Electromigration dispersion: theory vs. experiment\textsuperscript{1} SANDIP GHOSAL, ZHEN CHEN, Northwestern University — When the concentration of sample ions in zone electrophoresis is significant compared to that of the carrier electrolyte, axial variation of electrical conductivity along the capillary could arise. The consequent variations of the electric field results in electromigration dispersion of the sample peak. It has been shown (S. Ghosal and Z. Chen, Bull. Math. Biol. 2010 vol.72, pg. 2047), that, in an idealized three-ion system consisting of the sample ion, a co-ion and a counter-ion, all of equal diffusivity, the time evolution of the sample concentration is governed by a single nonlinear one dimensional transport equation. If the solute concentration is not too large, this equation reduces to Burger’s equation that permits exact analytical solution. In the aforementioned analysis, ionic dissociation and recombination was neglected, so that the model only describes systems of strong electrolytes. Here we show that the one dimensional model derived earlier also describes electrophoresis of a solute in the presence of a buffer consisting of a single weak acid (or base). A simple approximate formula is derived for the number of theoretical plates in the presence of electromigration dispersion and compared with published experimental data.

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