129f Electrophoretic Cells with Non-Newtonian Buffers and Joule Heating: an Efficient Approach for Velocity Profile Prediction

Mario A. Oyanader and Pedro E. Arce

Electrophoretic cells with relatively higher electrical fields generate temperature gradients because the Joule heating. These temperature gradients yield buoyancy flows that minimize considerably the separation efficiency of the cells. One possible way to minimize these effects is to use Non-Newtonian buffers. In this contribution, the authors present a parametric study and the effect of boundary conditions for the heat transfer problem of the situation originally studied by Bosse and Arce (2000a&b) for Newtonian fluid and for particular cases of Non-Newtonian fluids (Bosse et al, 2001a&b). The analysis will present an efficient and accurate approach to predict flow situations that will impact the behavior of the cells and possibly will determine a way to identify performance protocols. Temperature profiles are determined by using the Batchelor and Boussenessq approximations. This information is sequentially coupled with the Momentum Equation for the case of power-law models that is solved by using an efficient expansion of the integrand of the resulting integral equation that inverts the differential problem. A parametric study of the effect of the Joule heating number and heat transfer parameters is presented. Situations for further research will be outlined.