

Dynamics of Poisson–Nernst–Planck systems and applications to ion channel problems

Weishi Liu

University of Kansas

wslu@ku.edu

Abstract

Ionic flow through ion channels is an important process of electrodiffusion that depends on many physical parameters such as channel structures (channel shapes and spatial distribution of permanent charges), boundary concentrations, electric potential differences, diffusion coefficients, dielectric properties, ionic sizes, etc. It is not surprising that ionic flow exhibits extremely rich dynamics and its study is of great challenge.

Poisson–Nernst–Planck (PNP) systems serve as basic primitive models for ionic flow through ion channels. In this talk, we will present a dynamical system framework for analysis of PNP systems. The framework provides an opportunity for one to handle “all” relevant physical quantities all together. A number of results that have direct implications to ionic flow properties will be reported.