Introduction to electrokinetic phenomena: Learning by numerical modelling with the use of the OpenFOAM library

Dr Paweł Żuk, Team 10, IChF

Registration: send an email to pzuk@ichf.edu.pl by February 23, 2026. The course starts within the week of March 2-6, 2026.

(The availability of this lecture course depends on whether at least three Warsaw4PhD students are registered.)

Outline

We will learn about the importance of transport in physical and chemical systems by constructing and running numerical models in an open-source library, OpenFOAM, for solving Partial Differential Equations with the Finite Volume Method.

We will learn how to set up a numerical simulation, run it on a single CPU and multiple CPUs, visualize the results and generate data plots.

We will focus on electrostatics, and electrokinetics. We will simulate capacitor charging, ion flow through a pore and other phenomena that can be expressed using the Poisson-Nernst-Planck equations.