Abstract Submitted
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Mathematical analysis of electromigration dispersion fronts IVAN C. CHRISTOV, Purdue University — It is of interest to understand traveling electromigration wave phenomena, such as *isotachophoretic boundaries*, because of their applications in electrophoretic separation methods. To this end, we construct exact solutions to an unusual nonlinear advection–diffusion equation arising in the study of Taylor–Aris (also known as shear) dispersion due to electroosmotic flow during electromigration in a capillary. An exact reduction to a Darboux equation is found under a traveling-wave anzats. The equilibria of this ordinary differential equation are analyzed, showing that their stability is determined solely by the (dimensionless) wave speed without regard to any (dimensionless) physical parameters. Integral curves, connecting the appropriate equilibria of the Darboux equation that governs traveling waves, are constructed, which in turn are shown to be asymmetric kink solutions (*i.e.*, non-Taylor shocks). Furthermore, it is shown that the governing Darboux equation exhibits *bistability*, which leads to two coexisting non-negative kink solutions for (dimensionless) wave speeds greater than unity.

Ivan Christov
Purdue University

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