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Transient electrophoretic current in a nonpolar solvent PAVEL KORNILOVITCH, YOOCHARN JEON, Hewlett-Packard Company — The transient electric current of surfactants dissolved in a nonpolar solvent is investigated both experimentally and theoretically in the parallel-plate geometry. Due to a low concentration of free charges the cell can be completely polarized by an external voltage of several volts. In this state, all the charged micelles are compacted against the electrodes. After the voltage is set to zero the reverse current features a sharp discharge spike and a broad peak. The peak time is a useful measure of the micelle mobility. After complete polarization is achieved, the peak stops evolving with further increase of the compacting voltage. The peak time grows logarithmically with the charge content in the bulk. These features are reproduced in a one-dimensional drift-diffusion model. Time integration of the peak yields the total charge in the system. By measuring its variation with temperature, the activation energy of bulk charge generation has been found to be 0.126 eV. The results are relevant to the development of electrophoretic reflective displays.

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