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On generalized PoissonNernstPlanck equations

We consider the generalized system of nonlinear Poisson-Nernst-Planck equations, which describes concentrations of multiple charged particles with the overall electrostatic potential. The generalized model is supplied by volume and positivity constraints and quasi-Fermi electrochemical potentials depending on the pressure. We examine the nonlinear inhomogeneous Neumann conditions describing electro-chemical reactions. We focus on a proper variational modelling, well-posedness and asymptotic analysis as well as homogenization of the discontinuous model. The work is supported by the Austrian Science Fund (FWF) in the framework of the research project P26147-N26: PION.