

## **Lecture 7: Assessing Zeta Potentials**

- 7.1 Introduction – the importance of the zeta potential
  - 7.1.1 nanoparticle-nanoparticle interactions
  - 7.1.2 nanoparticle-cell interactions
  - 7.1.3 part of the initial nanomedical system-cell targeting process
  - 7.1.4 low zeta potential leads to low serum protein binding and potentially longer circulation
- 7.2 Zeta potential basics
  - 7.2.1 What is the zeta potential?
    - 7.2.1.1 surface layer potential
    - 7.2.1.2 Stern layer potential
    - 7.2.1.3 slip layer
    - 7.2.1.4 zeta potential layer
  - 7.2.2 How is it measured?
    - 7.2.2.1 electrophoresis
    - 7.2.2.2 conversion of electrophoretic mobility to zeta potential
  - 7.2.3 Zeta potential is the potential barrier to cell-nanoparticle interactions
  - 7.2.4 Optimal zeta potential is complicated but some general advice
- 7.3 Some factors affecting the zeta potential
  - 7.3.1 pH
  - 7.3.2 ionic strength
- 7.4 Some zeta potential experiences
  - 7.4.1 Size and zeta potential changes during LBL assembly of NPs
  - 7.4.2 Effects of pH and dilution on NP zeta potential
- 7.5 "Zeta sizing" measuring size on a zeta potential instrument
  - 7.5.1 DLS (Dynamic Light Scattering) sizing
  - 7.5.2 Relating scattering intensity to diffusion coefficients and hydrodynamic size
  - 7.5.3 Computing the hydrodynamic radius from the Stokes-Einstein equation
  - 7.5.4 Actual versus measured DLS values

## References

"Zeta potential measurement using laser Doppler electrophoresis (LDE)":

[http://www.malvern.co.uk/LabEng/technology/zeta\\_potential/zeta\\_potential\\_LDE.htm](http://www.malvern.co.uk/LabEng/technology/zeta_potential/zeta_potential_LDE.htm)

"Why Measure Zeta Potential?": <http://www.malvern.co.uk/malvern/ondemand.nsf/id/67126>

"Zeta Potential: An Introduction in 30 minutes":

[http://www.malvern.co.uk/malvern/kbase.nsf/0/26E2BC622DEE0CAC80256FBE00440C75/\\$file/MRK654-01%20An%20Introduction%20to%20Zeta%20Potential%20v3.pdf](http://www.malvern.co.uk/malvern/kbase.nsf/0/26E2BC622DEE0CAC80256FBE00440C75/$file/MRK654-01%20An%20Introduction%20to%20Zeta%20Potential%20v3.pdf)

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[http://www.malvern.co.uk/malvern/kbase.nsf/allbyno/KB000022/\\$file/Zeta\\_potential\\_in\\_pharmaceutical\\_formulation\\_MRK036-03-low\\_res.pdf](http://www.malvern.co.uk/malvern/kbase.nsf/allbyno/KB000022/$file/Zeta_potential_in_pharmaceutical_formulation_MRK036-03-low_res.pdf)

Using zeta potential to assess protein adsorption to surfactant coated latex:

[http://www.malvern.co.uk/malvern/kbase.nsf/0/AC284EC6076BF4D6802570D2005651E8/\\$file/MRK707-01%20Protein%20Adsorption%20to%20Surfactant%20Coated%20Latex.pdf](http://www.malvern.co.uk/malvern/kbase.nsf/0/AC284EC6076BF4D6802570D2005651E8/$file/MRK707-01%20Protein%20Adsorption%20to%20Surfactant%20Coated%20Latex.pdf)

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