The Dolomite Centre Ltd
Unit 1, Anglian Business Park, Orchard Road,
Royston, Hertfordshire, SG8 5TW, UK

T: +44 (0)1763 242491
F: +44 (0)1763 246125
E: sales@dolomite-microfluidics.com
W: www.dolomite-microfluidics.com

Dolomite Microfluidics – North America Office
Blacktrace Inc, 29 Albion Place
Charlestown, MA 02129, USA

C: 617 803 6655
T: 617 848 1211
F: 617 500 0136
E: salesus@dolomite-microfluidics.com

Experimental study of the separation behavior of nanoparticles in micro- and nanochannels

Mariateresa Napoli • Paul Atzberger • Sumita Pennathur

Abstract

In this article, we investigate the effects of pH, ionic strength, and channel height on the mobility and diffusivity of charged spherical particles within planar microfluidic channels. Specifically, we report results of a broad experimental study on the transport and separation behaviour of 50 and 100 nm spherical carboxylated polystyrene nanoparticles, confined in 20 lm, 1 lm, and 250 nm deep fluidic channels. We find that pH, ionic strength, and channel height have coupled impacts on mobility changes. In particular, we show that, depending on pH, the dependence of particle mobility on channel size can have opposing behavior.

In addition, we also show that at the nanoscale, at lower ionic strengths, there is a substantial increase in mobility, due to enhanced electric fields within the nanochannels. These effects are important to understand in order to avoid potential downfalls in terms of separation efficiency as well as design for better tuning of separation performance in micro- and nanochannels. Finally, we propose a method to estimate the effective zeta potential of spherical particles from measured electrophoretic mobility data. This could prove useful in characterizing a heterogeneous collection of particles having a distribution over a range of values of the zeta potential.

For further information please refer to research paper Microfluid Nanofluid (2011) 10:69–80