Two entropic finite volume schemes for a Nernst–Planck–Poisson system with ion volume constraints

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In this poster, we consider a drift-diffusion system with cross-coupling through the chemical potentials comprising a model for the motion of finite size ions in liquid electrolytes. The drift term is due to the self-consistent electric field maintained by the ions and described by a Poisson equation. This poster summarizes the results obtained in the eponymous preprint [5], with additions from the simpler model studied in [1], and motivated by the model presended in [4] from [2, 3]. The poster revolves around three columns. The first column is dedicated to the origin of the model, the different formulation of the fluxes and a proposition of two schemes. The second column concerns an existence result of the numerical schemes, emphasis could be made on the coercivity formulation or the jump-propagation approach to derive bounds from this coercivity using a simple 4-cells toy mesh example. The last column provides details on how the entropy-dissipation distance relates to the euclidean metric, and thus a compactness estimate. Convergence properties - some of them assuming non-degenerate solutions - are provided. Finally as a virtual footer, numerical experiments show the behavior of these schemes.

References

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