# TWO-SCALE COMPUTATIONAL MODELS FOR THE DISJOINING PRESSURE BASED ON A NON-LOCAL ANISOTROPIC HYPERNETTED CHAIN CLOSURE INCLUDING ION FLUCTUATION AND CORRELATION EFFECTS

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**Abstract.** A new homogenization method is proposed to compute the disjoining pressure in electrically charged porous media. The pore-scale model is based on the Poisson problem for the electric potential coupled with the integral Ornstein-Zernike equation supplemented by a anisotropic hypernetted chain closure to describe the ion-ion correlation functions along with a general representation for the chemical potential of the ions including a non-local excess component which captures the effects of the finite size of the ions. The non-local pore-scale model arises from the Statistical Mechanics framework and, in contrast to the classical electrical double layer theory based on the local Poisson-Boltzmann problem, does not assume point charge ions but rather charged hard spheres with charge located at their center. Numerical results are obtained for stratified micro-structure of parallel particles . using collocation schemes. Such results show that for higher valence ions the effects of ion-ion correlation forces give rise to attraction between the particles for some values of particle separation characterized by negative values of the disjoining pressure. .