Prediction of concentration profiles of finite-size ions near an electrode under alternating voltage condition

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The ion transport inside a cell determines the output power and capacitance of the electrochemical device. We focus on the transport of ions near an electrode because ions are reacted and electric double layers (EDLs) are formed near the electrode. Previous continuum modelling of ion transport considered finite sizes of ions and mobility as a function of ion concentration. The research focused on simulating the cyclic voltammetry and obtaining the capacitance of the system. In this work, we focus on the EDL structure and ion concentration profiles near the electrode by using continuum modelling. We adopt the alternating voltage condition in order to understand the effect of voltage inversion on the transport of ions. The electric field and the amount of reaction source are varied to understand their effects on the rate of reaction. Moreover, the frequency of alternating voltage is varied in order to understand the effects of varying reaction time.