Tunable Resistive Pulse Sensing for High Resolution Characterization of Nano to Micro-Scale Particle Solutions

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Accurate high resolution characterization of complex systems such as drug delivery particles is critical to understanding their function and optimization. Tunable resistive pulse sensing (TRPS), such as the Izon qNano, has generated considerable interest for its ability to accurately characterize the size[1], charge [2] and concentration [3] of nano to micro-scale particulate suspensions[4].
Measuring the properties of each particle as is passes through the elastic pore sensor provides high resolution analysis often beyond that of other analysis techniques.

Furthermore, the recently developed capability to simultaneously measure the size and charge on a particle-by-particle basis provides a unique method to better characterize and understand the role that these properties play[2].

The fundamental principles behind TRPS and how it has been used to improve the characterization of particle size, charge and concentration within complex (e.g. polydisperse or multimodal size and charge) suspensions will be discussed [1-3]. The ability to easily resolve similar but different sized particle populations has been demonstrated on biological and model complex samples composed of particles with diameters of 220, 330 and 410 nm.
Tuning the sensor gave rise to a 6 fold improvement in the measurement sensitivity[6] and when compared to four other size analysis techniques, TRPS was one of two devices capable of accurately resolving particles within complex samples[5].

Izon's instruments have been used to characterize a wide range of synthetic and biological particle systems including microbubbles, CNTs, viruses (Baculo, Adeno,...), exosomes, DNA coated particles, as well as study the surface modification, aggregation, and storage effects on liposomes.

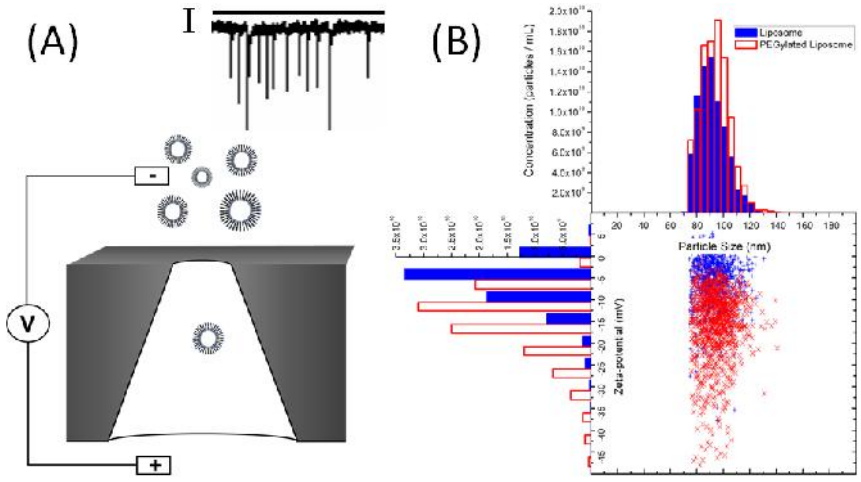

Figure 1. (A) Schematic of TRPS measurement of particles. As each particle passes through the pore it generates a resistive pulse signal *I* that is dependent on the particle size and charge.
(B) Experimental data showing the high resolution particle-by-particle size and charge analysis of two liposome formulations. The degree and homogeneity of liposome PEGylation can be characterized from the change in zeta-potential average and distribution.

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