Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Design of Porous Wick Structures: Steady Flows[1] MARK WEISLOGEL, RYAN JENSON, YONGKANG CHEN, LAWRENCE MELVIN III — Methods of analysis developed for capillary flows in large complex containers for spacecraft are applied to microscale networks of interconnected repeat units to develop design methodologies to compute optimal geometries for high performance microporous materials and structures on Earth. The fundamental transport mechanism in the media is the interior corner geometry. The specific objectives of the research focus on the optimization of high performance wick structures employed in advanced two-phase passive cooling systems for microelectronic thermal control. The analysis employs the governing transport equations in a cell-by-cell approach to compute optimal pore structures in the low saturation limit where the media may be effectively modeled as a nodal network of interconnected interior corners and solved by matrix methods. The 'all analytic' method under development does not employ empirically determined constants or highly varying numerical coefficients as other pore-scale investigations. Example pore geometries solved to date for steady flows clearly identify the origins of the manifold improvements possible in select porous structures. Applications for such methods are also helpful to improving transport processes in porous media such as fabrics and membranes.

[1]Support for this work provide by the National Science Foundation (CTS-0521890)

Mark Weislogel
Portland State University

Date submitted: 30 Nov 2005 Electronic form version 1.4