



## Electrophoresis

Natalja Fjodorova \*

Department of Chemoinformatics, National Institute of Chemistry in Ljubljana, Slovenia

**\*Corresponding author:** Natalja Fjodorova, Department of Chemoinformatics, National Institute of Chemistry in Ljubljana, Slovenia, **Tel:** 386 414 88 292 **E-mail:** [natalja.fjodorova@ki.si](mailto:natalja.fjodorova@ki.si)

**Received date:** November 04, 2020; **Accepted date:** November 18, 2020;

**Published date:** November 27, 2020

Under the control of a spatially uniform electric field, electrophoresis is the motion of scattered particles relative to a fluid. Electrophoresis of positively charged particles (cations) is often referred to as cataphoresis, while anaphoresis is often referred to as electrophoresis of negatively charged particles (anions). The electrokinetic phenomenon of electrophoresis was first observed in 1807 at the University of Moscow by Russian professors Peter Ivanovich Strakhov and Ferdinand Frederic Reuss, who observed that the application of a constant electric field caused the migration of clay particles dispersed in water. Ultimately, the presence of a charged interface between the surface of the particle and the surrounding fluid induces it. It is the basis for analytical techniques for separating molecules by size, charge, or binding affinity used in chemistry.

In laboratories, electrophoresis is used to distinguish size-based macromolecules. A negative charge is added by the technique so that proteins migrate towards a positive charge. DNA, RNA, and protein analysis are commonly used for electrophoresis. Suspended particles have an electrical surface charge, strongly influenced by species of surface adsorbed on which an electrostatic Coulomb force exerts an external electrical field.

Both surface charges in fluids are screened by a diffuse layer of ions, according to the double layer principle, which has the same absolute charge but an opposite sign with respect to that of the surface charge. In the diffuse layer, the electric field often exerts a force on the ions which have a direction opposite to that acting on the surface charge. This latter force is not directly applied to the particle, but to the ions in the diffuse layer located some distance from the surface of the particle, and part of it is transmitted by viscous stress all the way to the surface of the particle. This component of the force is also known as the force of electrophoretic retardation. The cumulative resulting force is zero if the electrical field is applied and the charged particle to be studied is in steady motion through the diffuse layer. Not only for electrophoresis theory, but for many other electro kinetic theories, the "thin double layer" model provides enormous simplifications. For most aqueous systems, where the duration of Debye is typically just a few nanometers, this model is correct. For nano-colloids in solution with ionic strength near to water, it just splits. The Smoluchowski theory also neglects surface conductivity contributions. For certain nanoparticles and non-polar fluids, where the length of Debye is much greater than in normal cases, this model may be useful. There are many theories of analytics that integrate surface conductivity and remove the constraint of Overbeek's pioneering small Dukhin number.

A common name for many analytical methods used in biochemistry and biotechnology is affinity electrophoresis. Via affinity electrophoresis, both qualitative and quantitative information can be obtained. The approaches include the so-called electrophoretic mobility shift assay, electrophoresis of charge shift and capillary electrophoresis of affinity. The techniques are focused on modifications through biospecific interaction or complex formation in the electrophoretic pattern of molecules.