Homogenization of the generalized Poisson–Nernst–Planck problem in a two-phase medium

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We investigate a generalized Poisson–Nernst–Planck system of nonlinear partial differential equations describing cross-diffusion of multiple charged particles in various electro-kinetics phenomena in bio-medical and electro-chemistry applications. A two-phase domain is endowed with inhomogeneous, nonlinear conditions at the interface between the solid and the pore parts. These features together bring the most difficulties to the homogenization procedure. Based on the asymptotic methods, periodic unfolding, and compensated compactness, we arrive at the homogenized problem supported by proper correctors and provided rigorously by residual error estimates.

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References

