Particle Concentration Effect On Dielectrophoretic Trapping

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Introduction: Dielectrophoresis (DEP), an electric field driven technique, has important applications in the enrichment, concentration and isolation of particles. Recent studies shown a difference between the experimental and theoretical DEP force in a real system [1]. Although a correction factor is a common approach [2], its origin is still uncertain.

Computational Methods: The AC/DC module was used to estimate the distribution of the electric field, as well as the particle net velocity in a tampered channel (Fig.1) [1].

$$v_x = \left(\mu_{ek} + \mu_{dep} \frac{\delta E}{\delta x} \right) E$$

If the velocity is measured on the centerline and *E* varies increases linearly [1]:

$$v_x = \left(\gamma^2 k^2 \mu_{dep} + \gamma k \mu_{ek} \right) x + \left(\gamma^2 k \mu_{dep} + \gamma k \mu_{ek} \right)$$

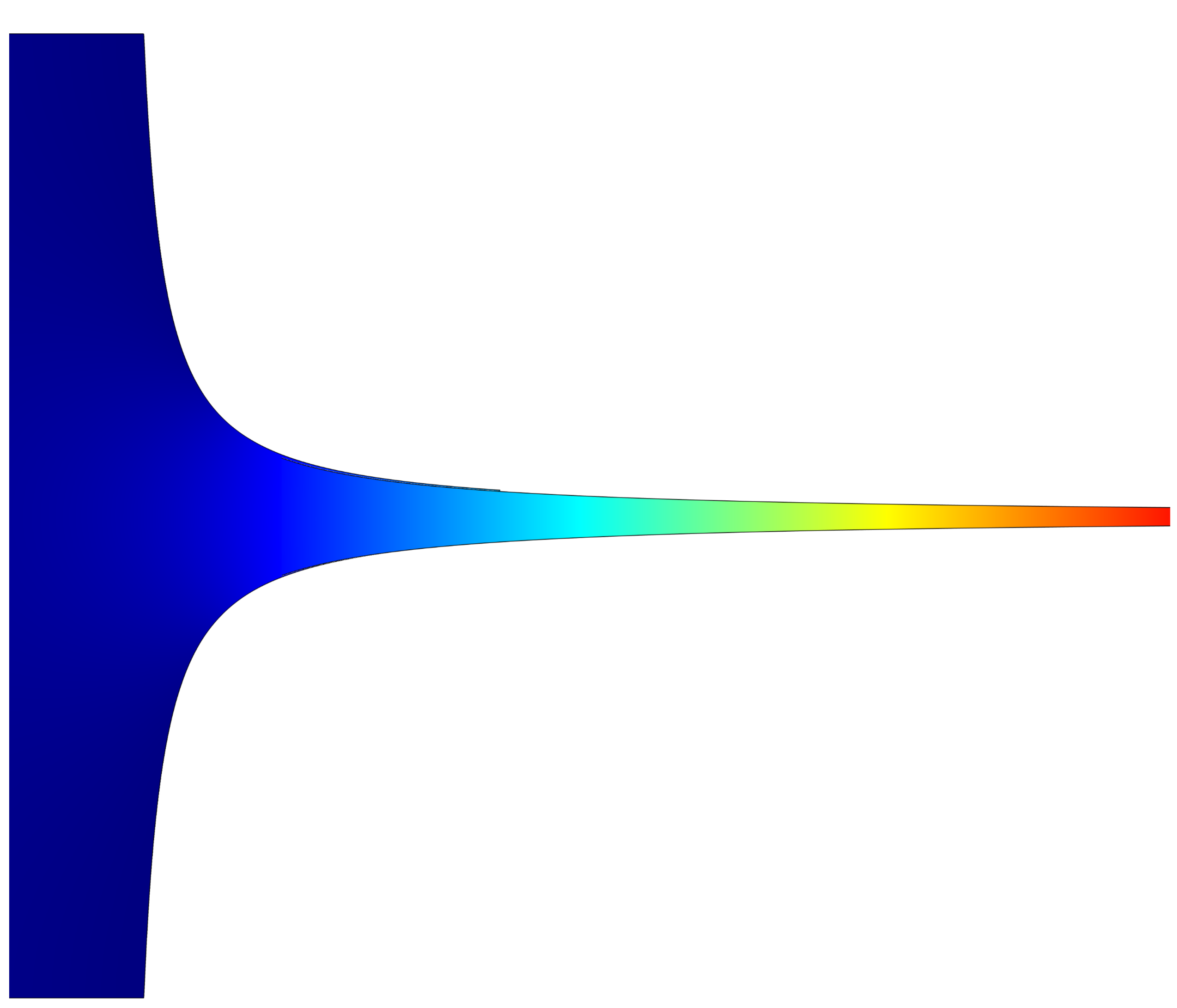
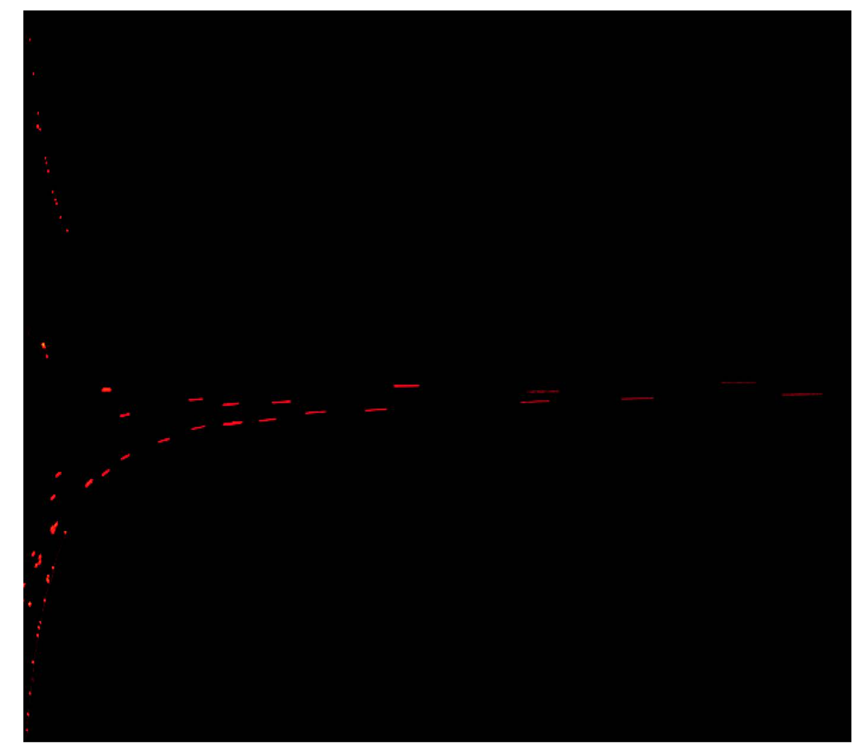


Figure 1. *E* distribution in a tampered channel.

Results: Numerical modeling was used to estimate the correction factor necessary to produce an inflection point in the velocity vs position plot.



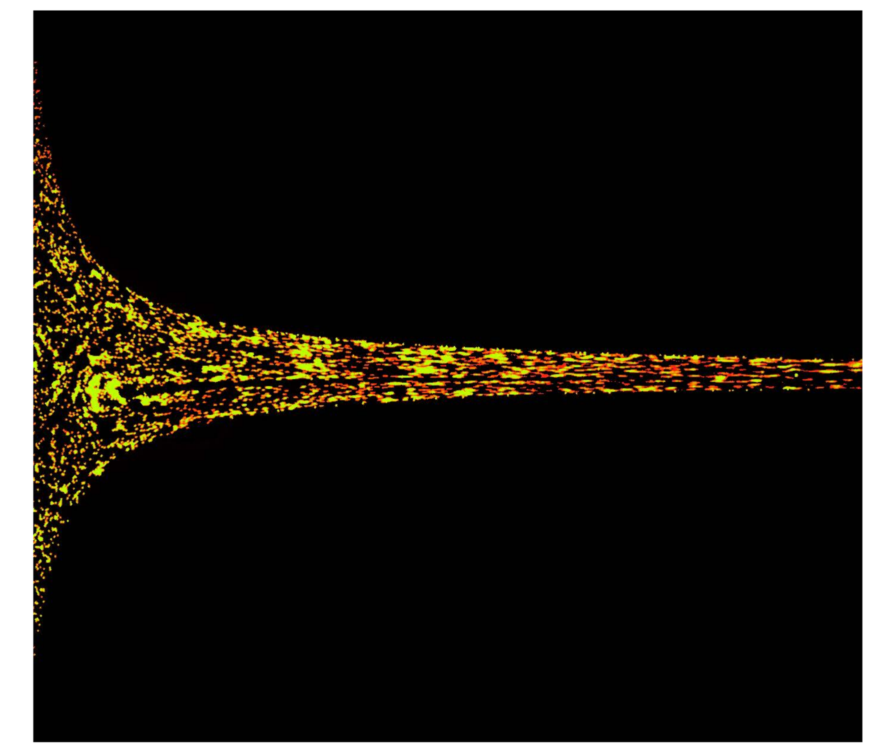


Figure 2. C_1=7.6E5 bead/mL). **Figure 3**. C_3=3.4E8 bead/mL.

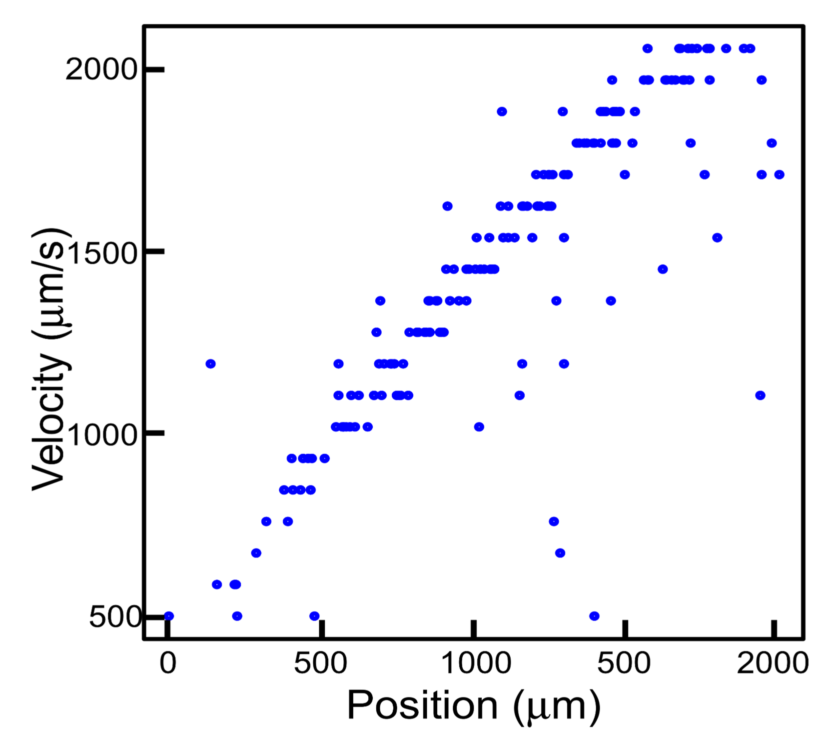


Figure 4. Velocity vs position.

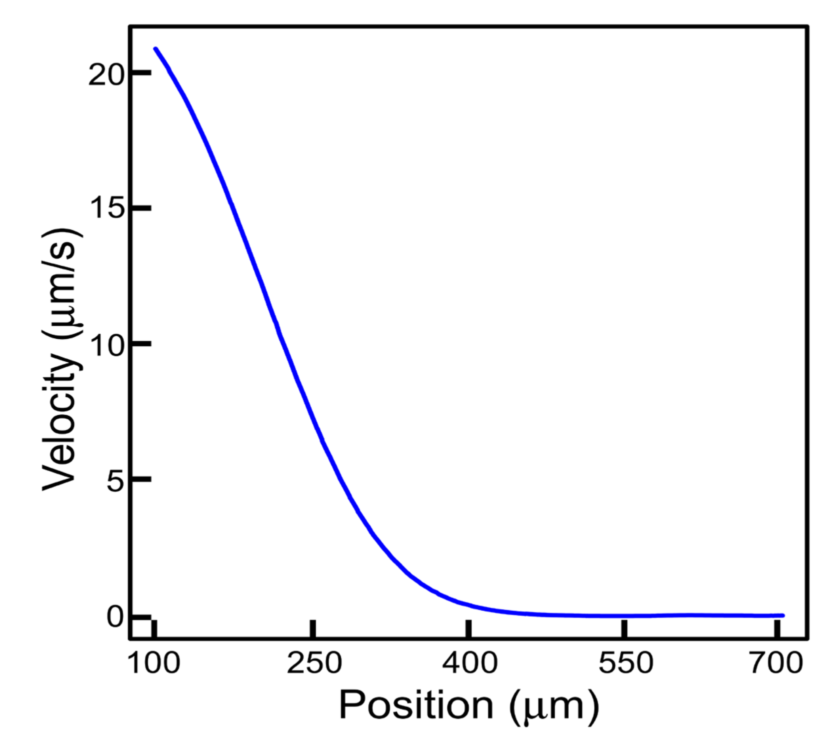


Figure 5. Inflection point.

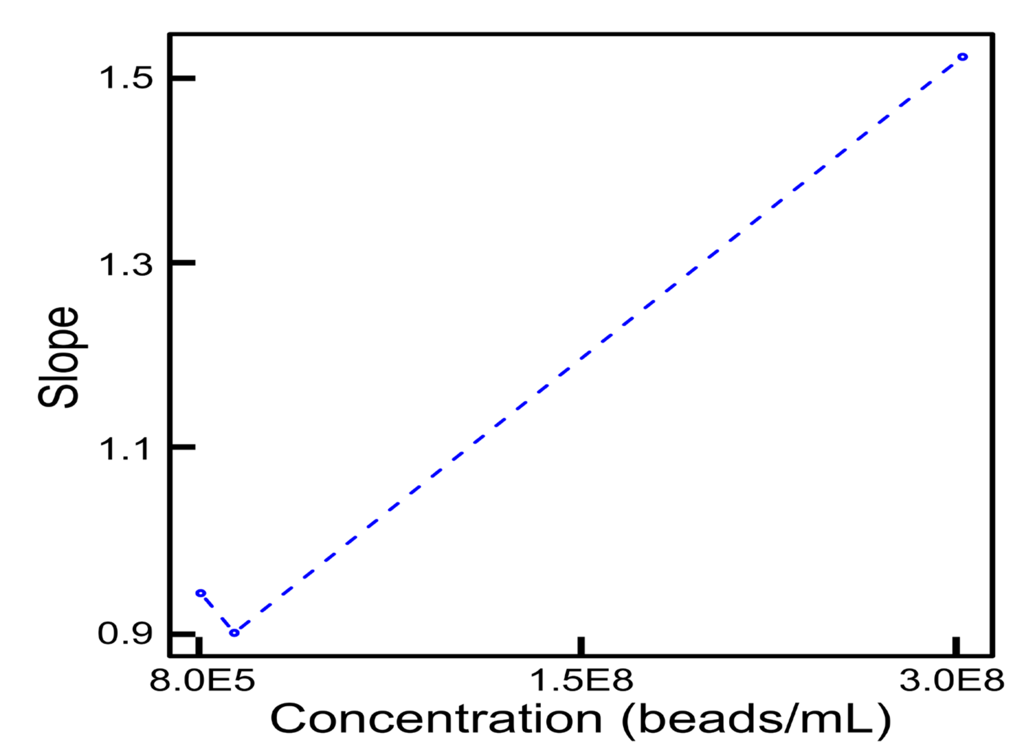


Figure 2. Correction factor estimation.

Conclusions: Particle concentration affects the correction factor. Its relation will be studied to determine the contribution of particle interactions on the correction factor.

References:

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2. M.A. Saucedo-Espinosa, B.H. Lapizco-Encinas, Experimental and theoretical study of dielectrophoretic particle trapping in arrays of insulating structures: Effect of particle size and shape, Electrophoresis, 36(9-10), 1086-1097, (2015).

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