same translational diffusion coefficient as the particle being measured.</p> <p>Zeta Potential In solution, the presence of a net charge on a particle affects the distribution of ions surrounding it, resulting in an increase in the concentration of counter-ions. The region over which this influence extends is called the <i>electrical double layer</i>¹. Conventionally, this layer is thought of as existing as two separate regions (figure 1):</p>	

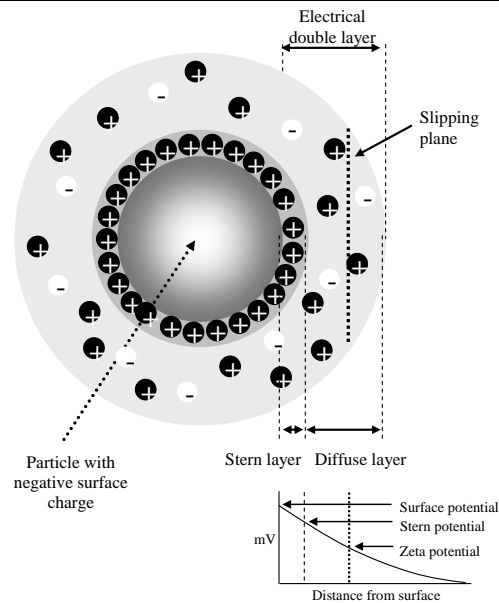


Figure 1: Schematic representation of the distribution of ions around a charged particle in solution.

- An inner region of strongly bound ions known as the *Stern layer*
- An outer layer of loosely associated ions called the *diffuse layer*.

As the particle moves through solution, due to gravity or an applied voltage, the ions move with it. At some distance from the particle there exists a “boundary”, beyond which ions do not move with the particle. This is known as the surface of hydrodynamic shear, or the *slipping plane*, and exists somewhere within the diffuse layer. It is the potential that exists at the slipping plane that is defined as the *zeta potential*

Main Features (Equipment Capabilities):

- Particle size range of ~2nm to ~6microns (or when sedimentation occurs)
- Sample size is approximately 1ml per test or 10ml for titration work
- pH or additive titrations can be produced for both size and zeta potential

Typical Samples & Images:

Wide range of samples can be measured. Limitation is on the dispersant and also the concentration.

The key to this technique is that the samples are stable and no sedimentation or creaming occurs within the sample whilst the analysis is running.

The viscosity of the samples is key to obtaining good quality data as the instrument uses brownian motion during the test.

Any further Information: