

# 國立交通大學應用數學系

## 學術演講公告

主講人：林太家教授(台灣大學 數學系)

講 題：Analysis of Poisson-Nernst-Planck systems and its applications

時 間：106 年 4 月 18 日(星期二) 下午 2:00 –3:00

地 點：(光復校區) 科學一館 223 室

茶 會：當天下午 1:30 (科學一館 205 室)

### Abstract

The Poisson-Nernst-Planck (PNP) system is a well-known model of ion transport, which belongs to Keller-Segel type systems and plays a crucial role in the study of many physical and biological phenomena. With a small parameter  $\varepsilon$ , PNP systems over annular domains have steady state boundary layer solutions with radial symmetry, which profiles form boundary layers near boundary curves and become flat in the interior domain as  $\varepsilon$  approaches zero. For the stability of boundary layer solutions to the radial PNP systems, we estimate the solution of the perturbed problem of the radial PNP system (with respect to the boundary layer solution) with global electroneutrality. We prove that the  $H_{\{r\}}^{-1}$  norm of the solution of the perturbed problem decays exponentially (in time) with exponent independent of  $\varepsilon$  if the coefficient of the Robin boundary condition of electrostatic potential has a suitable positive lower bound. The main difficulty is that the gradients of boundary layer solutions on boundaries may blow up as  $\varepsilon$  tends to zero. The main idea of our argument is to transform the perturbed problem into another parabolic system with a new and useful energy law for the proof of the exponential decay estimate.

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