1096-35-478 **B. S. Tilley*** (tilley@wpi.edu), Dept. Mathematical Sciences, Worcester Polytechnic Institute, 100 Institute Road, Worcester, MA 01609, and **S. Jimenez** (silvia.jimenez.bolanos@gmail.com) and **B. Vernescu** (vernescu@wpi.edu). *Soret effects in electrokinetically-driven heat exchangers for electronics applications.*

We are interested in extending classical asymptotic approaches to allow for the spatial pattern wavenumber to vary on the macroscale variables and to find how changes in microstructure geometry affect macroscopic properties and transport. To this end, we consider here the thermal transport of a weakly dielectric coolant through nonuniformly spaced laminates, under an applied electric field, as a simple model for heat sinks in electronics. Power is continuously being generated by the laminates, and the local rates of heat and ion transport depend on the local electric potential, local ion concentrations, and local thermal gradients in the coolant. We find a coupled system of partial differential equations that describe the local microscale temperature and deviations from the Darcy pressure. Microscale values of all of these quantities are known in terms of the solutions to these effective equations. Charge aggregation effects are seen in the isothermal case, and the effect of ionic species transport due to the local temperature field impacts the overall heat transport capabilities of the heat exchanger. We are especially interested in geometries in the laminate spacing which allow for better thermal transport by the coolant for a prescribed power distribution. (Received September 04, 2013)