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**Dispersion in isotachophoresis** MORAN BERCOVICI, JUAN G. SANTIAGO, Stanford University — Isotachophoresis (ITP) is a widely used separation and preconcentration technique, which has been utilized in numerous applications including drug discovery, toxin detection, and food analysis. In ITP, analytes are segregated and focused between relatively high mobility leading ions and relatively low mobility trailing ions. These electromigration dynamics couple with advective processes associated with non-uniform electroosmotic flow (EOF). The latter generates internal pressure gradients leading to strong dispersive fluxes. This dispersion is nearly ubiquitous and currently limits the sensitivity and resolution of typical ITP assays. Despite this, there has been little work studying these coupled mechanisms. We performed an analytical and experimental study of dispersion dynamics in ITP. To achieve controlled pressure gradients, we suppressed EOF and applied an external pressure head to balance electromigration. Under these conditions, we show that radial electromigration (as opposed to radial diffusion as in Taylor dispersion) balances axial electromigration. To validate the analysis, we monitored the shape of a focusing fluorescent zone as a function of applied electric field. These experiments show that ITP dispersion may result in analyte widths an order of magnitude larger than predicted by the typical non-dispersive theory. Our goal is to develop a simplified dispersion model to capture this phenomenon, and to implement it in a numerical solver for general ITP problems.

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