Ions redistribution and meniscus relaxation during Langmuir wetting process

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Despite its obvious importance, the role of electrostatic interactions and electrokinetic relaxation during Langmuir wetting processes is not sufficiently understood yet. In the present study the non-stationary kinetics of ions redistribution within the meniscus region during deposition of a charged amphiphilic monolayer after beginning or stopping of the substrate motion is analyzed on the basis of the results of numerical simulations. The time evolution of the ion concentration profiles forming at the contact line and propagating toward the bulk solution is considered. During this relaxation process both the electric potential and the ion concentration distributions in the meniscus region change gradually toward those corresponding to a steady-state regime for the given substrate and monolayer velocities [1, 2]. A stationary deposition regime is established when the region of quasi-stationary distributions reaches the external boundary of the Nernst layer provided that the substrate motion is not very fast. For the substrate velocities higher than the critical one the concentration near the contact line can decrease to such small values which do not allow a stable deposition process.