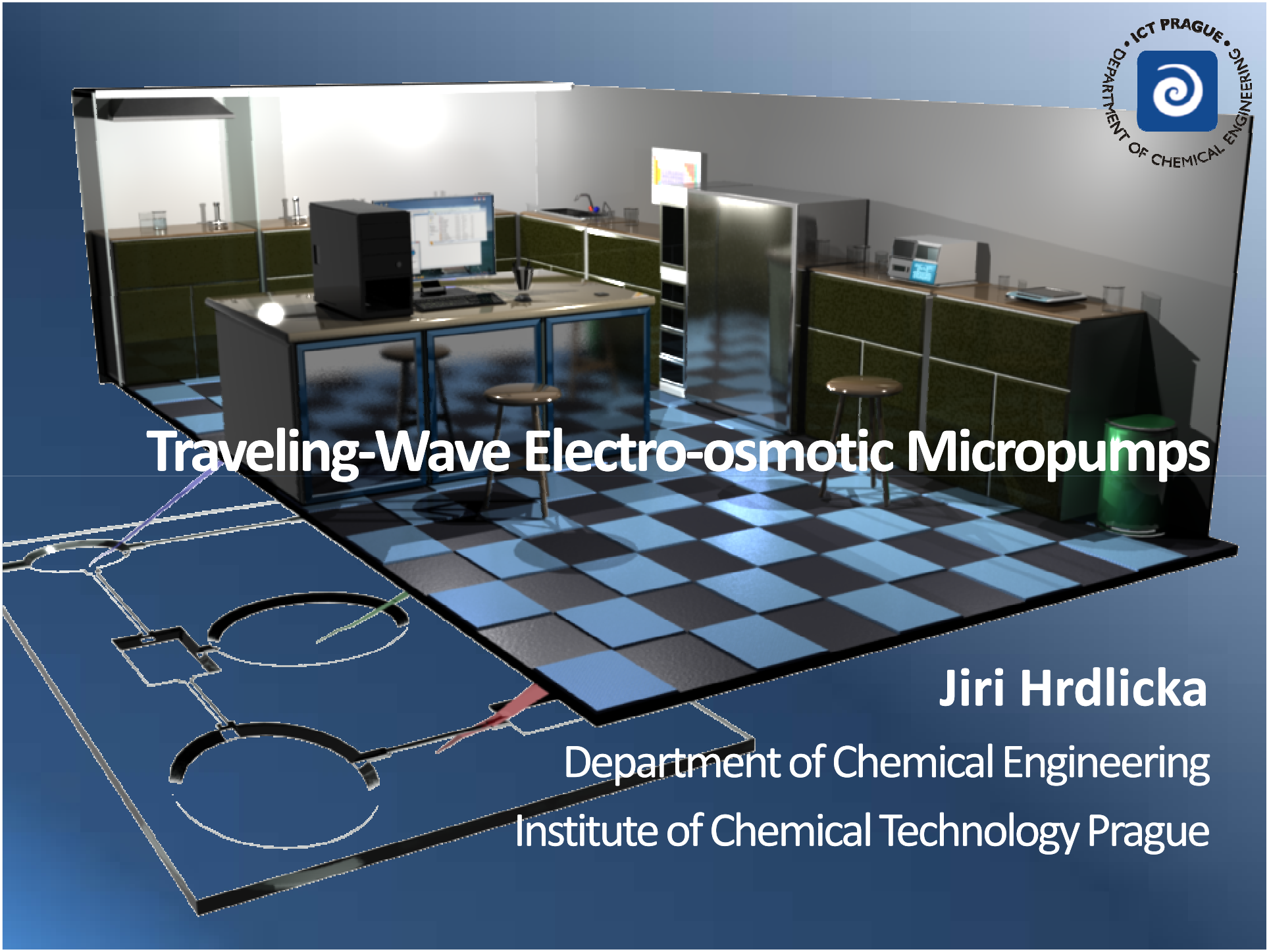

Traveling-Wave Electro-osmotic Micropumps

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Outline

AC electro-osmotic micropumps:
function, geometry & model

COMSOL Multiphsics:
software implementation

Results:
postprocessing

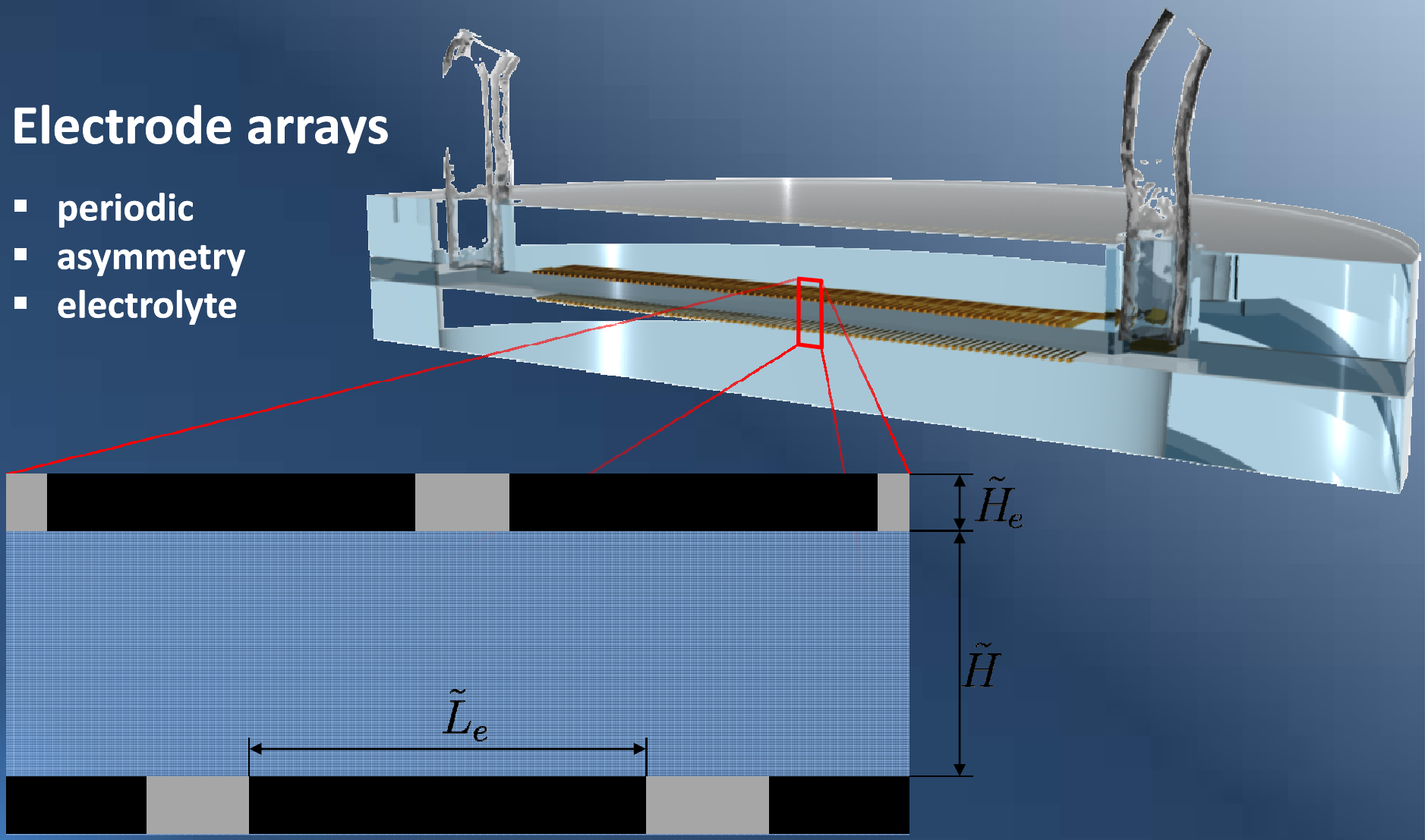
Conclusions / Summary

AC electro-osmotic micropumps

Function, structure & building blocks

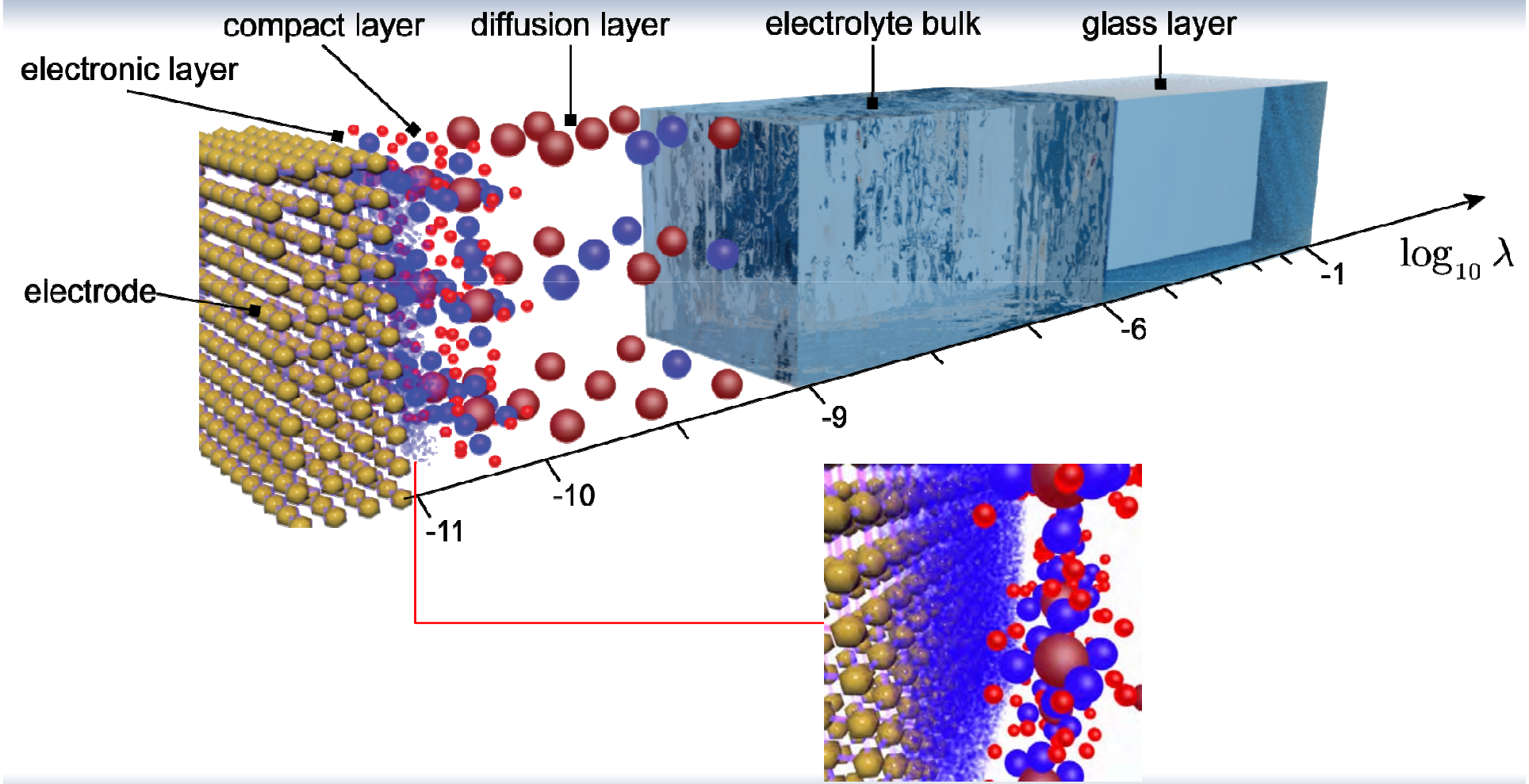
Electrode arrays

- periodic
- asymmetry
- electrolyte

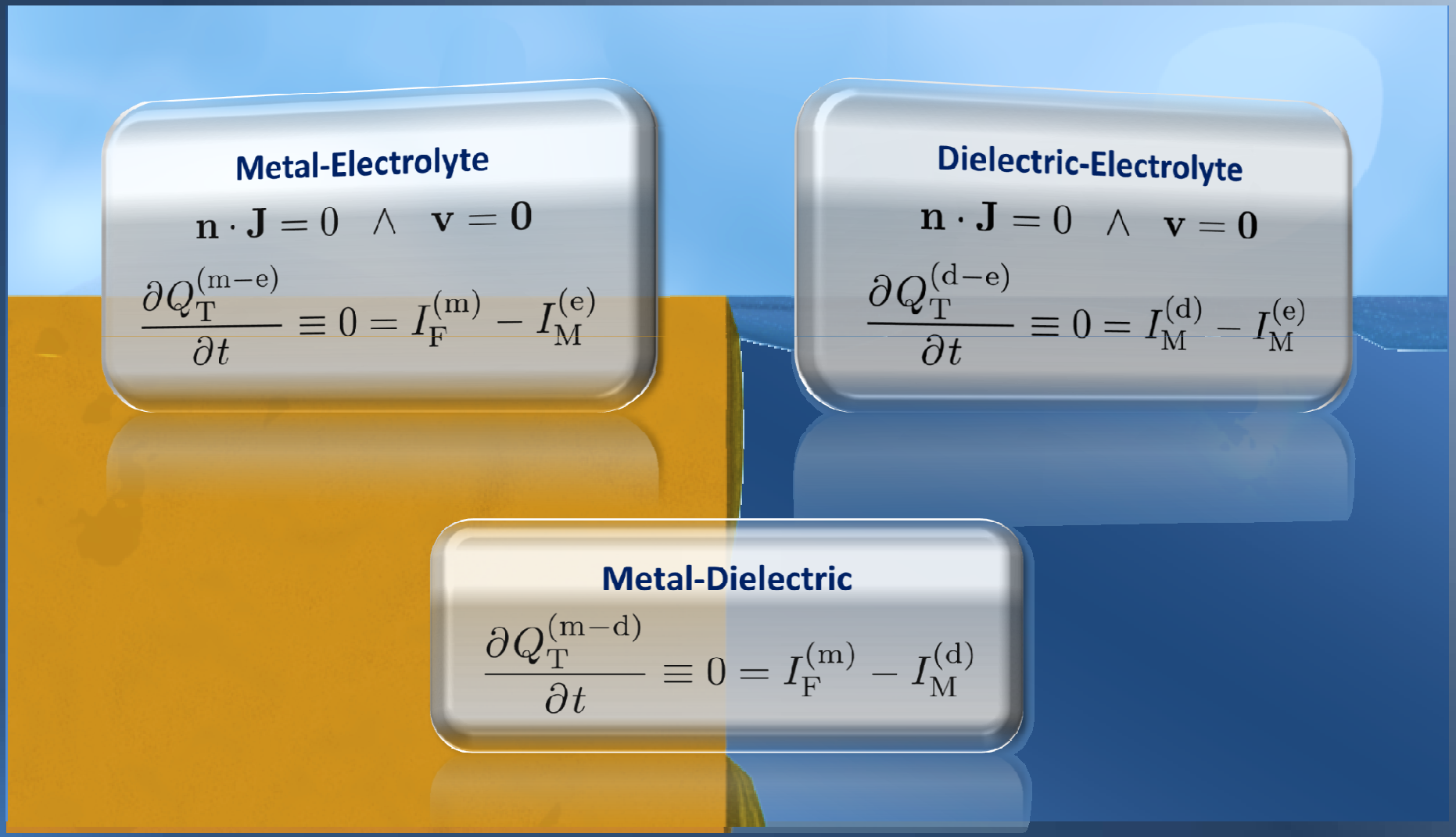


The electrode-electrolyte interface

A complete electric double-layer



Mathematical Model



Software Implementation
Use of COMSOL Multiphysics

Used Software

- Matlab
- COMSOL Multiphysics

Stage-wise simulation

- BCs are switched each period-quarter
- End state becomes the initial state

System Geometry

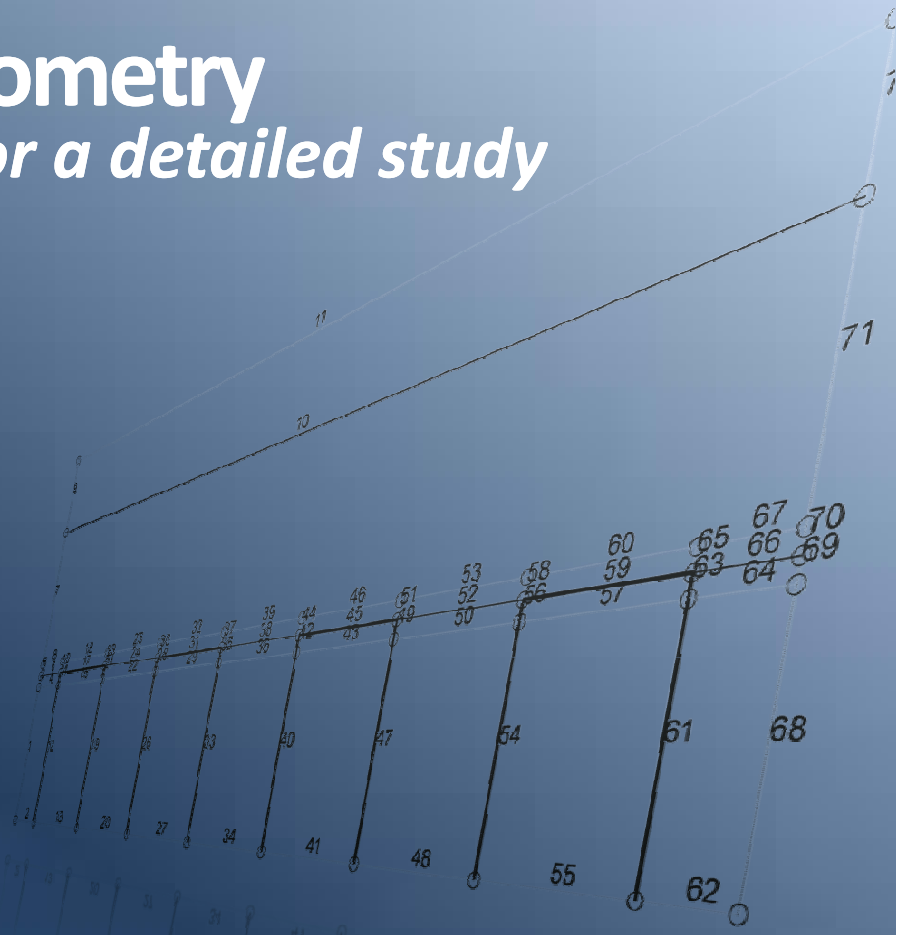
Domain subdivision for a detailed study

Domains

- electrodes
- dielectrics
- electrolyte

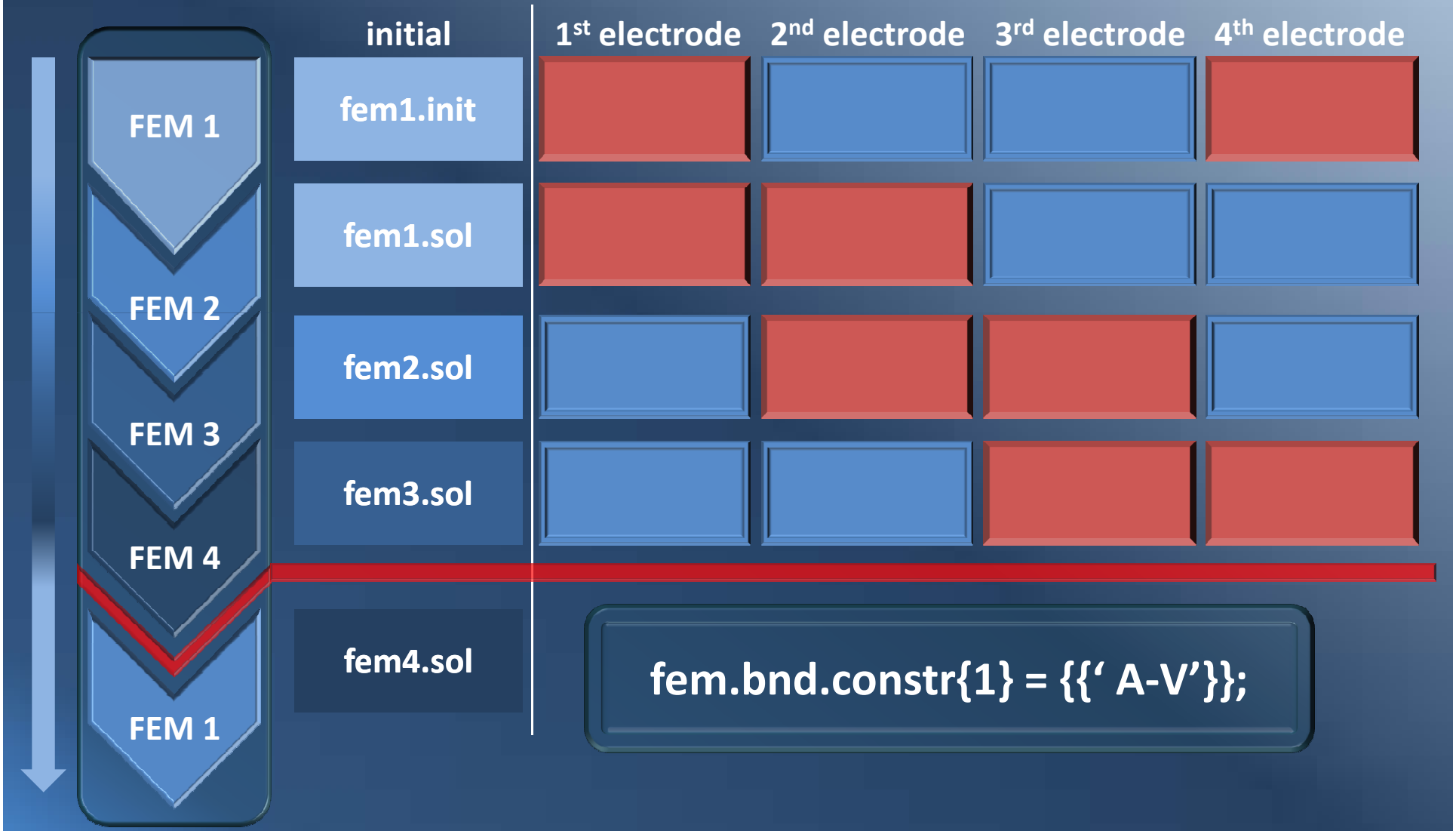
Subdomains

- metal EDL parts
- electrolyte EDL parts



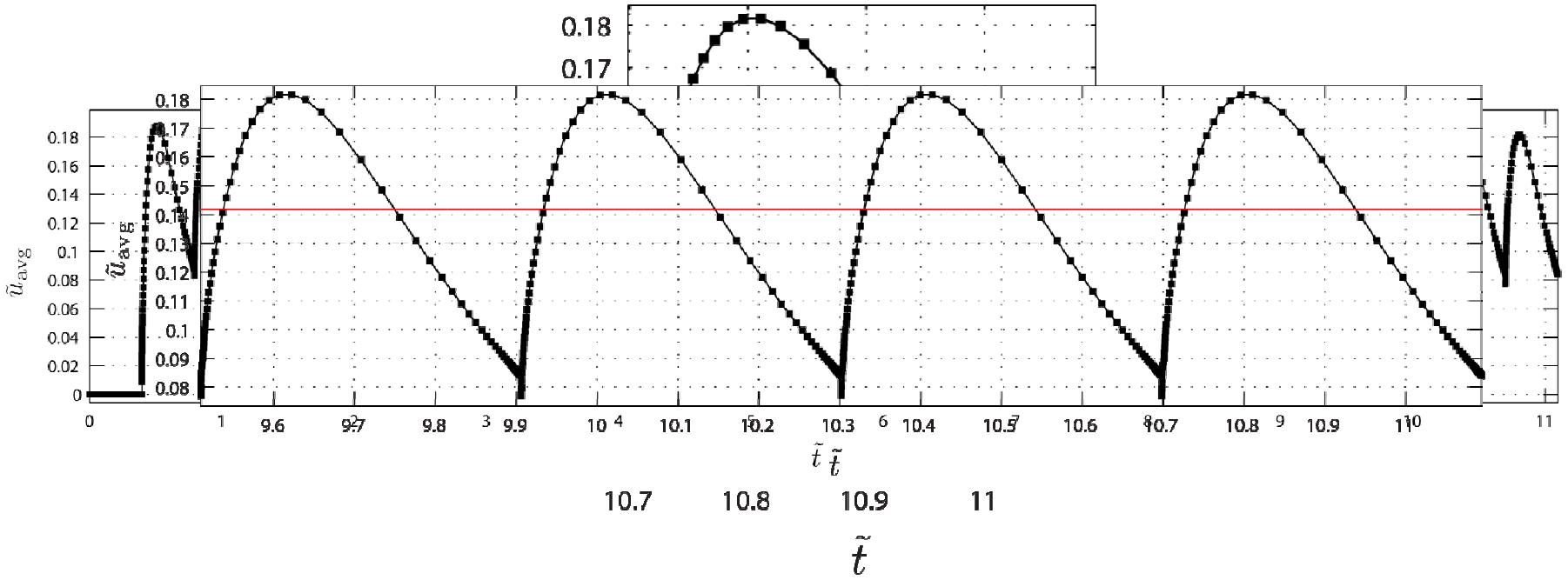
Discontinuous driving implementation

Use of COMSOL Multiphysics

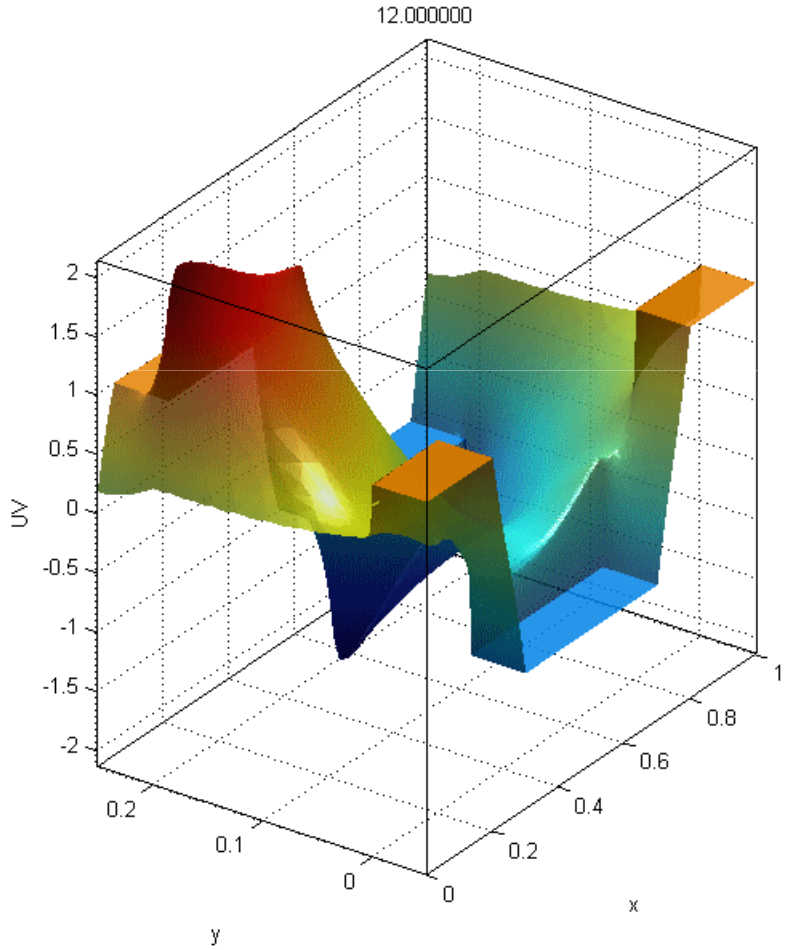


The average velocity transient

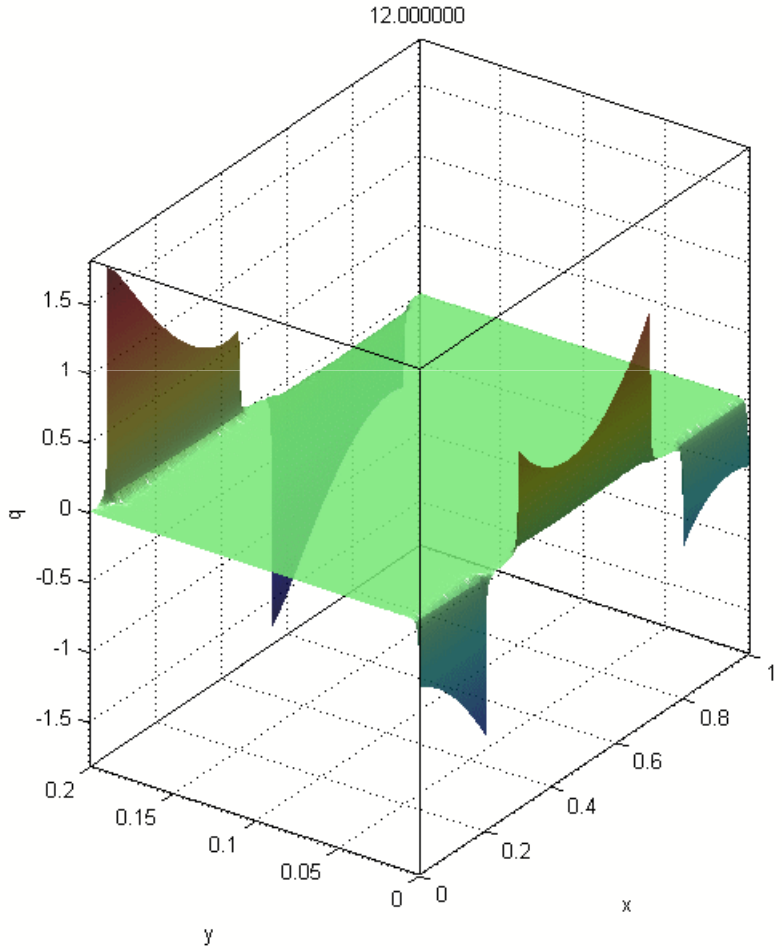
At optimal frequency of the AC signal



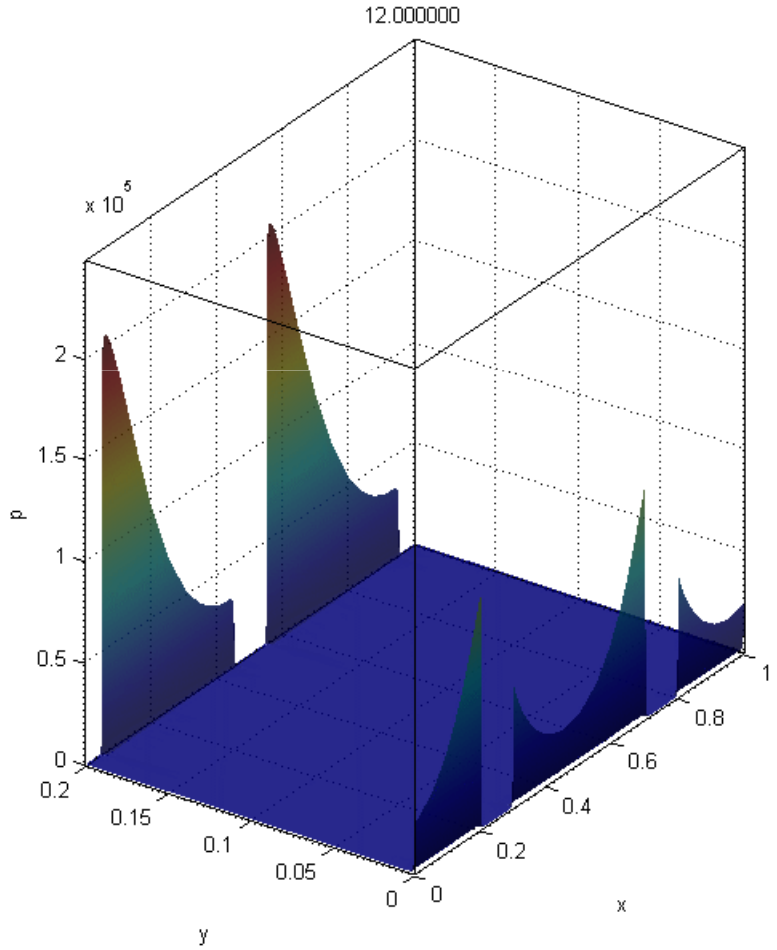
The electric potential



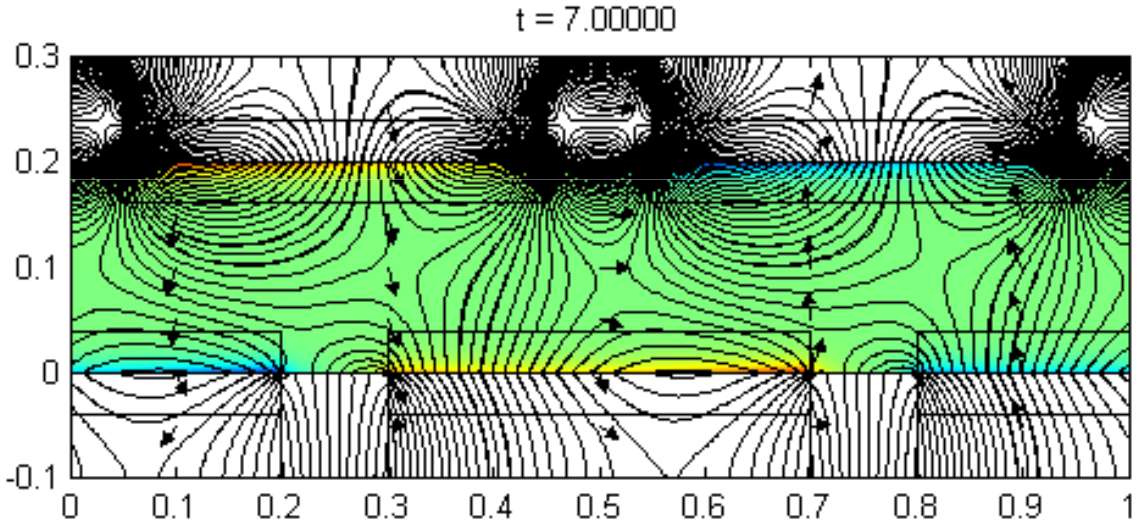
The electric charge density



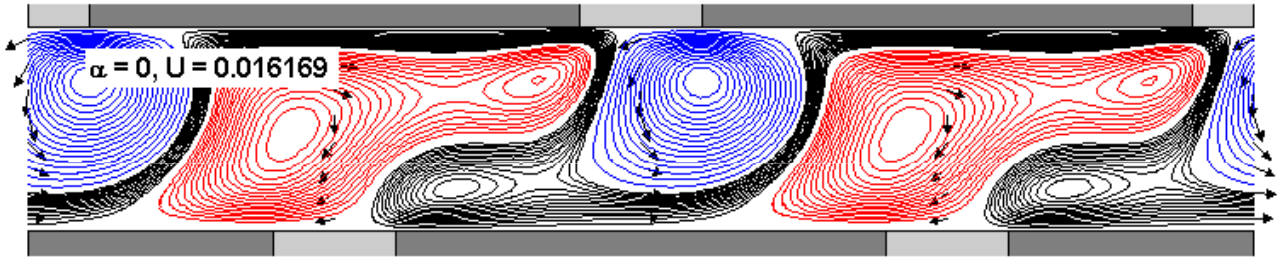
The pressure



The electric current



The flow patterns



Conclusion

Model formulated in the weak form:

wider set of boundary conditions available

Michochannel surroundings added:

electrode and dielectric blocks included in the model

Additional driving modes:

sinusoidal, square waveform and discontinuous signals