

Editorial

Fundamentals of Electrophoresis

It is my great pleasure to present the fifteenth special issue on the Fundamentals. The first special issue on Fundamentals was co-edited by Bohuslav Gas and Petr Bocek in 2003. Since then it has been published on an annual basis to highlight the theoretical and computational aspects of electrophoresis and other electric field driven phenomena. As a guest editor of this important special issue, I would like to thank Prof. Gas for his dedication and strong leadership role in editing the Fundamentals of Electrophoresis until 2015 and establishing this issue as one of the essential pillars of this journal by publishing highly cited papers.

The current edition consists of twenty papers from esteemed research groups around the world highlighting experimental and computational techniques as well as theoretical aspects. Based on core contributions, articles are grouped into five major thematic categories: electrokinetic flow, capillary electrophoresis, isoelectric focusing, ionic interactions in confinements, and electrochromatography. The electrokinetic flow section features four papers covering both experimental innovation and numerical modeling. The first two papers demonstrate bubble free pumping and Joule heating effects at the microchannel entry region, while the third and fourth papers present numerical solutions of electroosmotic flow around a spherical microparticle of nonhomogeneous surface charge and electroosmotic flow through porous media, respectively.

The capillary electrophoresis section starts with a mini-review on common misconceptions in dual-opposite injection electrophoresis. A new custom dye matrix is presented in the second paper for capillary electrophoresis, while a method for finding ionic strength dependent electrophoretic mobility is introduced in the third paper. Experimental techniques are presented in the fourth and fifth papers for protein extraction and separation of preconcentrated ions. The final paper in this section provides a modeling framework to describe the translocation dynamics of large macromolecules in the cross-linked gel.

The next section is dedicated to isoelectric focusing, one of the workhorses of proteomics, where proteins are separated based on their isoelectric points. The theoretical foundation of isoelectric focusing is one of the most complex among all electrophoretic techniques. The interaction among proteins, ampholytes, and electric fields is highlighted in this section. In a two-paper series, analytical expressions are presented for steady state concentration distribution of proteins in both narrow and broad pH range isoelectric focusing. The final paper in this section provides the insight for water formation and the mitigation strategy in narrow pH range isoelectric focusing. The effect of confinements is the key feature in our next sections. Four excellent theoretical papers demonstrate different aspects of ionic interactions in micro/nanofluidic devices. The last section of this special issue is dedicated for the electrokinetic chromatography, where effects of two different phases are studied both experimentally and theoretically.

While organizing this special issue, I received overwhelming responses and supports from my colleagues demonstrating paramount interest for this special issue. Unfortunately, we were not able to accommodate all contributions in this special issue due to page limitation. Some of the submitted research papers to this special issue will be published in a future regular issue of Electrophoresis.

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



Prashanta Dutta

special issue and provide necessary logistical supports for successful publication of this issue.



Prashanta Dutta
Guest Editor