

Editorial

Fundamentals of Electrophoresis 2018

It is the time of the year to present the Special Issue on Fundamentals, and I am very pleased to bring this important Special Issue on your desk, computer or mobile device. The sixteenth Special Issue features three review articles and sixteen regular research papers from renowned researchers around the globe. The first review paper summarizes important theoretical works on the coupling between suspension rheology and Derjaguin-Landau-Verwey-Overbeek (DLVO) forces. Models used to calculate particle-particle interaction forces in a concentrated colloidal suspension are highlighted along with their applicability and limitations. The second review paper presents the electric field driven pumping in a microfluidic device. In this extensive review, both theoretical developments and experimental findings are illustrated for a number of electric-field-driven non-mechanical pumping including DC electroosmosis, AC electroosmosis, AC electrothermal, induced charge electroosmosis, and liquid dielectrophoresis. The third review focuses on fundamentals of cell separations using affinity methods, where the role of flow, temperature and adhesion forces are discussed.

Regular research articles are grouped into four major categories: theory, modeling and simulation, separation and sensing platform, and dielectrophoresis. The theory section consists of three nice papers addressing the method for (i) determining stability constants for analyte-ligand complexes, (ii) finding the electrostatic interaction of electric double layer and lipid layer encapsulated nanoparticles, and (iii) calculating band broadening due to Joule heating in free flow electrophoresis. Like theory, modeling and simulation is an important part of this Special Issue. Four excellent papers are presented in this section to (i) study field-effect controlled electrothermal flow in a microfluidic device for mixing, (ii) characterize isomer mixtures using capillary electrophoresis, and (iii) investigate the fundamental transport characteristics of a microparticle in a gel and oil-water interface.

The next section is dedicated to the development and application of separation and sensing platforms. The first four papers in this section reported the fundamental aspects to (i) design a sheath flow interface for CE-MS, (ii) develop a new detector with elemental sensitivity for liquid separation, (iii) construct a Coulter counter based rigid nanoparticle sensor, and (iv) synthesize a mechanically strong polyacrylamide gel matrix. The remaining two papers present application of existing and new platforms to determine the lipid bilayer affinities and mobilities of DNA and dyes. The last section of this Special Issue is dedicated to the dielectrophoretic based separation of circulating tumor cells, trapping of silica beads, and enrichment of submicron particles.

As usual, the Special Issue on Fundamentals will continue in coming years. Potential authors are encouraged to visit the journal website for the call. As the Guest Editor for this Special Issue, I would like to thank all authors for their high-quality works and reviewers for their significant time and efforts to provide constructive criticisms. Finally, I would like to thank the journal Editor-in-Chief Prof. Ziad El Rassi for inviting me to edit this Special Issue for the second time and provide necessary logistical supports for successful publication of this issue.

Prashanta Dutta

Guest Editor



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