

367c Single or Married: Electrokinetics or Electrokinetic-Hydrodynamics? a Dual Senior Elective/Grad Level Course

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Electrokinetics (EK) has been around from the time of the electrical phenomena discovered by Volta, Galvani, Arrhenius, Ostwald, Nerst and others. In today technology, EK has gained a forceful presence since applications on genomics, proteomics, micro-separations, electrophoresis, fuel cells just to name a few are at the heart of many new technologies. Therefore, there is a need for students to be trained in areas where EK plays an important role.

When students are facing with the learning of EK principles and related applications, the task is not trivial. As a matter of fact, the subject is complicated since people from physical chemistry, hydrodynamics, colloidal and interfacial science and applied physics and mathematics have contributed to the body of knowledge. In addition, the nomenclature and approaches are not consistent since different schools have used different denominations and, even similar concepts are sometimes called differently. In short, enormous activation energy is required in the learning process. A need for systematization has been recognized recently (see Saville, 2004).

Based on the framework of the successful transport theory introduced by Bird, Stewart and Lightfoot (1960) and a definition of electrokinetics based more on electrical engineering rather than on colloidal chemistry, the authors will present a framework for the understanding of the subject including identifying the word "Electrokinetic-Hydrodynamics" to highlight a family of applications where both EK and hydrodynamics play a substantial role. Furthermore, the authors will identify a number of analogies with non-electrical applications that helps students to quickly grasp concepts and put them to work in their research or profession. The experience gained at the FAMU-FSU College of Engineering, Tennessee Tech College of Engineering and the College of Engineering at the Universidad Catolica del Norte in Antofagasta, Chile and workshops delivered at international meetings for practitioners by one of the authors (PA) will be used as feedback. Also, they will illustrate the presentation with projects and techniques used in the course. This has been conducted largely by using collaborative and active leaning approaches.