Homogenization Results for Ionic Transport in Periodic Charged Media

Claudia Timofte

Faculty of Physics, University of Bucharest, P.O. Box MG-11,
Bucharest-Magurele, Romania
claudiatimofte@yahoo.com

Keywords: homogenization, ion transport, the periodic unfolding method.

A macroscopic model for a nonlinear system of coupled partial differential equations arising in the modeling of ionic transport phenomena in periodic charged porous media is rigorously derived.

Our model can serve as a tool for biophysicists to analyze the ion transport through protein channels. Ion channels are very important in biology, because they control many vital biological functions, such as information transfer and processing in the nervous system, the muscle contraction and coordination, the regulation of hormone secretion, etc.

Also, this setting proves to be relevant in the modeling of the flow of electrons and holes in a semiconductor device.

The main tool for obtaining our macroscopic model is the use of the periodic unfolding method, which allows us to deal with general media.