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Characterization of liposomes and silica nanoparticles using resistive pulse method

Yauheni Rudzevich[a], Yuqing Lin[a], Adam Wearne[a], Antonio Ordonez[a], Oleg Lupan[a,b], Lee Chow[a,*]

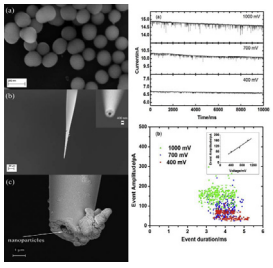
[a] Department of Physics, University of Central Florida, Orlando, FL 32816, USA
[b] Department of Microelectronics and Semiconductor Devices, Technical University of Moldova, 168 Stefan cel Mare Blvd., Chisinau, MD-2004, Republic of Moldova

HIGHLIGHTS

- New technique for simultaneous nanoparticles size and velocity measurements is proposed.
- Show size distribution of 40 nm and 90 nm in radius SiO_2 nanoparticles and 40 nm liposomes.
- Measurements of electrophoretic velocity of 40 nm and 90 nm SiO_2 nanoparticles presented.
- Different particles concentrations were examined.

GRAPHICAL ABSTRACT

We demonstrated a novel approach to simultaneously measure electrophoretic velocity and size distribution of organic and inorganic colloids in a size range 40–200 nm. This precise and accessible, single particle resolution technique is a promising alternative to dynamic light scattering and laser doppler velocimetry.



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ABSTRACT

The ability to precisely count inorganic and organic nanoparticles and to measure their size distribution plays a major role in various applications such as drug delivery, nanoparticles counting, and many others. Here we employ a simple resistive pulse method that allows translocations, counting, and measuring size and velocity distribution of silica nanoparticles and liposomes with diameters from 50 nm to 250 nm. This technique is based on the Coulter counter technique but has nanometer size pores. It was found that ionic current drops when nanoparticles enter the nanopore of a pulled micropipette, producing a clear translocation signal. Pulled borosilicate micropipettes with opening 50–350 nm were used as the detecting instrument. This method provides a direct, fast and cost-effective way to characterize inorganic and organic nanoparticles in a solution.

1. Introduction

Size plays an important role in the properties of nanoparticles [1,2]. The ability to determine the size distribution and concentration of nanoparticles are extremely useful in numerous applications [3,4]. Traditionally, determination of the size and concentration of nanoparticles has been performed through chromatography [5], gel

* Corresponding author. +1 407 823 2333; fax: +1 407 823 5112.
E-mail addresses: Lee.Chow@ucf.edu, chowucf@gmail.com (L. Chow).

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